2-21-11
RC 70

ADF·G

RC 70

Overview Of Upper Cook Inlet Salmon Management & Management Plans

Presented by

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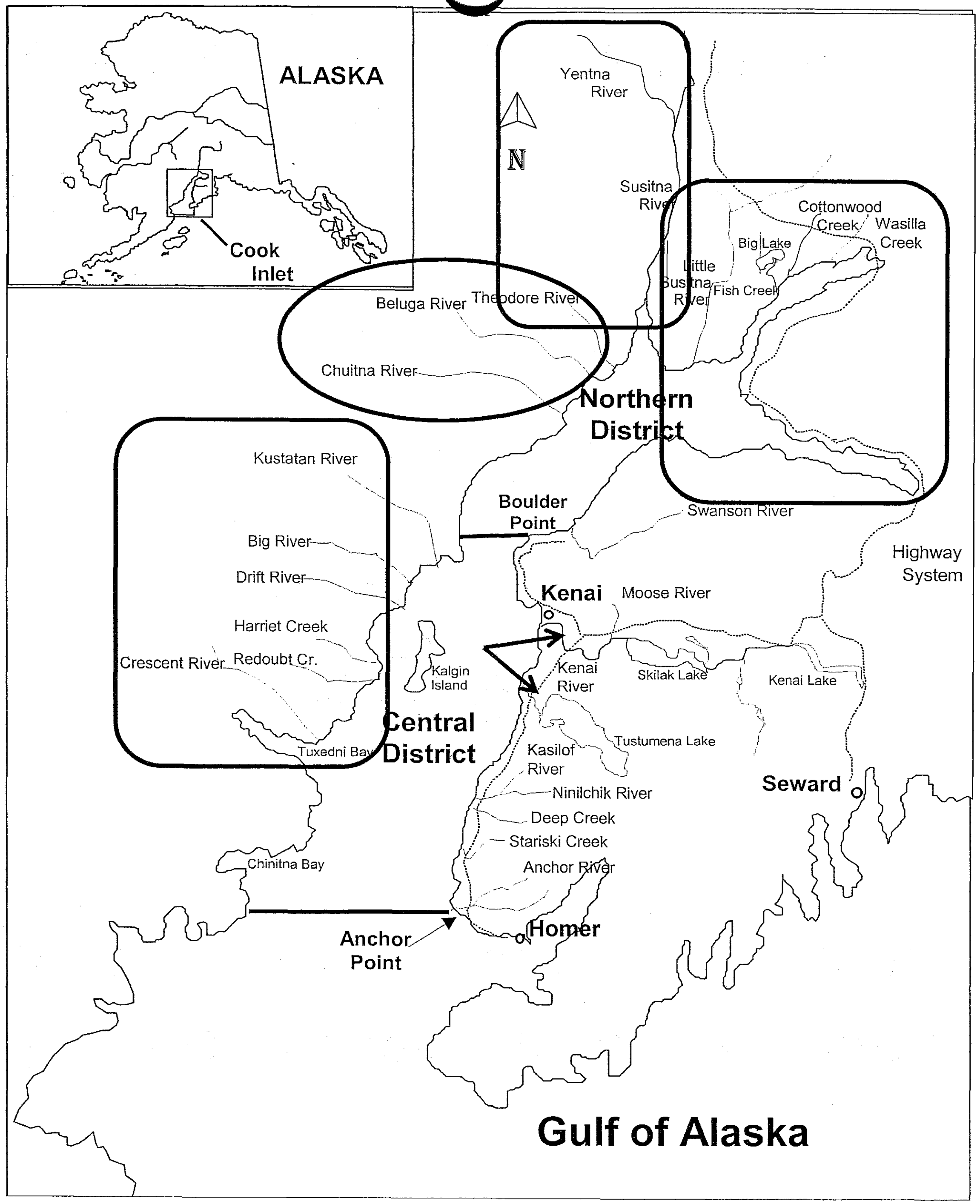
Commercial Fisheries

Tom Vania
Sport Fisheries

November 2010

Lower Cook Inlet Board of Fish Meeting


ALASKA
Cook Inlet
N
Yentna River
Susitna River
Cottonwood Creek
Wasilla Creek
Big Lake
Little Susitna River
Fish Creek
Beluga River
Theodore River
Chuitna River
Northern District
Kustatan River
Big River
Drift River
Harriet Creek
Crescent River
Redoubt Cr.
Tuxedni Bay
Boulder Point
Swanson River
Highway System
Kenai
Moose River
Kalgin Island
Kenai River
Skilak Lake
Kenai Lake
Central District
Tustumena Lake
Kasilof River
Ninilchik River
Deep Creek
Stariski Creek
Anchor River
Seward
Chinitna Bay
Anchor Point
Homer
Gulf of Alaska

Latitude and Longitude are based on the North American Datum of 1983 (NAD 83) which is equilivalent to the World Geodetic System 1984 (WGS 84).

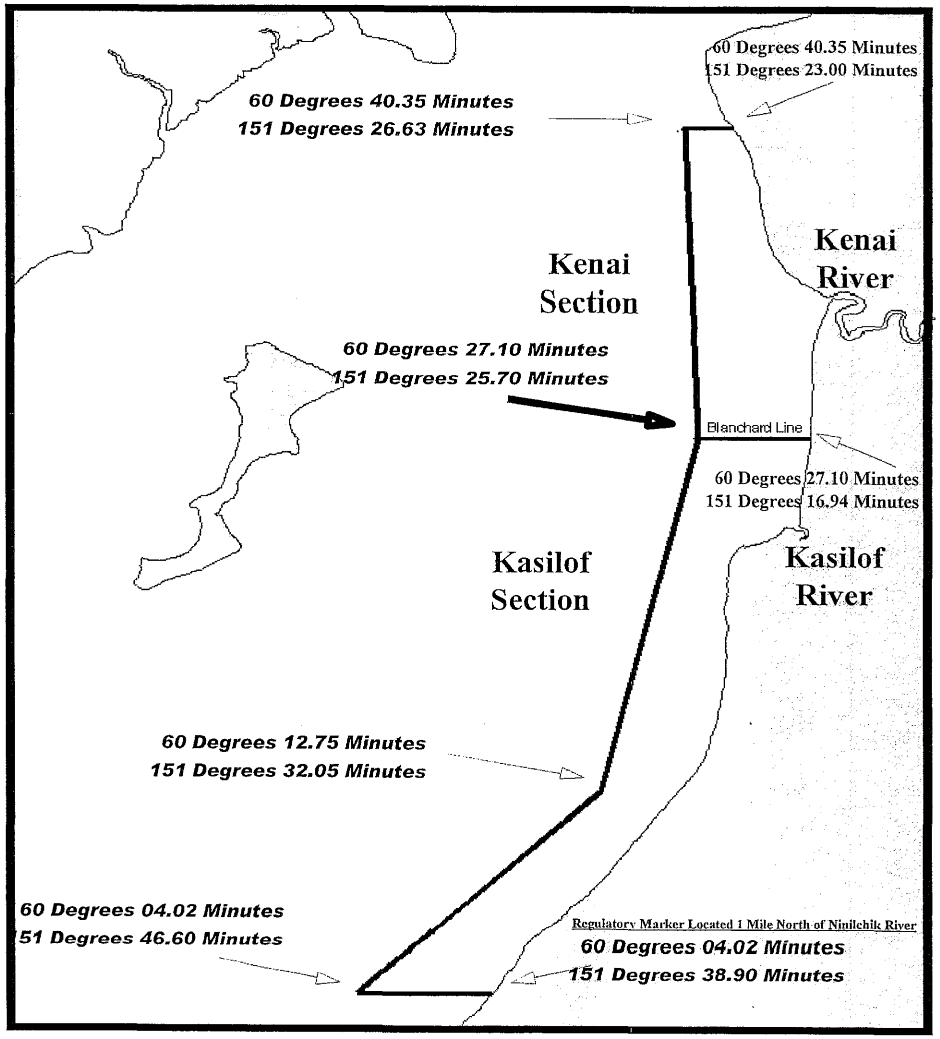
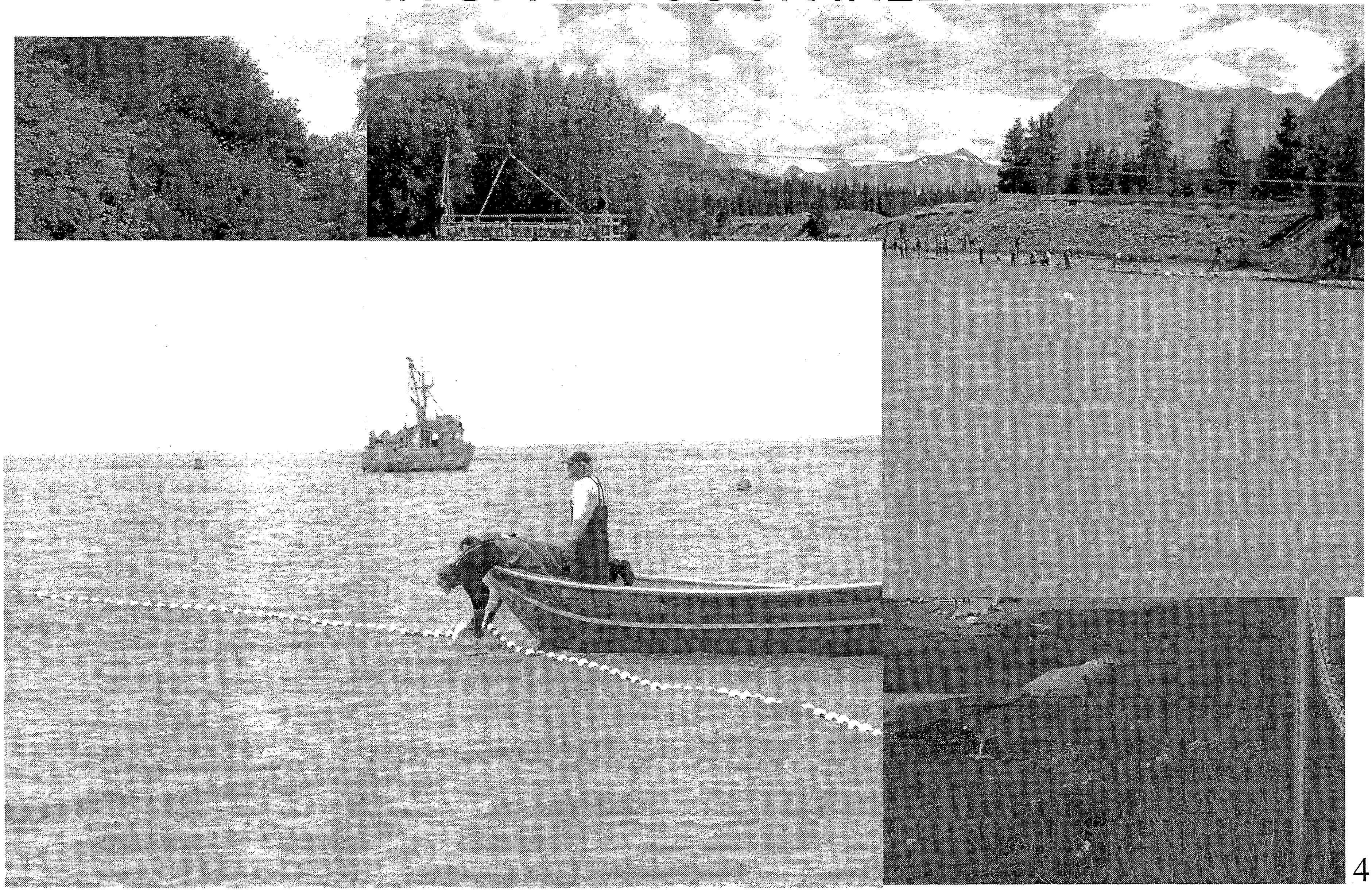


Figure 1. Map of the Kenai and Kasilof Sections with waypoint descriptions.

OVERVIEW OF SALMON MANAGEMENT PLANS IN UPPER COOK INLET



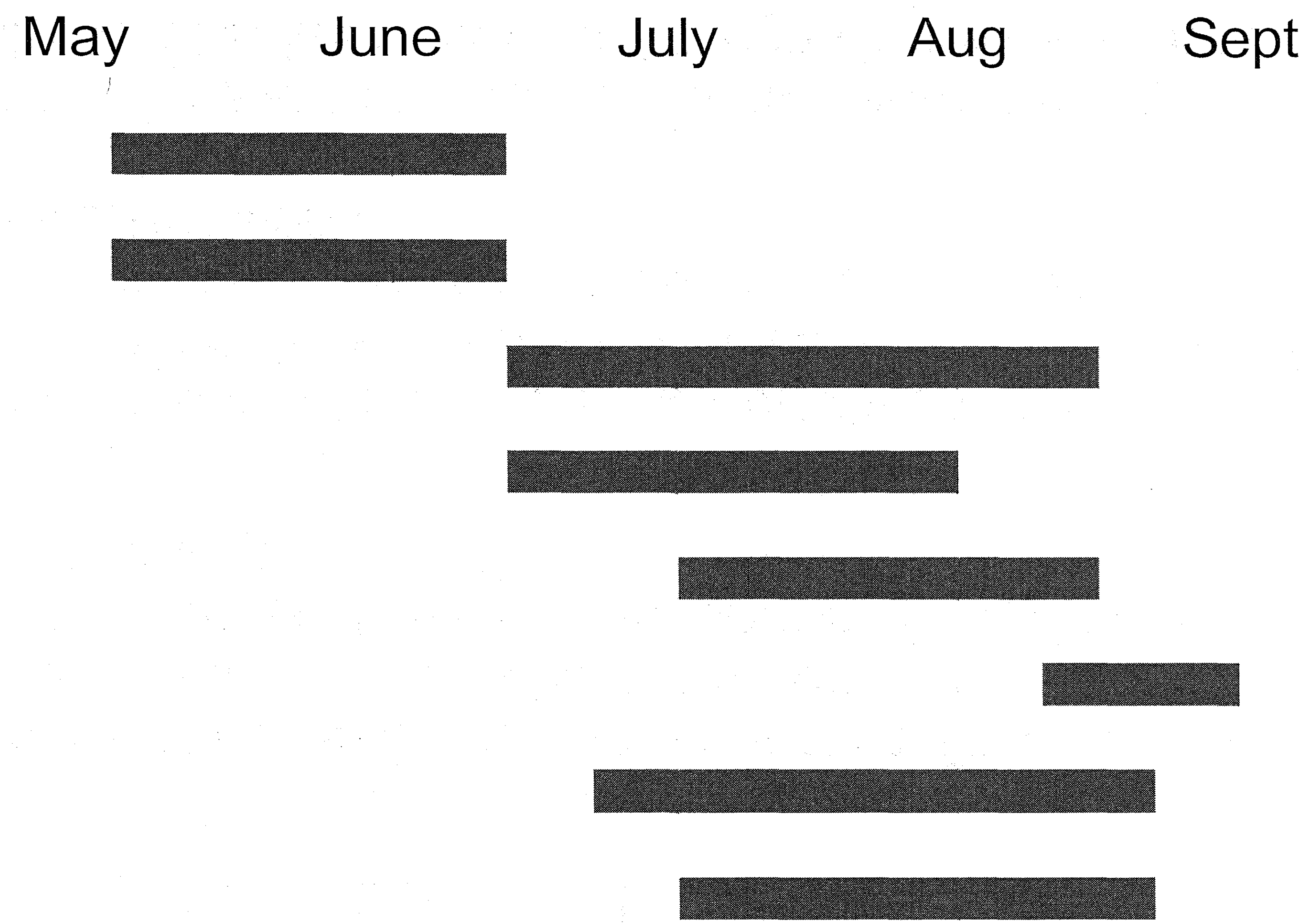
OVERVIEW OF SALMON MANAGEMENT PLANS IN UPPER COOK INLET

- The Upper Cook Inlet Salmon Management Plan guides harvest and allocations of stocks through step down management plans. Meeting escapement goals is primary objective of the department.

- "Step-down plans" provide specific objectives and guidelines to the department for in-season management of salmon resources. Specific management objectives and allocative instructions.

- Step-down plans are structured around migratory timing of major stocks of salmon moving through Upper Cook Inlet.

Run Timing of Salmon in Upper Cook Inlet



Organization of Management Plans in Upper Cook Inlet

There are a total of 16 management plans in the UCI Mgmt Area

UCI Salmon Management Plan
Yentna River Subsistence Plan
UCI Personal Use Plan
Riparian Habitat Plan

Early (← Prior to July 1)	**Middle** (July)	**Late** (August →)
Northern District King	Kenai LR King	Kenai Coho
Kenai/Kasilof ER King	Kenai LR Sockeye	
Big River Sockeye	Kasilof Salmon	
UCI Marine Early King	Packer's Creek Sockeye	

← Russian River Sockeye →

Central District Drift Plan →

Northern District Salmon →

Organization of Management Plans in Upper Cook Inlet

UCI Salmon Management Plan

Cook Inlet Subsistence Fisheries
UCI Personal Use Plan
Riparian Habitat Plan

Early (Prior to July 1)	**Middle** (July)	**Late** (August ⟶)
Northern District King	Kenai Late Run King	Kenai Coho
Kenai/Kasilof ER King	Kenai Late Run Sockeye	
Big River Sockeye	Kasilof Salmon	
UCI Marine Early King	Packer's Creek Sockeye	

⟵ Russian River Sockeye ⟶

Central District Drift Plan ⟶

Northern District Salmon ⟶

UCI Subsistence Fisheries

- **Most of UCI is designated as a nonsubsistence area.**
- **Two small subsistence fisheries:**
  - **<u>Tyonek</u>**
    - King salmon fishery in Tyonek Section of Northern District.
    - Set gillnets used.
  - **<u>Upper Yentna River</u>**
    - Sockeye fishery in upper reaches of Yentna River.
    - Fish wheels with a live box.

PERSONAL USE SALMON MANAGEMENT PLAN

- Parts overlap all timeframes; emphasis is during mid-July.
- Evolved from subsistence fisheries.
- **Fisheries:**
  - One remaining set gillnet fishery - targets Kasilof sockeye.
  - Largest two are dip net fisheries target Kasilof and Kenai sockeye.
  - Fish Creek and Beluga dip net fisheries.
  - Date-triggered and focus on sockeye salmon.

RIPARIAN HABITAT FISHERY MANAGEMENT PLANS

- Not specific to any time frame, although emphasis is clearly during the middle time frame (July).

- The objective of these management plans are to provide the ability to regulate inriver fisheries to protect riparian habitat.

- Most of the assessment and application has been for the Kenai River late run sockeye and king salmon fishery.

Organization of Management Plans in Upper Cook Inlet

UCI Salmon Management Plan
Cook Inlet Subsistence Fisheries
UCI Personal Use Plan
Riparian Habitat Plan

Early (Prior to July 1)	**Middle** (July)	**Late** (August →)
Northern District King	Kenai Late Run King	Kenai Coho
Kenai/Kasilof ER King	Kenai Late Run Sockeye	
Big River Sockeye	Kasilof Salmon	
UCI Marine Early King	Packer's Creek Sockeye	

← Russian River Sockeye →

Central District Drift Plan →

Northern District Salmon →

MANAGEMENT PLANS DURING THE EARLY TIMEFRAME (PRIOR TO JULY 1)

- Most stocks are managed primarily for recreational purposes.

- **Fisheries:**
  - Freshwater sport fisheries for king salmon.
  - Sport fishery for early-run Russian River sockeye.
  - Commercial fisheries for Northern Cook Inlet king salmon and Western Cook Inlet sockeye.

MANAGEMENT PLANS DURING THE EARLY TIMEFRAME (PRIOR TO JULY 1)

Northern District King Salmon Management Plan

- Management guidelines for commercial king salmon fishery. Monday periods between May 25 and June 24; 12 hour periods.

Kenai R. and Kasilof R. Early-Run King Salmon Conservation Mgmt. Plan

- Ensure adequate escapement, conserve unique large size Kenai River kings, and provide guidelines primarily to sport fishery.

Big River Sockeye Salmon Management Plan

- Guidelines for commercial fishery in Kustatan Subdistrict and west side of the Kalgin Island Subdistrict.

UCI Salt Water Early-Run King Salmon Management Plan

- Guidelines for the king salmon sport fishery in Deep Creek Area.

Russian River Sockeye Salmon Management Plan

- Ensure adequate escapement and provide guidelines to preclude allocation conflicts.
- Early run harvested primarily by sport fishery, late-run harvested by sport, commercial and personal use fisheries.

Organization of Management Plans in Upper Cook Inlet

UCI Salmon Management Plan
Cook Inlet Subsistence Fisheries
UCI Personal Use Plan
Riparian Habitat Plan

Early (Prior to July 1)	**Middle** (July)	**Late** (August →)
Northern District King	Kenai Late Run King	Kenai Coho
Kenai/Kasilof ER King	Kasilof River	
Big River Sockeye	Kenai Late Run Sockeye	
UCI Marine Early King	Packer's Creek Sockeye	

← Russian River Sockeye →

Central District Drift Plan →

Northern District Salmon →

MANAGEMENT PLANS DURING THE MIDDLE TIMEFRAME (JULY)

- Sockeye, chum, and pink salmon are managed primarily for commercial uses.
- Kenai late run king salmon managed primarily for sport and guided sport uses.
- Minimize the incidental take of Northern District coho, late Kenai king, and Kenai coho.
- Major fisheries: commercial, personal use, sport and guided sport fishing.

KASILOF RIVER SALMON MANAGEMENT PLAN

- Harvest Kasilof sockeye salmon excess to escapement needs and harvest salmon in fisheries that have historically taken them.
- Achieving lower end of Kenai OEG takes priority over not exceeding upper end of Kasilof OEG.
- Sets commercial season opening dates, allowable fishing time, limits on additional fishing time, and mandatory closed periods.
- Opening of fishery through July 7: maximum 48 hours of emergency order fishing time per week, and close fishery for 36 consecutive hours per week beginning Thursday or Friday.
- Special Harvest Area should be rarely used, and only after exhausting other methods.
- Tied to Kenai River late run sockeye salmon management plan after July 7.

KENAI RIVER LATE-RUN KING SALMON MANAGEMENT PLAN

- Ensure adequate escapement of late-run king salmon.
- Managed primarily for sport and guided sport uses.
- Provides specific direction on managing sport, guided sport, and commercial fisheries to achieve escapement goal.
- Habitat assessment.

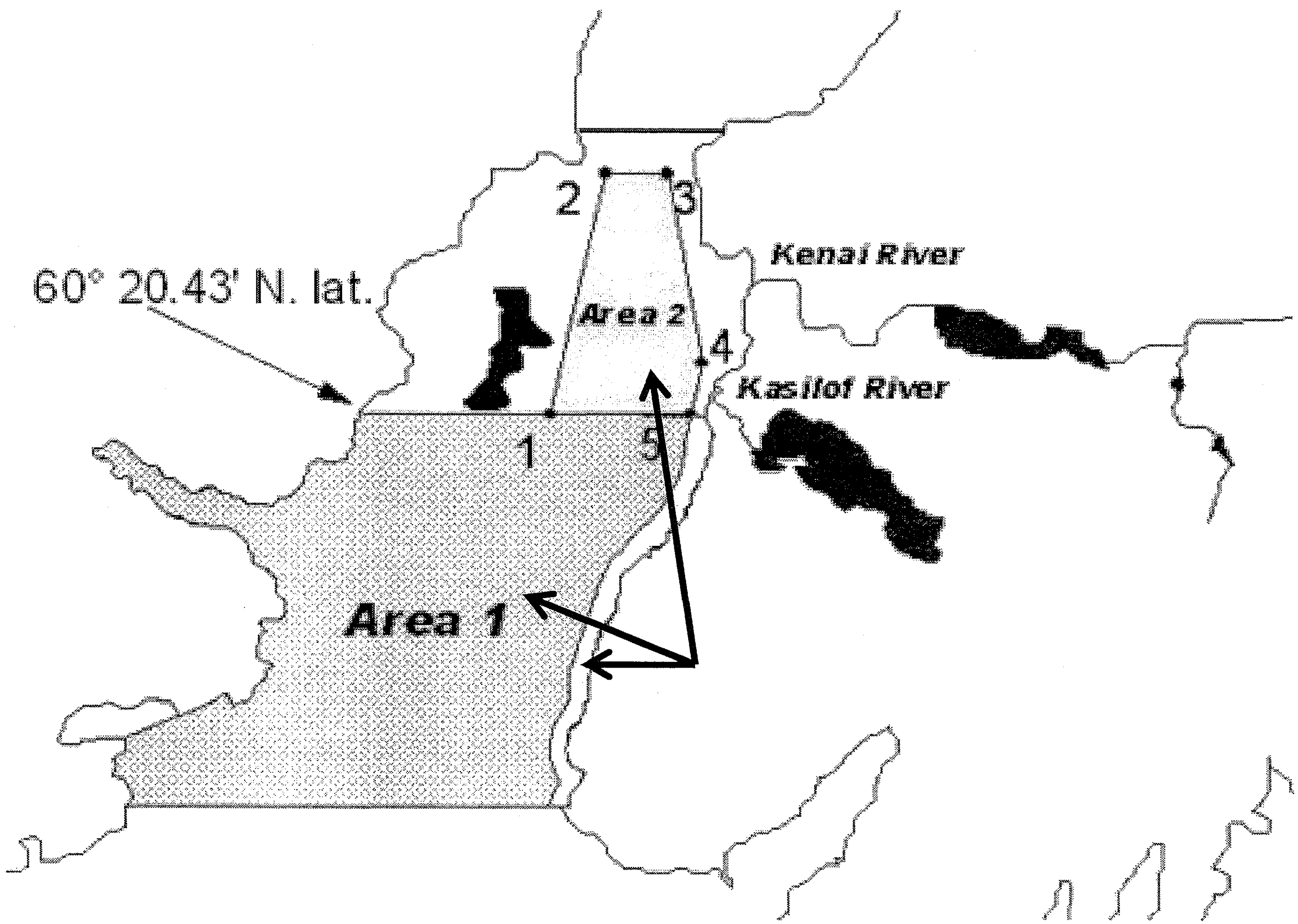
KENAI RIVER LATE RUN SOCKEYE SALMON MANAGEMENT PLAN

- Manage Kenai late run sockeye:
  - Primarily for commercial uses.
  - Minimize commercial harvests of ND coho, late-run Kenai king, and Kenai coho.
  - Specific objectives: 1) meet OEG range, 2) achieve inriver goals, and 3) distribute escapements evenly within OEG range in proportion to run size.
- Fishing time dependent on run strength; larger runs = more fishing time; closed fishing windows except in runs less than 2 million sockeye salmon.
- Establishes inriver goals based on abundance (<2 mil, 2-4 mil, >4 mil) and guidelines for each run strength range.
- Inriver goal tiers are 650,000 to 850,000, 750,000-950,000, and 850,000 to 1.1 million sockeye salmon.
- Habitat assessment.

Central District Drift Gillnet Fishery Management Plan

- Kenai and Kasilof Sections
- Drift Areas 1, 2, 3, and 4
- During certain time periods, the drift fleet is limited to areas within the central district, allowing fish to migrate to the north.

Central District Drift Gillnet Fishing Areas



NORTHERN DISTRICT SALMON MANAGEMENT PLAN

- Manage harvest of Northern District chum, pink, and sockeye for commercial uses.
- Minimize harvest of Northern District coho salmon by:
  - Additional Northern District periods not allowed if coho salmon expected to be most abundant stock in harvest.
  - Regular periods only after August 15 in the Northern District .
- Susitna River sockeye salmon are stock of yield concern. Action plan states:
  - June 25 – July 19: regular fishing periods only.
  - July 20 – August 7: one net only.

Organization of Management Plans in Upper Cook Inlet

UCI Salmon Management Plan
Cook Inlet Subsistence Fisheries
UCI Personal Use Plan
Riparian Habitat Plan

Early (Prior to July 1)	**Middle** (July)	**Late** (August ⟶)
Northern District King	Kenai LR King	Kenai Coho
Kenai/Kasilof ER King	Kenai LR Sockeye	
Big River Sockeye	Kasilof Salmon	
UCI Marine Early King	Packer's Creek Sockeye	

⟵ Russian River Sockeye ⟶

Central District Drift Plan ⟶

Northern District Salmon ⟶

KENAI RIVER COHO SALMON MANAGEMENT PLAN

THE LATE TIMEFRAME (August - September)

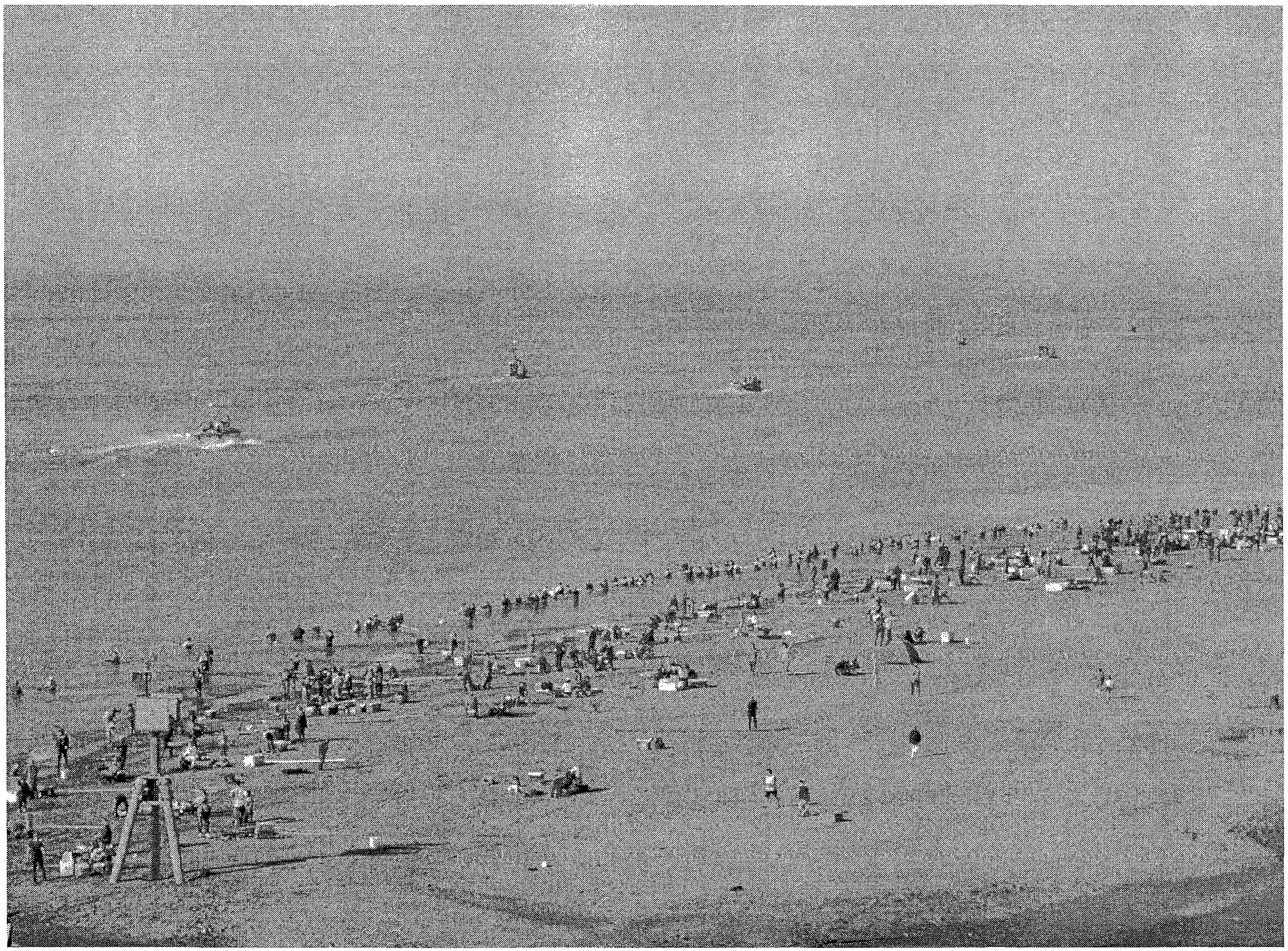
- Ensure adequate escapement into the Kenai River.
- Manage primarily for sport and guided sport uses.
- Middle and upper river close beginning November 1, and in the lower river beginning December 1.
- Eastside set gillnets close August 15 unless closed after July 31 if less than one percent of season total sockeye harvest has been taken for two consecutive fishing periods.

OVERVIEW OF SALMON MANAGEMENT PLANS IN UPPER COOK INLET

Summary:

- Meeting escapement goals are the primary objective of all management plans.
- Management plans are structured around migratory timing of major stocks of salmon moving through Upper Cook Inlet.
- "Step-down" plans provide specific management objectives to the department for management and allocation of fisheries.

<u>QUESTIONS?</u>



Proposal #261

RC 72

Greetings Board Members,

After reading the Department comments that recently became available I am writing you today to voice my opposition to Proposal 261 and to give my personal opinion on the Department comments located in RC3. It is my hope that you will scrutinize the Department's support of this proposal because in my opinion:

1) The department has not conducted a thorough review in regard to the following policy:

5AAC 75.222. Policy for the management of sustainable wild trout fisheries.

(c) Management of wild trout fisheries should be based on the following principles and criteria:

(2) wild trout populations should be maintained for optimal sustained yield as follows:

(F) impacts of fishing, including incidental mortality, should be assessed and considered in harvest management decisions;

(14) "wild trout" means the species rainbow trout or steelhead trout (*Oncorhynchus mykiss*)

and

2) The department has not taken into consideration that this is inherently an allocative issue that allows more opportunity for bait fisherman.

Furthermore the Department supports the proposal due to the following reasons that I believe are built on faulty logic. They are:

1) "Current regulations for late season fisheries within the Kasilof River drainage are not consistent…"

Correct, current regulations within the Kasilof drainage are not consistent but this is not a reason to support the proposal. The Kasilof River above the Sterling Highway Bridge is the only river or stream in Southcentral Alaska with the presence of a substantial steelhead trout population (ADF&G Anadromous Waters Catalog) where a fisherman can use bait up until Sept 15, use multiple hooks year round, and retain steelhead. The steelhead fishery on the Kasilof River above the bridge is the most liberal fall steelhead fishery in all of Southcentral Alaska and is likely a remnant regulation from the days of the hatchery steelhead fishery. This is no reason to

RC___

align regulations on the river and unintentionally open lower Kasilof catch and release wild trout fishery that allows bait while steelhead trout are migrating upriver.

and

2) "regulations for late season fisheries within the Kasilof River drainage… are more restrictive than regulations in other locations that support similar fisheries

I am not sure what the "other locations" are but in all of the locations where coho and steelhead are present together, the river is baitless with a single hook starting September 1st and nonretention year round. These locations include: the Anchor River, Stariski Creek, Deep Creek, Ninilchik River and Crooked Creek. The lower Kasilof River regulations are not more restrictive, they are the same as the above systems.

If the "other locations" is meant to include the Lower Kenai River simply because it is large glacially fed river with a coho sport fishery I again believe the department comments are incorrect. The Lower Kenai fall coho fishery is not taking place while any semblance of a wild steelhead trout population is migrating through. Furthermore, the Kasilof River attains its highest water levels of the season during early September as the glacier continues its seasonal melt. Water is high and fast. During this time steelhead trout are highly accessible to anglers as many fish are found in slower shallow water close to the river bank. I have made these observations on the Kasilof while working with the US Fish & Wildlife service on a steelhead tagging study and during personal fishing trips in the fall of 2007, 2008, 2009, and 2010. In my opinion, the Lower Kasilof and Lower Kenai River late-season fisheries are not similar fisheries due to the presence of wild steelhead trout that are highly susceptible to increased mortality with the use of bait.

Thank you for consideration of my comments.

Todd Anderson

I am an ADF&G Fisheries Biologist and sport fish on the Kasilof River in the fall. I am not representing ADF&G and am writing you today representing myself and my own opinions.

ADF&G Anadromous Waters Catalog

Pink line = Presence of Steelhead Trout

Proposal #261
RC

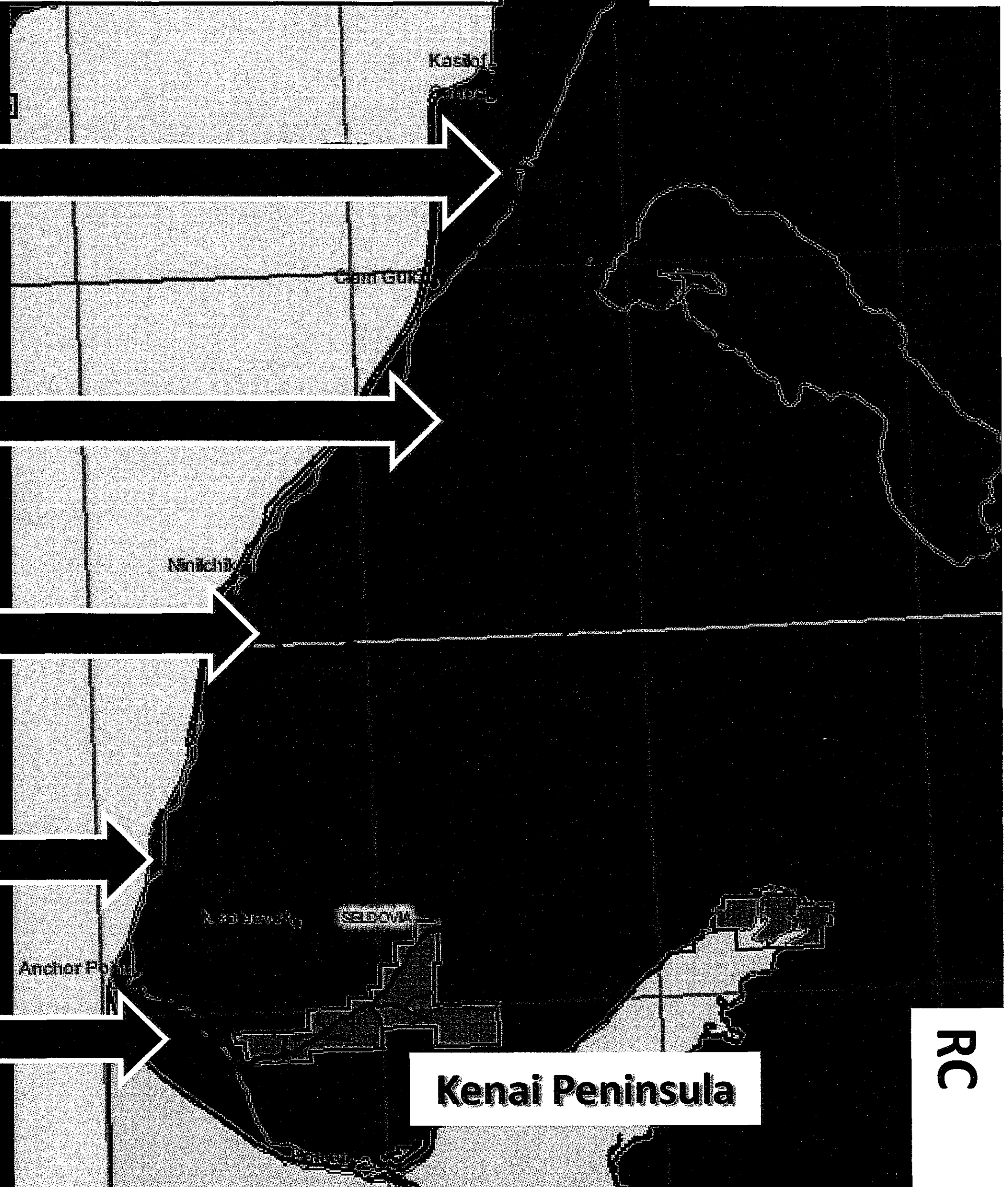
<u>Crooked Creek</u>
September 1-
UNBAITED SINGLE HOOK
NONRETENTION

<u>Ninilchik River</u>
September 1-
UNBAITED SINGLE HOOK
NONRETENTION

<u>Deep Creek</u>
September 1-
UNBAITED SINGLE HOOK
NONRETENTION

<u>Stariski Creek</u>
September 1-
UNBAITED SINGLE HOOK
NONRETENTION

<u>Anchor River</u>
September 1-
UNBAITED SINGLE HOOK
NONRENTENTION

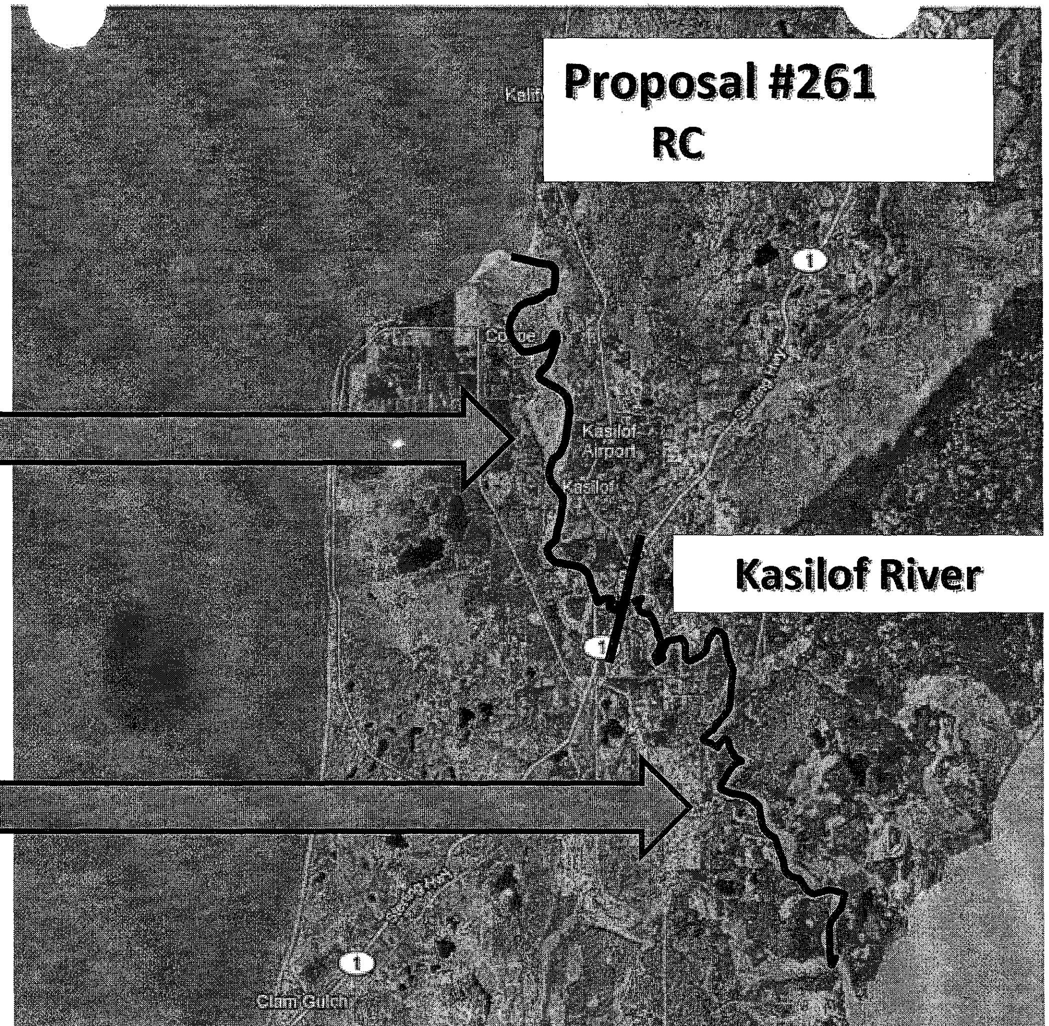


RC

Proposal #261
RC

Kasilof River-Below the Bridge
September 1-
UNBAITED SINGLE HOOK
NONRETENTION

Kasilof River- Above the Bridge
September 1-15
BAIT
MULTIPLE HOOK ALLOWED
2 per day/2 in Possession



Department Comment???

The Department SUPPORTS this proposal. Current regulations for late season fisheries within the Kasilof River drainage are not consistent and are more restrictive than regulations in other locations that support similar fisheries.

RC

I believe the Department and Board should consider the policy outlined in 5AAC 75.222 in regards to the use of bait after Sept 1 in the Kasilof River just as the policy has been applied to all other areas with substantial wild steelhead trout populations on the Kenai Peninsula.

5 AAC 75.222. Policy for the management of sustainable wild trout fisheries

(C) Management of wild trout fisheries should be based on the following principles and criteria:

(2) wild trout populations should be maintained for optimal sustained yield as follows:

(F) Impacts of fishing, including incidental mortality, should be assessed and considered in harvest management decisions;

RC

RC73

Comments to Board of Fisheries; February 21, 2011

Proposals 126, 127, 133, 136, 137, 144: I SUPPORT THESE PROPOSALS

Proposals 125, 128, 129, 130, 131, 132: I DON'T SUPPORT THESE PROPOSALS

My reasons for supporting and not supporting all of the above are the same: The first reason is I have an economic interest in the fisheries of the Mat-Su Valley, and to a lesser degree, of the entire Cook Inlet. I own the Mat-Su Outdoorsman Show which depends on sport fishing charters, sport fishing related businesses, and sport fishermen themselves to survive. Without a good representation of any of these groups the show will fail, and it is the major source of my income. We need more salmon to return to Mat-Su streams to support businesses like mine that depend on good salmon fishing opportunities to survive. And this includes commercial fishing businesses which ultimately depend on sustainable returns of salmon to ALL streams in Cook Inlet.

My second reason, which is much more important than the first, is my 55 years in Alaska has all been dependent on the outdoor opportunities we have in our great State. For me to continue to have reasonable opportunities to catch salmon in Mat-Su streams, there must be healthy runs return to these streams. All the proposals I listed (plus many others in this proposal book) will improve the health of the salmon runs in the Valley and ensure Alaskans have good sport fishing opportunities in these streams.

By far the most important reason I chose the above proposals to either support or not support is that I feel, first and formost, we have an obligation to manage our fisheries to protect every single naturally spawning salmon population in the State. The first two reasons I listed above are important to our livelihoods and to our enjoyment of the Alaska outdoors, but no personal interests should be put above managing for sustainable numbers of returning spawners to all of our salmon streams. We can all find other ways of making a living than commercial use of our salmon reasources, and we can also travel to other areas of the State to harvest salmon for our personal use, but not protecting salmon stocks in every stream and river of the State is simply not using good judgement for present or future Alaskans. I feel this reason should always be the Board's top priority when making any decision on Alaska issues.

Tony Russ
574 Sarahs Way
Wasilla, AK 99654
907-376-6474
fax 907-373-6474

ANS Options: Proposals 102, 103, 270

- For fish stocks with C&T uses, under AS 16.05.258(b) the board must "determine the amount of the harvestable portion that is reasonably necessary for subsistence uses."
- No ANS findings in regulation for the Tyonek Subdistrict subsistence fishery or the Yentna River subsistence fishery.
- Proposal 103 requests review of ANS for Yentna River fishery.
- Consideration of proposals and/or action plans provides opportunity to adopt ANS for Tyonek Subdistrict.
- **RCs 20 and 50** provides ANS options for both fisheries.

RC 74

ANS Options: Yentna River

- Two options, each with 2 suboptions.
- Based on harvests since fishery established in 1996 through 2010 and traditional use patterns.
- Options include separate ANS range for each species or one range combining all species.
- Option 1 defines ANS ranges based on mean harvests and standard deviations (SD).
- Option 2 defines ANS ranges based on low and high harvests within the 1996 - 2010 time span.

ANS Options: Yentna River

Option 1A:	**400 to 700 salmon**
Option 1B:	**300 to 550 sockeye salmon**
	50 to 100 chum salmon
	50 to 100 pink salmon
	50 to 100 coho salmon
Option 2A	**400 to 650 salmon**
Option 2B	**250 to 550 salmon**
	50 to 100 chum salmon
	50 to 100 pink salmon
	50 to 100 coho salmon

ANS Options: Tyonek Subdistrict

- Five options, with suboptions.
- Options 1-4 based on reported harvests and traditional use patterns.
- Option 5 based on reported harvests.
- Options 1–4 include separate ANS ranges for king salmon and all other salmon, or separate ranges for each species.
- Option 5 includes all species in one range.
- Options differ in range of years to consider (1980–2009 or 1992–2009).
- Options 1, 2, 5A, 5B define ANS ranges based on mean harvests and standard deviations (SD).
- Options 3, 4, 5C, 5D define ANS ranges based on low and high harvests within a time span.

ANS Options: Tyonek Subdistrict

	King salmon	Sockeye salmon	Chum salmon	Pink salmon	Coho salmon	Salmon other than kings	All salmon combined
Option 1A	950 to 1,300					200 to 350	
Option 1B	950 to 1,300	50 to 200	50 to 100	50 to 100	50 to 200		
Option 2A	950 to 1,750					200 to 400	
Option 2B	900 to 1,750	50 to 200	50 to 100	50 to 100	50 to 200		
Option 3A	750 to 1,350					150 to 450	
Option 3B	750 to 1,350	50 to 200	50 to 100	50 to 100	50 to 250		
Option 4A	750 to 2,650					150 to 500	
Option 4B	750 to 2,650	50 to 300	50 to 100	50 to 100	50 to 350		
Option 5A							1,200 to 1,550
Option 5B							1,200 to 2,100
Option 5C							1,100 to 1,600
Option5D							1,100 to 2,900

RC 75

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THE GREAT KENAI SOCKEYE "OVERESCAPEMENT" DEBATE
REVIEW & ASSESSMENT OF CURRENT INFORMATION

SUMMARY

- ✓ This summary reviews the history and current information concerning the continuing controversy over the significance of effects of large Kenai sockeye escapements on future returns.

- ✓ An updated escapement goal analysis by ADFG for UCI (Fair et al. 2010), corrected historical late-run sockeye data for biases recently identified in the Kenai sockeye sonar. The Department concluded that a simple 2-parameter brood-year interaction model continues to provide the best fit for historical Kenai River sockeye salmon-return data.

- ✓ Our assessment found that the brood-year interaction term provided a relatively marginal improvement in model performance relative to a general Ricker model based solely on the brood year spawning escapement.

- ✓ We also found that the brood year interaction model failed the test of more recent data. No significant relationship between observed and predicted recruitment values is apparent from brood year 1993-2005 data collected since the model was developed.

- ✓ These findings corroborate previous assessments conducted by ADF&G. John Clark et al. (2007a) found that, while the brood year interaction model provided the best statistical fit to the available spawner-recruit data, the fundamental assumptions of the model were suspect. In a comprehensive review of the biological and fishery related aspects of overescapement, Bob Clark et al. (2007b) found some evidence for delayed density dependence in some stocks, but relatively small short term effects on yield and no evidence for long-term stock collapse due to large escapements.

- ✓ "Overescapement" risks have long been represented as biological justification for commercial fishery allocation priorities for Kenai sockeye at the expense of other stocks, species and fisheries. However, current data has shown that predictions of the imminent collapse of late-run Kenai sockeye due to large escapements in 2004-2006 have not been realized. In fact, the 2010 Kenai sockeye forecast of close to 4 million would be a greater than average run.

- ✓ We conclude that, in light of the significant uncertainty surrounding the marginal effects of Kenai sockeye escapements exceeding the upper goals, the very high priority assigned to these goals by the current management system does not appear to be warranted.

R. Beamesderfer & T. Garrison February 20, 2011

INTRODUCTION

Upper Cook Inlet (UCI) commercial fisheries have long been managed to maximize harvest of the very-productive Kenai sockeye run. Exploitation rates of Kenai late-run sockeye are among the highest in Alaska (Clark et al. 2007b). Intensive commercial fisheries in the inlet severely impact upstream personal use and recreational fisheries by reducing delivery of king, coho, and sockeye salmon, particularly during extended periods of near-continuous commercial fishing around the peak of the sockeye run.

High Kenai sockeye harvest rates have been justified by concern for the risks of large spawning escapements on future production. Predictions of severe consequences of "overescapement" (i.e. escapements exceeding established escapement goals) have largely driven UCI fishery management since the 1990s. A very high priority has been established by the management system to avoid large Kenai sockeye escapements. This management priority has effectively trumped many other conservation, productivity, and fishery goals throughout the inlet.

This review summarizes the history of Kenai late-run sockeye escapement goal analysis and examines the biological basis for "overescapement" theory based on current scientific information.

HISTORY

The Brood-year Interaction Model

While no Kenai sockeye escapement has ever failed to replace itself, stock-recruitment and juvenile analyses during the 1990s produced a series of models predicting a severe reduction in production from escapements exceeding the 500,000 to 1,000,000 range of the current Optimum Escapement Goal (OEG). At the heart of these analyses was a "brood-year interaction" model which predicted that successive large escapements would effectively collapse future returns (Carlson et al. 1999). Model conclusions hinged on just three years of data from 1987-1989 resulting from the accidental coincidence of very large sockeye runs following favorable ocean conditions during the mid-1980s and the Exxon Valdez disaster in 1989 (Figure 1). A series of juvenile and limnological models and relationships were derived as justification for the mechanism of this brood-year interaction effect (Schmidt and Tarbox 1993, Schmidt 1994, Schmidt and Tarbox 1995, Schmidt and Tarbox 1996, Schmidt et al. 1996, Edmundson et al. 2003). Ironically, most of this work was funded as a result of the same oil spill that accidentally produced large escapements in the first place.

Stock-recruitment relationships have long been a fundamental principle of salmon fishery management (Hilborn and Waters 1992). The underlying theory holds that large escapements will result in density-related reductions in yield per recruit due to increased competition for finite spawning or rearing habitat. As a consequence, fisheries are typically managed for intermediate levels of escapement in order to maximize average yield. The brood-year interaction hypothesis behind Kenai sockeye management is a unique variation on basic stock-recruitment theory. The primary difference is in the degree of effect. Conventional theory predicts a gradually-decreasing reduction in production for many salmon stocks when escapement exceeds optimum levels. The brood-year interaction hypothesis predicts a severe reduction in future returns when successive escapements substantially exceed optimum levels.

"Overescapement" fears were fed by another series of large escapements in 2004-2006 (Figure 1). These resulted from a combination of strong sockeye runs, poor run strength forecast accuracy, and commercial fishery limitations enacted by the 1999 and 2002 Fishery Boards intended to optimize the balance among commercial, personal use and sport fisheries. Concern was fueled by reports of very small sizes of sockeye fry in Skilak Lake where the majority of Kenai sockeye rear for one to two years before emigrating to the ocean. Record low fry sizes were recorded for age 0 sockeye during fall in 2004-2006 (Figure 2). Small fry sizes coincided with large numbers due to high spawning escapements and reduced water clarity due to glacial runoff patterns.[1] Fry size is inversely correlated with survival. Winter starvation is thought to occur if fry don't reach a critical size with sufficient energy reserves. Marine survival is also inversely correlated with size at emigration. (Larger smolts generally return in future years at a higher rate.)

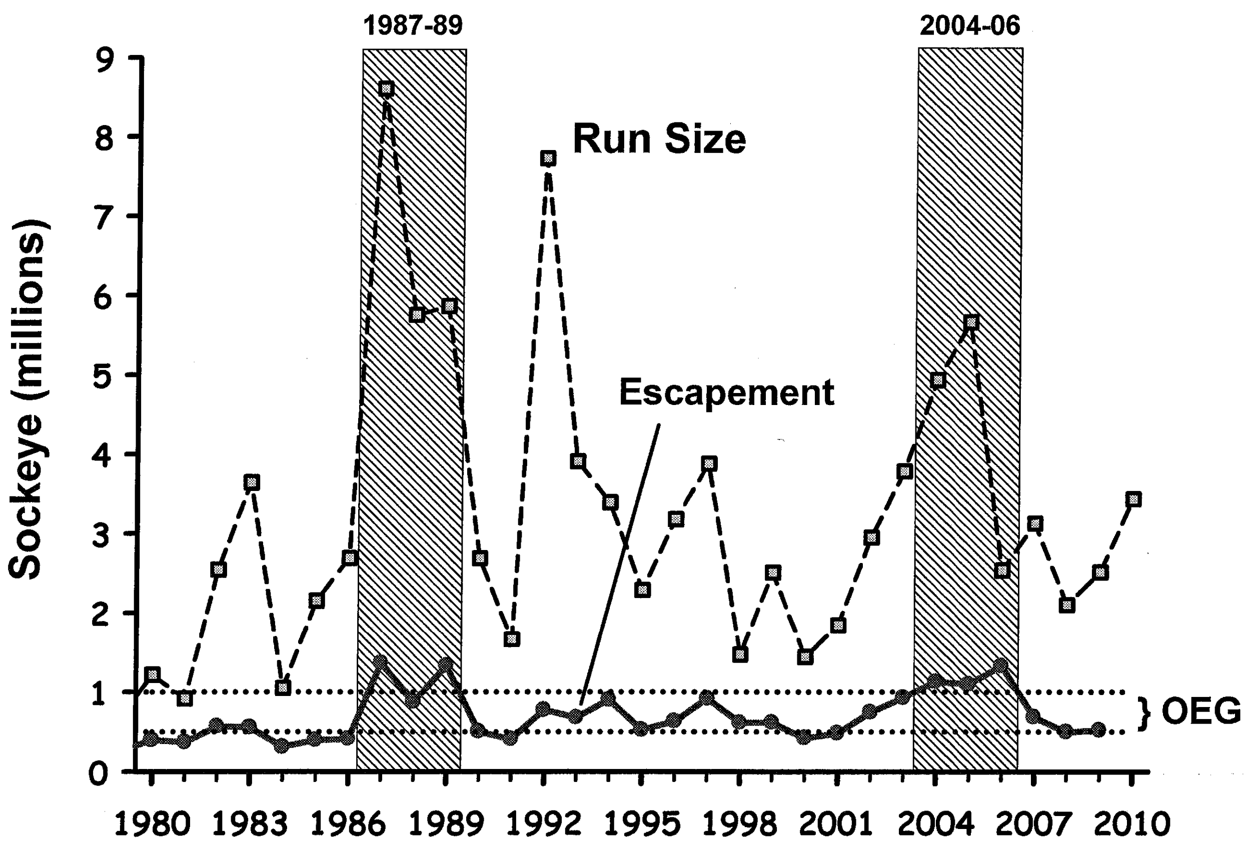

Figure 1. **Recent escapements and run sizes of late-run Kenai sockeye relative to the current Optimum Escapement Goal (OEG) based on historical bendix Sonar data.**

[1] *Water clarity in Skilak Lake is highly correlated with flood frequency. Periodic floods introduce large amounts of sediment into the lake which reduces water clarity as measured by euphotic zone depth. (Greater EZD = clearer water = higher plankton productivity). Water clarity gradually increases over several years as the turbidity is gradually flushed through the system.*

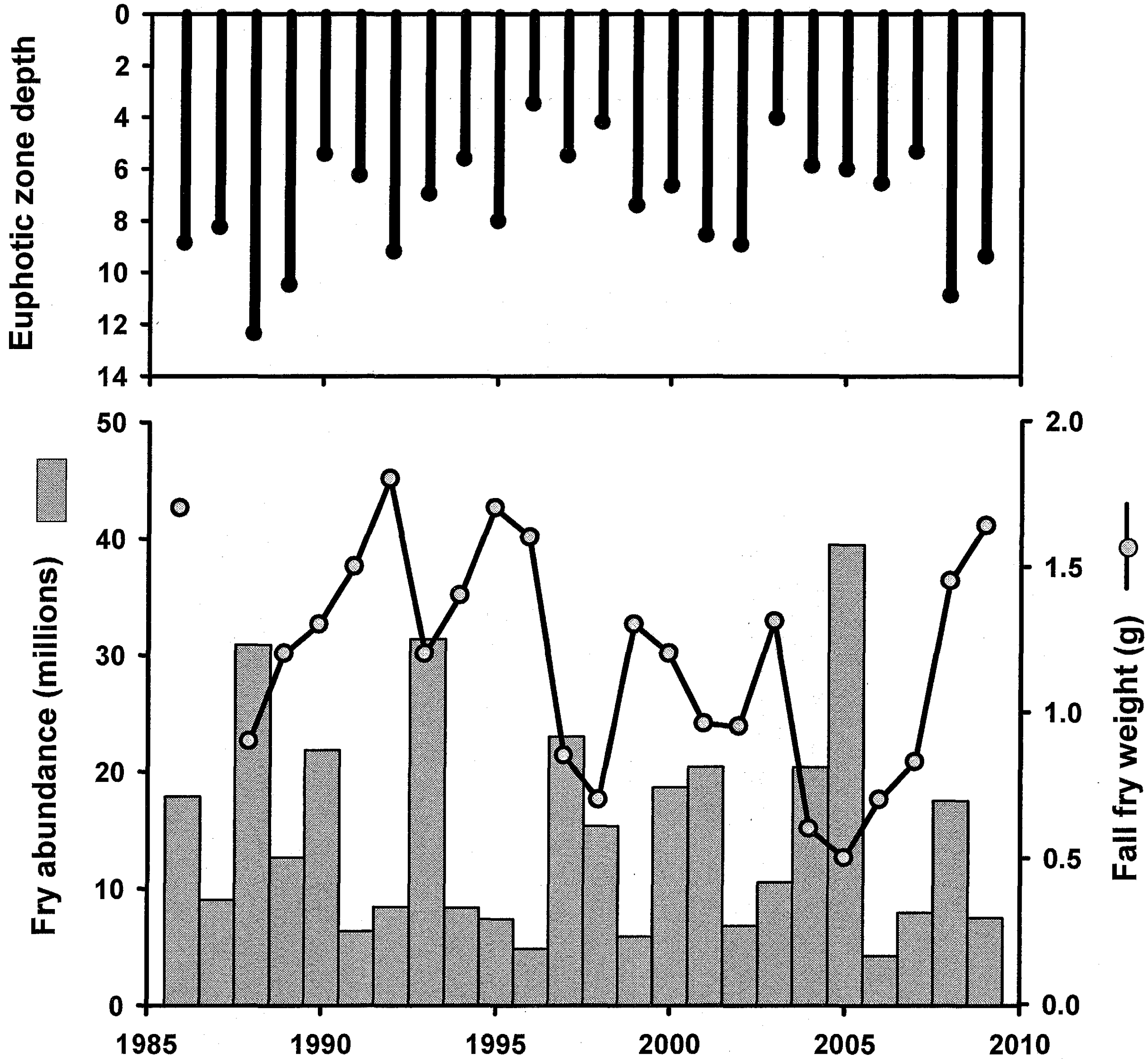

Figure 2. **Age 0 sockeye fry abundance, fall fry weight and euphotic zone depth (m) in Skilak Sake.**

Predictions of the pending collapse of late-run Kenai sockeye due to large escapements in 2004-2006 contributed to significant reductions in commercial fishery limitations by the 2005 and 2008 Fishery Boards in order to ensure avoid large Kenai sockeye escapements. At the same time, these escapements provided the first real opportunity to empirical test the "overescapement" hypothesis. If the brood-year interaction hypothesis is correct, then the sequence of large brood years escapements in 2004-2006 should produce very low sockeye returns from 2009 through 2011. However, average or higher returns would suggest that risks of large escapements are not as great as has previously been theorized.

ADF&G ESCAPEMENT GOAL ANALYSIS

An updated escapement goal analysis for UCI analyzed the fits of various stock-recruitment models to recent stock-recruitment data (Fair et al. 2010). This analysis corrected historical late-run sockeye data for biases recently identified in the Kenai sockeye sonar. Fair et al. (2010) estimated brood year returns for the 1968 through 2005 brood years using 7 alterative models previously identified by Carlson et al. (1999) and Clark et al. (2007a).

Fair et al. (2010) fit models to data for BY 1969-2005 and BY 1979-2005. They concluded that a simple 2-parameter brood-year interaction model best fit the Kenai River sockeye salmon-return data from both time intervals based on R^2 and AIC values (Table 1). The improved fit of the simple brood-year interaction model over the classic Ricker was primarily due to brood-years 1988-1990, which followed the largest escapements ever observed in 1987 and 1989 (Fair et al. 2010). The full brood-year data set (1969-2005) provided better model fits than the reduced data set (1979-2005) primarily because the older data included points from very low escapements. The more recent data accounted for just 28% of the historical variation in stock-recruitment data. Adding the 1969-1978 data improved the fit to 60%.

Both the Ricker and Brood-year interaction models predicted similar recruitments for escapements less than 1.2 million (Figure 3). At higher escapements, the brood-year model would predict lower recruitments when similar recruitment levels were observed in successive years. As a result, lower yields are predicted from high escapements based on the brood-year interaction effect. Brood-year and general Ricker models performed similarly when large escapements were interspersed with lower levels.

Based on this analysis, Fair et al. (2010) recommended that the Kenai late-run salmon SEG be set at 700,000 to 1,200,000 spawners as estimated using the brood-year interaction model fit to the full data set. This is approximately equivalent to the current SEG of 500,000-800,000 accounting for the sonar correction.

Table 1. Summary of adult stock-recruitment models evaluated for Kenai late-run sockeye salmon by Fair et al. (2010).

		BY 1969-2005		BY 1979-2005	
	Model	r^2	AIC	r^2	AIC
1	General Ricker	0.528	59.68	0.073	50.08
2	Classic Ricker	0.528	57.32	0.063	47.96
3	Autoregressive Ricker	0.556	57.59	0.230	46.48
4	Cushing	0.499	59.52	0.073	47.54
5	Classic Ricker with brood interaction	0.561	57.17	0.249	44.39
6	General Ricker with Brood interaction	0.600	53.55	0.282	43.16
7	Simple brood interaction	0.600	51.23	0.282	40.71

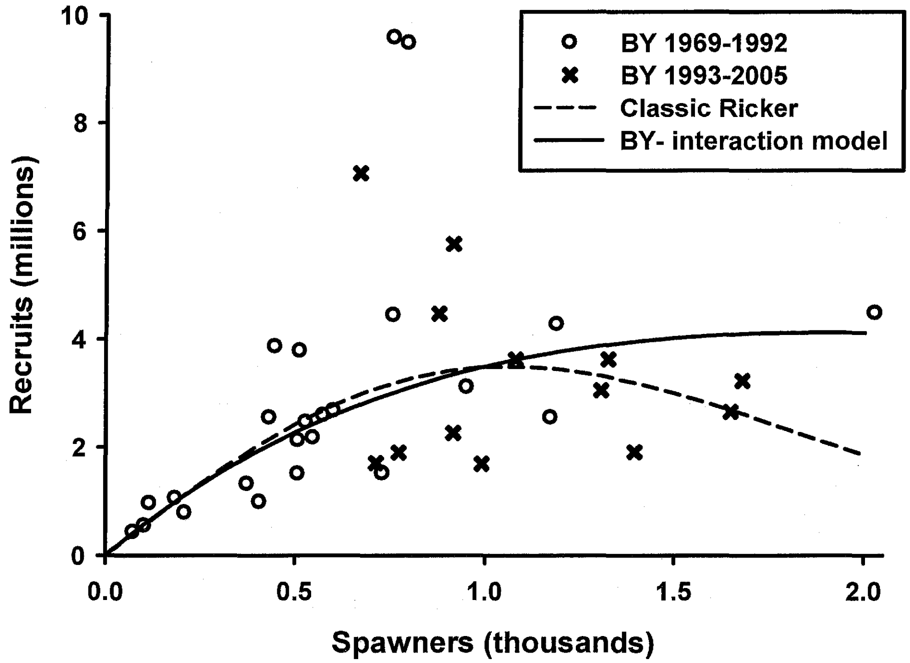

Figure 3. **Sockeye stock-recruitment analysis for Didson-corrected 1969-2005 brood year returns of late-run Kenai sockeye using Classic Ricker and brood-year interaction models as per Fair et al. (2010). The period 1962-1992 includes data originally used by Carlson et al. (1999) to develop the brood-year interaction model. Brood years 1993-2005 include all available data since initial model development.**

OUR ASSESSMENT

The recent escapement goal analysis for UCI salmon (Fair et al. 2010) did not utilize current data to critically review the performance of the Brood-year interaction model beyond refitting a series of alternative stock-recruitment models to the historical dataset. Therefore, we conducted additional analyses of current data to evaluate: 1) whether brood-year interaction effects account for a meaningful portion of the historical variation recruitment relative to a simple Ricker model, and 2) whether the brood-year interaction model accurately predicts recruitment patterns based on data collected subsequent to its initial development.

Stepwise Analysis of Brood-year Effect

We examined whether brood-year interaction effects account for a meaningful portion of the historical variation recruitment relative to a simple brood-year model based on a simple an hoc comparison of the r^2 values for the general Ricker model with and without the brood-year interaction term. This analysis showed that the brood-year interaction term provided a relatively marginal improvement in model performance (Figure 3). Only 7% of the variation in recruitment was related to the brood year interaction term in the full data set recommended by Fair et al. (2010). The effect increases to 21% in the 1979-2005 data set which reflects the leveraging effect of the 1987-1989 data points.

In fact, the improvement in both r^2 and AIC in the simple brood interaction model relative to the general Ricker model with brood interaction might be a statistical artifact of the model comparison method. Both metrics impose statistical penalties for models with more than one term. Fair et al. (2010) found that the general Ricker with brood-year interaction effects performs similar to the simple brood year interaction model with main effects. In fact, in the context of a linear model, fitting a model to describe the effect of interacting brood-year stocks without additionally modeling the main effects of those stocks is a statistically novel approach. When fitting models with interaction terms, it is questionable from a modeling perspective to not include the main effects (Kutner et al. 2005).

Table 2. Comparison of the contribution of the brood year interaction term to model fits using a general Ricker model reported in Fair et al. (2010).

Model	BY 1969-2005		BY 1979-2005	
	r^2	Improvement	r^2	Improvement
General Ricker	0.528	--	0.023	--
General Ricker with brood interaction	0.600	0.072	0.282	0.209

Test of the Brood-year Model with Recent Data

The brood-year interaction model is not supported by stock recruitment data collected subsequent to model development (Figure 4). Predicted and observed values were positively and significant correlated for BY 1969-1992 data used to derive the original model. This model accounted for about half of the observed variation between predicted and observed values. However, the brood year interaction model has failed the test of data from BY 1993-2005. No significant relationship between observed and predicted values is apparent since the model was developed. In fact, predicted and observed models are negatively correlated (although the relationship is not significant).

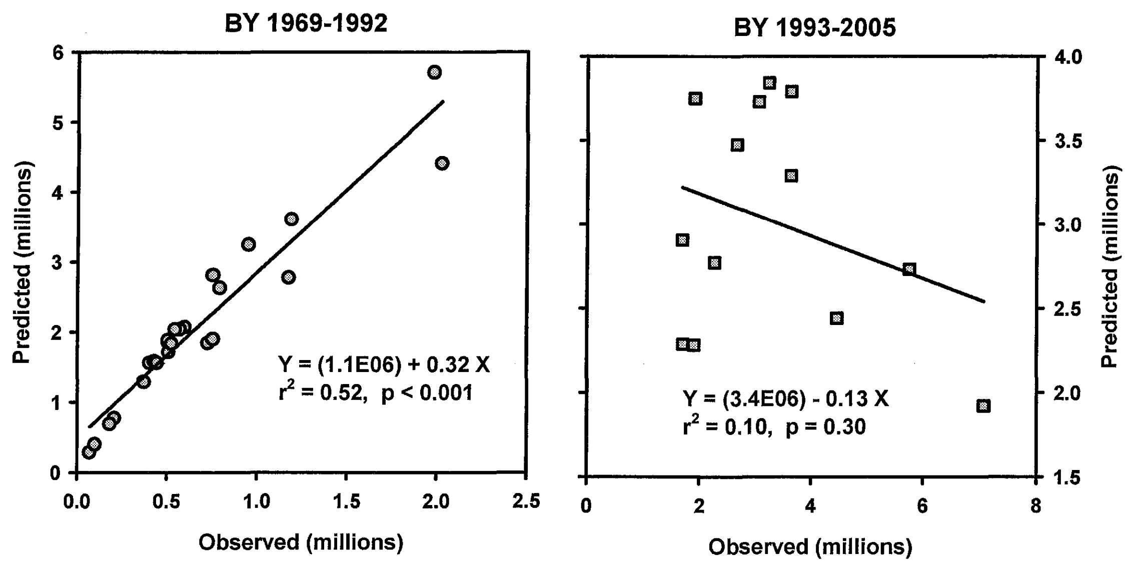

Figure 4. Comparisons of predicted and observed recruitments based on the simple brood-year interaction model for BY 1969-1992 data upon which the model was originally derived and more recent data from BY 1993-2005 used to empirically test model performance as a predictive tool.

Fair et al. (2010) found that the brood year interaction model continues to provide the best fit to a historical data set which includes the 1987-1989 data points which continue to drive the original model fit. However, the model is gradually breaking down over time as it does not accurately predict subsequent recruitment patterns. This suggests that the good fit of the original model to pre-1993 data may be an artifact of the model fitting process rather than a true characterization of a brood-year interaction effect. The original model is only just now being tested with complete return year data from a succession of large escapements from 2003-2006. The signal from the recent data has not yet been fully reflected in brood year analyses by Fair et al. (2010) which do not include more recent returns. However, current data has shown that predictions of the imminent collapse of late-run Kenai sockeye due to large escapements in 2004-2006 have not been realized. In fact, the 2010 Kenai sockeye forecast of close to 4 million would be a greater than average run.

DISCUSSION

Assessments of current Kenai stock-recruitment data, including corrections for historical undercounts of the sonar system, continue to highlight significant questions regarding the risks associated with large escapements. The brood year interaction effect accounts for a very small portion of the variability in recruitment. The model has failed to accurately predict recruitment patterns where tested with data collected subsequent to it's development.

These findings corroborate previous assessments conducted by ADF&G. A Department review prior to the 2005 Board meeting found that, while the brood year interaction model provided the best statistical fit to the available spawner-recruit data, the fundamental assumptions of the model were suspect (Clark et al. 2007a). They concluded:

> *From a biological perspective, there is good reason to believe in a brood year interaction effect, but little reason to believe the effect is multiplicative. Thus like the Ricker model, the brood interaction model is suspect.*

Clark et al. (2007a) concluded that the existing data were inadequate to determine whether the escapement goal range includes maximum sustained yield. This led to a reclassification of the Kenai escapement goal from a BEG to an SEG.

A comprehensive review of the biological and fishery related aspects of overescapement was subsequently completed by the Department in response to statewide concern over the issue of "overescapement" (Clark et al. 2007b). This review found that escapements exceeding goals reduced yields if the goals accurately reflect the capacity of the system. Escapements that exceeded goals resulted in higher subsequent yields when existing goals did not encompass MSY. Short term losses in yield due to overescapement where goals included MSY were typically small (5% or less of the annual run, 10% in the Kenai). Some evidence was found for delayed density dependence in some stocks but there was no evidence for long-term stock collapse due to large escapements.

The potential significance of "overscapement" continues to be highly debated in salmon fishery management throughout the region. Ruggerone and Rogers (2003) found some evidence for reduced productivity of several Alaska stocks following large escapements when fisheries were restricted due to the Exxon Valdez oil spill. However, a review of overescapement in British Columbia sockeye and pink stocks by Walters et al. (2004) found no evidence for anything like a "collapse" or "near-collapse" of production following runs with very large numbers of spawners.

The fundamental question regarding the effects of large Kenai sockeye escapements is not whether they reduce future productivity but whether the effect and risk is substantial enough to elevate commercial fishery management for a single strong stock, Kenai late-run sockeye, at the expense of other stocks of sockeye, kings, and coho and other personal use and sport fisheries throughout the inlet. In light of the significant uncertainty surrounding the marginal effects of Kenai sockeye escapements exceeding the upper goals, the very high priority assigned to these goals by the current management system does not appear to be warranted.

ACKNOWLEDGEMENTS

This assessment is based in part on previous work funded by the Kenai River Sportfishing Association. Published and unpublished data on recent juvenile and adult sockeye was provided by Mark Willette and Lowell Fair of the Alaska Department of Fish and Wildlife.

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RC76

Economic Values of Sport, Personal Use, and Commercial Salmon Fishing in Upper Cook Inlet

Executive Summary

Upper Cook Inlet is unique among all of Alaska's maritime regions in its relative proportions of recreational and commercial fishing. Upper Cook Inlet supports Alaska's largest and most economically valuable recreational fisheries. Sport and personal use fishing is heavily concentrated in the region, and the economic values associated with these activities are very substantial. By contrast, commercial fisheries in Upper Cook Inlet yield a small fraction of the state's commercial harvest and the associated economic values are very modest.

Over the past decade the economic values of sport and personal use salmon fisheries in Upper Cook Inlet have greatly surpassed those of the commercial salmon fisheries by every available measure. State fisheries management systems—designed primarily to accommodate commercial fisheries—continue to grapple with the profound and ongoing changes in both recreational and commercial salmon fisheries in the region.

To more clearly define the economic importance and relative values of salmon fisheries in Upper Cook Inlet, this report reviews published studies and agency data on participation, economic significance, net economic value, and potential economic impacts of management practices in the region's sport, personal use, and commercial salmon fisheries.

COOK INLET SALMON FISHERIES

Cook Inlet is divided into two fisheries management areas—Upper and Lower Cook Inlet. Anchor Point (near Homer) is the boundary between the two areas. Upper Cook Inlet is divided into two districts—the Central District (from Anchor Point north to Boulder Point) and the Northern District (from Boulder point north). The Central District is the gateway for salmon returning to the Kenai, Matanuska-Susitna, and Anchorage Borough watersheds.

Almost two-thirds (64%) of the total Cook Inlet commercial salmon catch comes from Upper Cook Inlet. An even greater percentage of the total harvest value—about five-sixths (83%)—comes from Upper Cook Inlet. This means that the great bulk of high-value salmon species caught in Cook Inlet are taken in Upper Cook Inlet. Sockeye salmon constitute almost all (93%) of the value of the Upper Cook Inlet commercial salmon harvest with Chinook and coho each constituting 3% and chum 1%.

Upper Cook Inlet Commercial Salmon Harvest Value by Species

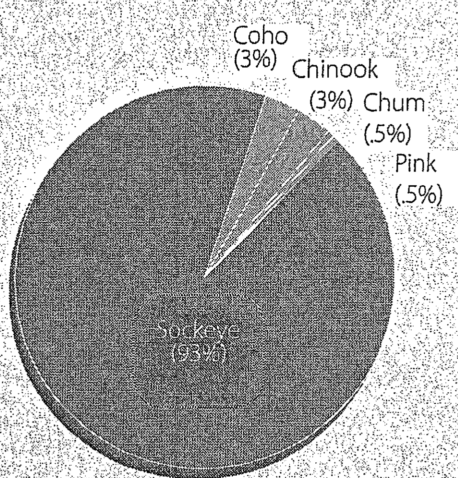


Figure ES 1. From 2002-2006, sockeye salmon averaged 93% of the annual harvest value with Chinook and coho each constituting 3%, chum 1%, and pink less than a half of a percent. Source: ADF&G 2007.

Upper Cook Inlet Commercial Sockeye Salmon Harvest by Gear Type & Location

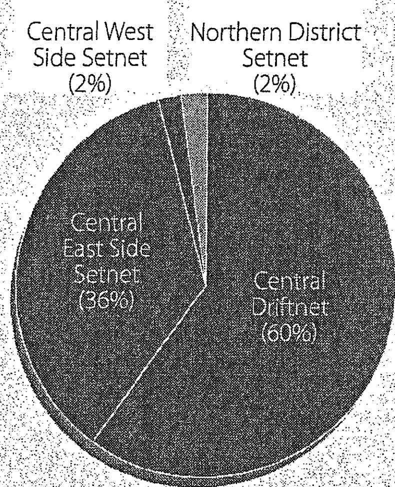


Figure ES 2. Division of Upper Cook Inlet commercial sockeye salmon harvest by gear type and location, 1990-1994. Source: ISER 1996.

While sockeye salmon is by far the most commercially valuable fish species in Cook Inlet, run-timing and migration routes utilized by all salmon species overlap in Upper Cook Inlet to such a degree that the commercial fishery is largely mixed-stock and mixed-species in nature.

Sockeye salmon are one of the most highly valued salmon species and by far the most abundant species in recreational fisheries in Upper Cook Inlet. Chinook salmon is perhaps the most highly valued salmon species in recreational fisheries, but Chinook harvests are by far the smallest of any salmon species in the region. Though less abundant than sockeye, coho salmon are much more abundant than Chinook and are very highly valued in Upper Cook Inlet recreational fisheries.

Essentially all (98-99%) commercially harvested salmon in Upper Cook Inlet are caught in the Cen District. Set gillnets take half of the Upper Cook Inlet commercial salmon harvest and more than two-thirds (70%) of these set gillnets are concentrated on the east side of the Central District where the Kenai River watershed is located. Kenai sockeye generally comprise more than half (52%) of the total Upper Cook Inlet commercial salmon harvest.

The Kenai River watershed supports the largest and most intensively used recreational salmon fisheries in the state. Low numbers of salmon passing through the Central District commercial salmon fisheries to the Northern District of Upper Cook Inlet have limited the development of recreational salmon fishing in Matanuska-Susitna Borough watersheds.

Upper Cook Inlet Commercial Fisheries Management Districts

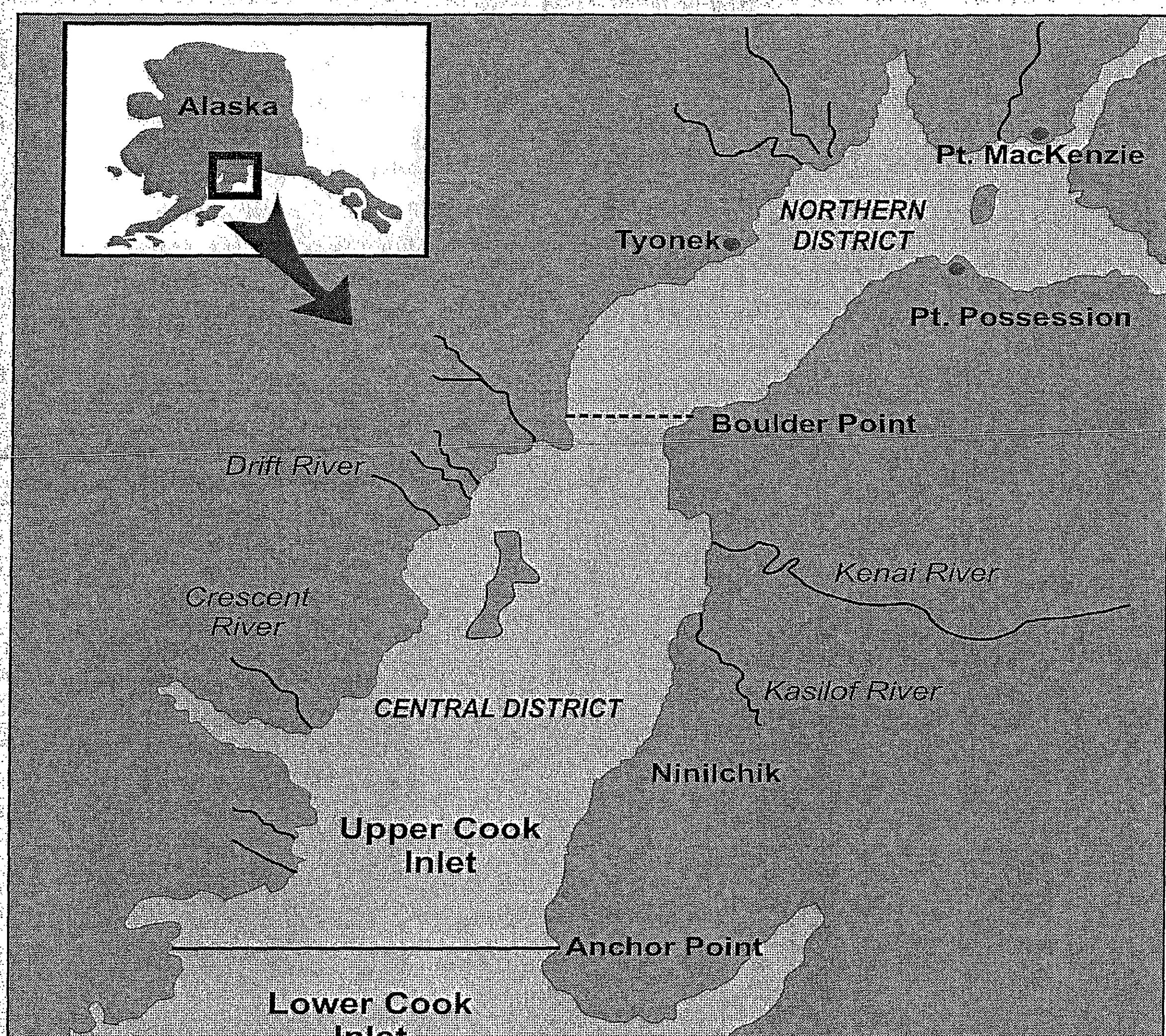


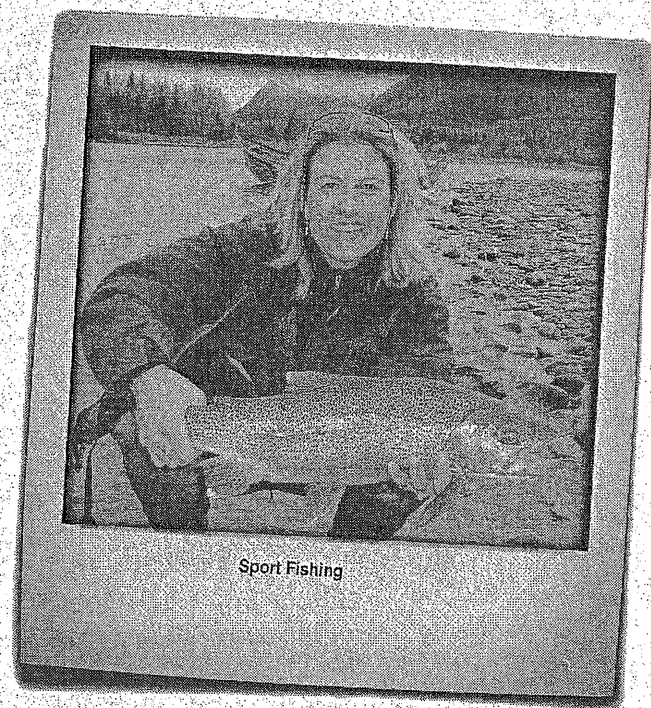
Figure ES 3. Upper Cook Inlet Commercial Management Districts. Source: ADF&G 2004.

PARTICIPATION

Sport and Personal Use

With one out of every three Alaskans active in sport fishing (some 207,000 resident anglers), Alaska has the highest rates of participation in recreational fishing in the nation. The great bulk of sport fishing activity in Alaska is attributable to Alaskans who account for well over two-thirds (70%) of some 2.8 million annual sport fishing days in the state. Moreover, recreational fishing by Alaskans is highly concentrated in the Southcentral region with almost three-quarters (72%) of all established resident anglers living and doing nearly all (95%) of their sport fishing in the region.

More than a quarter of a million anglers—Alaskans and visitors—fish each year in the Cook Inlet boroughs (Anchorage, Matanuska-Sustina and Kenai Peninsula).



Sport Fishing

Annual Sport Fishing Days in Alaska by Angler Residence (2006)

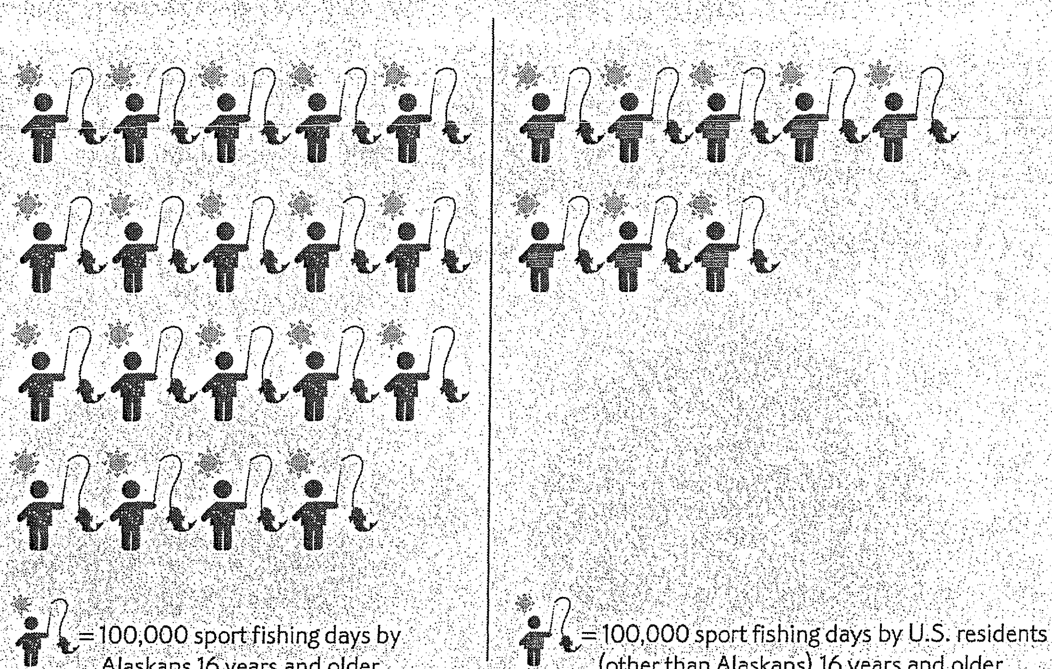


Figure ES 4. US residents 16 years and older spent 2.8 million days sport fishing in Alaska in 2006. Alaskans accounted for 1.9 million days (70% of the total)of those days. Other U.S. residents accounted for 0.8 million days (30% of the total) of those days. Source: USF&WS 2007.

Percentages of Alaskans Who Sport Fish by Region of Residence

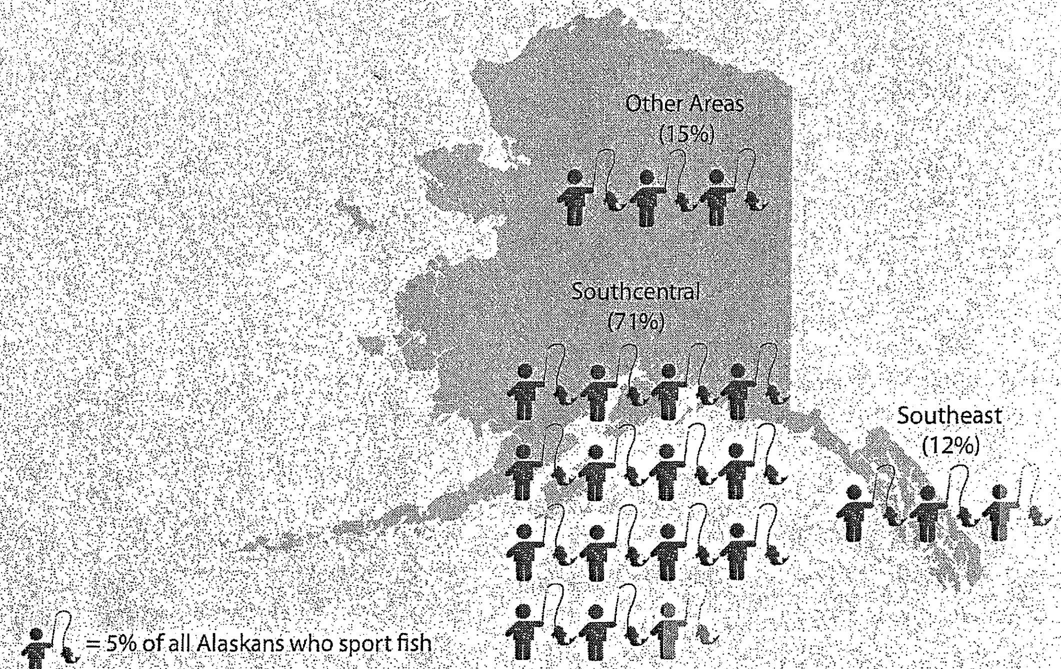


Figure ES 5. Percentage of all Alaskans who sport fish by region of residence, 2002-2006. (2% of anglers are of unknown residence.) Source: ADF&G 2007.

More than half (51%) of all summer fishing trips in the state—by Alaskans and visitors—are in Upper Cook Inlet. Salmon fishing in Upper Cook Inlet accounts for almost three-quarters (73%) of all fishing trips in the area and well over one-third (37%) of all recreational fishing in the state.

More than a quarter of a million (261,000) anglers—Alaskans and visitors—fish each year in the Cook Inlet boroughs. Of these, some 160,000 anglers fish for salmon in Upper Cook Inlet. In addition, some 20,000 Alaskans obtain personal use permits to net Upper Cook Inlet salmon to feed their households. Alaskans with personal use permits harvest about the same number of sockeye salmon (~300,000) in Upper Cook Inlet each year for household use as all anglers—Alaskans and visitors—take in the Upper Cook Inlet sport fisheries. Alaskans with personal use permits take about one-third and sport anglers—Alaskans and visitors—take about two-thirds of the total Upper Cook Inlet recreational (non-commercial) salmon harvest of all species.

Proportion of All Alaska Fishing Trips Occurring in Upper Cook Inlet

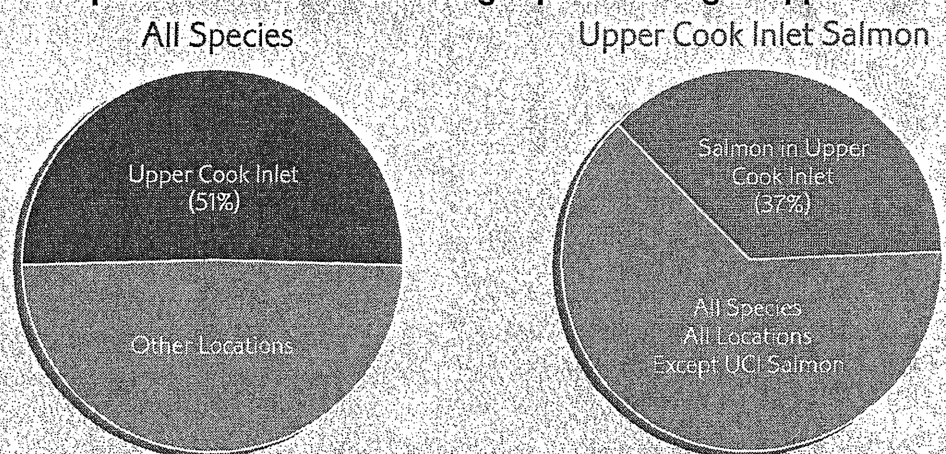


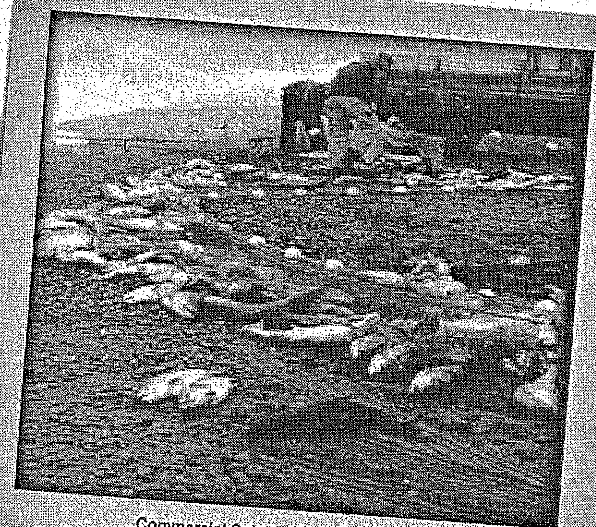
Figure ES 6. Proportion of all Alaska fishing trips (by Alaskans and visitors) occurring in Upper Cook Inlet and proportion of all state fishing trips targeting salmon in Upper Cook Inlet, 1993. Source: Tabulation of site-specific trip data in Haley et al. 1999.

Commercial

Some 844 commercial permit holders reported a catch in the Upper Cook Inlet management area in 2006. One out of five (22%) commercial permit holders in Cook Inlet are nonresidents. Between 1,375 and 2,500 individuals are estimated to be seasonally employed in commercial harvesting and processing or have jobs arising out of the indirect economic effects of commercial salmon harvests in Upper Cook Inlet.

The Upper Cook Inlet commercial salmon catch accounts for 2.2% of the total statewide commercial salmon harvest.

Comparisons of commercial salmon harvest yields in Cook Inlet with yields in other commercial salmon fisheries in the state indicate that commercial salmon fishing effort is disproportionately concentrated in Cook Inlet. Cook Inlet commercial salmon fisheries have substantially lower yields and substantially higher rates of permits not fished than comparable fisheries. In Cook Inlet there are 25 commercial salmon permits fished for every 100,000 fish harvested, compared to three permits fished for every 100,000 fish harvested in the rest of the state. Comparison of Upper Cook Inlet percentages of commercial salmon caught and permits fished statewide indicate that commercial salmon fishing effort is disproportionately concentrated in Upper Cook Inlet.



Commercial Salmon Set Gillnet

Upper Cook Inlet Proportion of Statewide Commercial Salmon Harvest

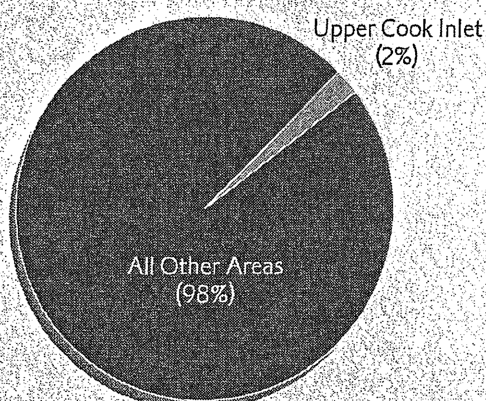


Figure ES 8. Average annual proportions of statewide commercial salmon catch by area 2000-2006. Source: ADF&G 2007.

Upper Cook Inlet Percentages of Commercial Salmon Caught & Permits Fished Statewide (2006)

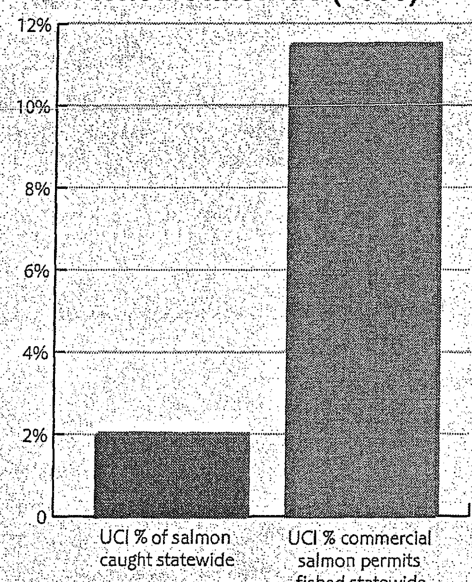


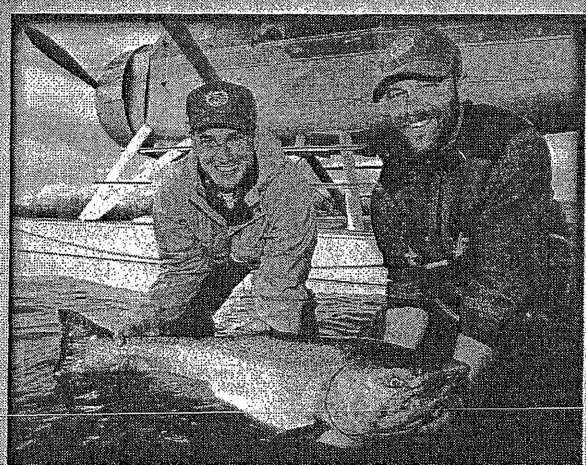
Figure ES 9. In 2006 Upper Cook Inlet accounted for 11.5% of all actively fished commercial salmon permits but only 2.0% of the statewide salmon catch. Source: ADF&G 2007, CFEC 2007. (From 2000-2006 the Upper Cook Inlet commercial salmon catch averaged 2.2% of the statewide harvest total. Source: ADF&G 2007.)

ECONOMIC SIGNIFICANCE

Sport and Personal Use

Sport and personal use fishing in Southcentral Alaska generate direct annual spending of some $453 million (2006 dollars) and total sales of $581 million that support 6,100 "full-time equivalent" or "average annual" jobs that produce $186 million in income. Sport and personal use salmon fishing in Upper Cook Inlet generates total annual sales of some $316 million (2006 dollars) that support 3,400 average annual jobs producing $104 million in income in the region.

Recreational salmon fishing in Upper Cook Inlet generates 3,400 average annual jobs producing $104 million (2006 dollars) in income.



Salmon Charter Fishing
(Greg Syverson/Accent Alaska.com)

Commercial

Estimates based on high ex-vessel (commercial catch) values of the mid-1990s attribute 500 average annual jobs and $18 million (2006 dollars) in annual income to harvesting, processing, and indirect and induced employment from commercial salmon harvests in Upper Cook Inlet. At current (2000-2006) average annual commercial harvest values for salmon in Upper Cook Inlet, employment arising from commercial harvesting and processing as well as indirect and induced employment is estimated to be between 275 and 500 average annual jobs, and average annual income is estimated to be between $10 and $18 million (2006 dollars).

Commercial salmon fishing in Upper Cook Inlet generates between 275 and 500 average annual jobs producing between $10 and $18 million (2006 dollars) in income.

Though the size of wild salmon runs fluctuates from year to year, the recent average annual commercial salmon harvest in Upper Cook Inlet is greater than long-term averages. The average commercial salmon harvest in Upper Cook Inlet over the most recent five-year period (2002-2006) of 4.34 million is greater than the average harvests in the region over the past ten years (1996-2005) of 3.70 million and past fifty years (1966-2005) of 4.27 million. By contrast, the inflation adjusted average annual value (in 2006 dollars) of Upper Cook Inlet commercial salmon harvests from 2000-2006 of $16 million is one-seventh (14%) of the highest historic average annual valu for an equivalent time period (1986-1992) of $108 millio and about one-third (39%) of the average annual value of the most recent decade (1991-2000) of $40 million.

Salmon Row Processor
(Terry Chick/Accent Alaska.com)

Average Annual Jobs and Income Generated by Salmon Fishing in Upper Cook Inlet by Harvest Type

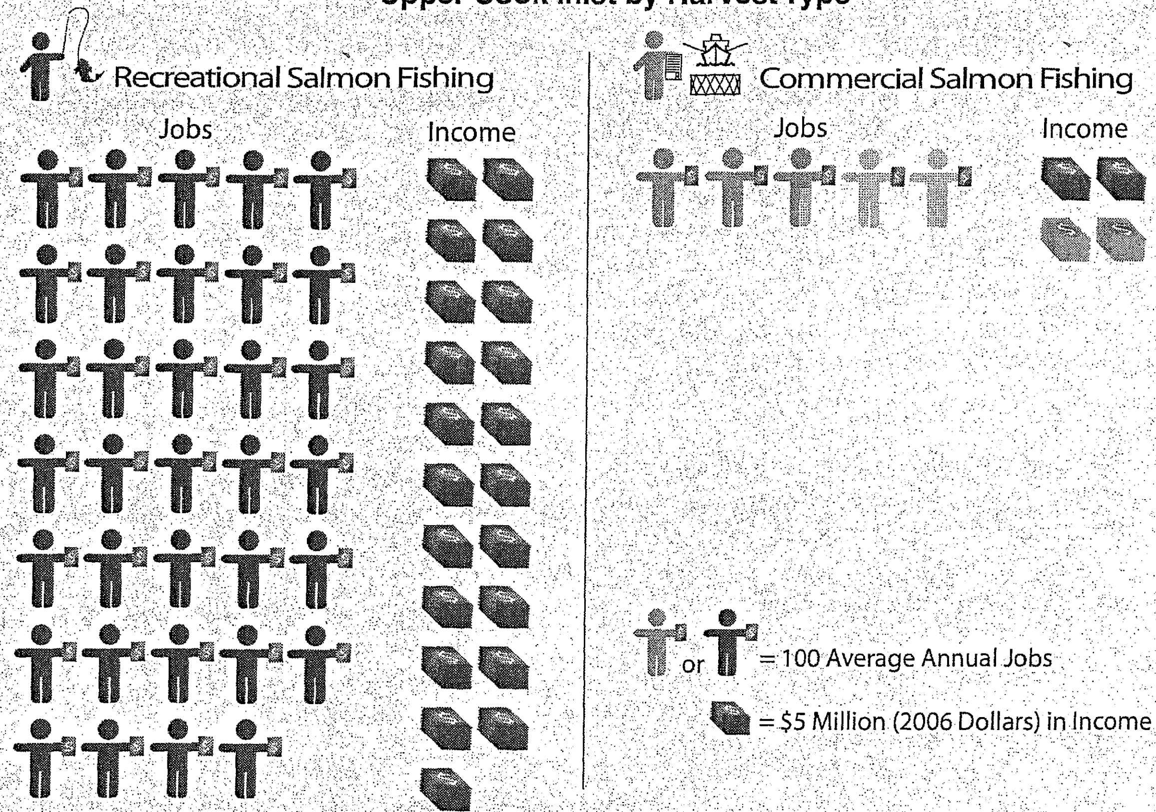


Figure ES 11. Commercial salmon fishing in Upper Cook Inlet generates between 275 and 500 average annual jobs producing between $10 and $18 million (2006 dollars) in income. Recreational salmon fishing in Upper Cook Inlet generates 3,400 average annual jobs producing $104 million (2006 dollars) in income. Source: Calculations based on data reported in ADL&WD 2007, ADF&G 2007, ADF&G 2006, ADF&G 2005(b), Colt 2001, Haley et al. 1999, ISER 1996.

Upper Cook Inlet Commercial Salmon Ex-Vessel Values by Decade & Most Recent Period (Inflation Adjusted)

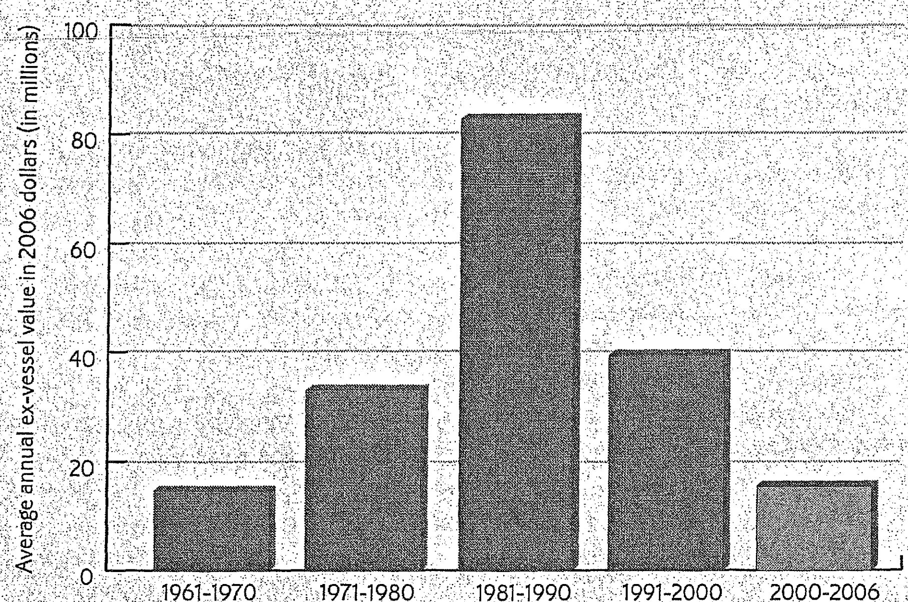


Figure ES 12. Average annual ex-vessel value of commercial salmon harvests in Upper Cook Inlet by decade and most recent period. Source: ADF&G 2007, ADL&WD 2007.

FUTURE TRENDS

Sport and Personal Use

Demand for recreational fishing opportunities in the Cook Inlet boroughs is expected to grow by 2.3% per year through 2011—a net increase of almost 29,000 anglers over 2002-2006 levels. From 2002 to 2006, ADF&G issued an average 20,000 permits for Upper Cook Inlet personal use fishing. A record 21,910 personal use permits were issued in Upper Cook Inlet in 2004. Increases in sport and personal use harvests in Upper Cook Inlet will be determined by administrative allocation rather than underlying demand for fishing opportunities.

Commercial

Comparisons of historical harvest data show that the size of the current commercial salmon catch in Upper Cook Inlet cannot be used as the explanation for current low commercial salmon harvest values. The size of the average annual commercial salmon harvest in Upper Cook Inlet in recent years is greater than the average harvest sizes in the region over the past ten and past fifty years, yet the current average market value of the harvest is lower than any decade since the 1960s.

This fundamental change in price regimes for Alaska salmon has resulted from dramatic increases in production of farmed salmon and globalization of world seafood markets. Salmon farming and globalization of seafood markets will continue to exert downward pressure on prices and values in Alaska's commercial salmon fisheries and act as a driving force for changes in salmon fisheries management.

In this new economic environment, the exceptional values of commercial salmon harvests in Upper Cook Inlet from the late 1980s to the early 1990s can no longer realistically be used to set benchmarks for fisheries management goals and objectives. To match the historic financial yields of Upper Cook Inlet commercial salmon permit holders under current market conditions, the average annual commercial salmon harvest in Upper Cook Inlet would have to be increased by two (200%) to five (500%) times and exceed the highest average annual harvest of any decade on record.

ECONOMIC IMPACTS

In 1996, the Institute of Social and Economic Research (ISER) published a study assessing the potential economic impacts of increasing management targets for late-run Kenai sockeye by 200,000 fish thus making more fish available in-river for sport and personal use fishing on the Kenai River while potentially reducing commercial harvests and profits. The study modeled scenarios projecting ranges of sockeye run sizes and salmon prices—reflective of values in the early 1990s—ranging from a low of $1.00 per pound to a high of $1.75 per pound.

The study found that during high runs there would be no economic impacts, at medium runs and low prices sport gains would exceed commercial losses, and at low runs commercial losses would probably exceed sport gains. The study's authors noted that "given the range of uncertainty in our estimates, we can't definitely conclude that actual commercial losses would be larger than sport gains." The study noted but failed to assess the gains that would accrue to Northern District (Matanuska-Susitna and Anchorage boroughs) recreational fisheries from the increased number of sockeye salmon that would escape through the Central District under the higher management target.

The real (inflation adjusted) price per pound values of commercially caught sockeye salmon modeled in the ISER study are much higher than the nominal (non-inflation adjusted) values stated in the study. Characterized in constant value 2006 dollars, ISER effectively modeled commercially harvested sockeye salmon at a high value of $2.37 per pound, a low value of $1.35 per pound, and a median value of $1.94 per pound. The nominal values paid for commercially harvested sockeye salmon in Upper Cook Inlet from 2000-2006 were between $1.10 and $0.60 per pound. The average annual price per pound from 2000-2006—calculated in constant 2006 dollars—was $0.83 per pound. This means that the ISER study used price assumptions almost one and two-thirds times (163%) greater at the low end and almost three times (286%) greater at the high end than the current average annual price per pound. Moreover, commercial permit values, harvesting and processing jobs and income, and commercial fisheries net economic values are now fractions of the values used in the ISER study.

This suggests that under current commercial salmon fishery price regimes and values the ISER study model would show economic gains in sport fisheries in Upper Cook Inlet that would exceed regional losses in the commercial fisheries in essentially all of the critical harvest level study scenarios. This would indicate that increasing salmon allocations for recreational fishing in Upper Cook Inlet would generate overall economic gains in the region.

ALLOCATION AND MANAGEMENT

Commercial fisheries are allocated about five-sixths (82%) of the Upper Cook Inlet salmon harvest, while sport, personal use, and subsistence fisheries are allocated about on-sixth (18%) of the catch. The percentage of the total salmon harvest that is allocated for recreational use in British Columbia is 11%, in the Pacific Northwest it is 4%, and in Alaska it is 2%. For Alaska to be comparable with proportionate distributions in other North American Pacific salmon fisheries, allocations for recreational salmon fishing in the state would need to be increased by two (200%) to five and a half (550%) times. Since Alaska's recreational salmon fishing is so heavily concentrated in Cook Inlet, this would mean that allocations in the region would need to be substantially increased.

The success of recreational fisheries relies not only on receiving an appropriate share of the salmon harvest but also on receiving those fish in a way that is meaningful to recreational users. Recreational fisheries management is based on providing anglers predictable opportunities to harvest a meaningful number of fish incrementally over the entire course of the fishing season. Management practices that optimize commercial fisheries harvests in Upper Cook Inlet often negate management practices that sustain recreational fisheries.

Percentage of Pacific Salmon Harvest Allocated for Recreational Fishing by Region

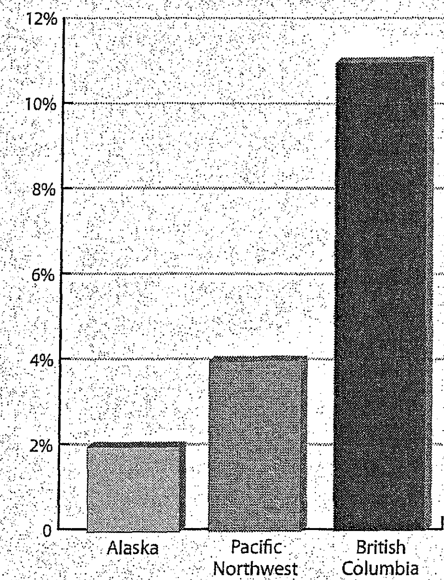


Figure ES 14. Upper Cook Inlet annual average harvest share by species for commercial and recreational (sport and personal use) fishing from 2002-2006. Source: Knapp et al, 2007.

Upper Cook Inlet Salmon Harvest Allocation by User Group & Species, 2002-2006

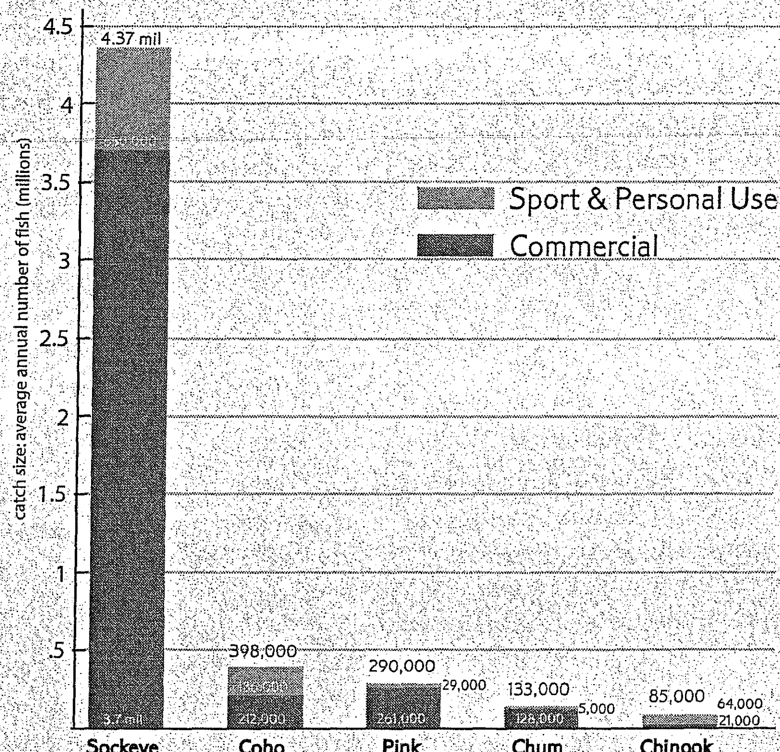


Figure ES 15. Upper Cook Inlet annual average harvest share by species for commercial and recreational (sport and personal use) fishing from 2002-2006. Source: ADF&G 2007.

CONCLUSION

The significant economic differences between commercial and recreational salmon fishing in Upper Cook Inlet are not generally understood or widely recognized. Because participation levels in recreational salmon fishing in Upper Cook Inlet are so much greater than those in commercial salmon fishing, recreational fishing produces much greater activity in local economies than does a comparable commercial harvest.

There are about eight to 15 times (800-1,454%) as many Alaskans who obtain personal use permits to harvest salmon in Upper Cook Inlet as there are individuals—Alaskans and nonresidents—who are employed in or have jobs arising out of commercial salmon harvests in Upper Cook Inlet. There are about 32 to 59 times (3,240-5,890%) as many Alaskans who sport fish for salmon in Upper Cook Inlet as there are individuals—Alaskans and nonresidents—who are employed in commercial salmon harvesting and processing or have jobs arising indirectly out of commercial salmon harvests in Upper Cook Inlet.

Recreational salmon fishing in Upper Cook Inlet generates about 7 to 12 times (680-1,236%) as many average annual jobs and 6 to 10 times (577-1,040%) as much average annual income in the region as commercial salmon fishing.

Recreational fishing also attracts visitors from outside of Alaska who bring wealth into the state in the form of new dollars spent in local economies. There are about 31 to 57 times (3,120-5,670%) as many visitors to Alaska who sport fish for salmon in Upper Cook Inlet as there are individuals—Alaskans and nonresidents—who are employed in commercial salmon harvesting and processing or have jobs arising indirectly out of commercial salmon harvests in Upper Cook Inlet.

In all, there are about 63 to 115 times (6,300-11,560%) as many anglers—Alaskans and visitors—who sport fish for salmon in Upper Cook Inlet as there are individuals—Alaskans and nonresidents—who are employed in commercial salmon harvesting and processing or have jobs arising indirectly out of commercial salmon harvests in Upper Cook Inlet.

Due, in part, to the impact of these vastly greater rates of participation, recreational salmon fishing in Upper Cook Inlet generates about seven to 12 times (680-1,236%) as many average annual jobs and six to ten times (577-1,040%) as much average annual income in the region as commercial salmon fishing.

Fisheries management in Upper Cook Inlet faces the ongoing challenge of adhering to policies and practices that recognize the central economic importance of sport and personal use fisheries in the region.

The additional worth of commercial and recreational fishing to participants—that is, the value over and above the costs and expenses of participation—is not accounted for by measures of economic activity such as sales, jobs, and income. This additional worth is measured by net economic value (NEV) assessments. The net economic value (NEV) to Alaskans of recreational salmon fishing in Upper Cook Inlet is 62 (6,200%) times greater than the NEV of commercial salmon fishing to permit holders—Alaskans and non-residents—in the region.

Markets for Alaska salmon continue to be impacted by mounting pressures from the globalization of seafood markets and an explosion in aquaculture production. There is no projected abatement of these trends, and they will continue to act as a driving force for changes in salmon fisheries management. Unprecedented commercial fishery values in the late 1980s and early 1990s are no longer realistic benchmarks for fisheries management goals and objectives. It is crucial that the inevitable restructuring of salmon fisheries management in Upper Cook Inlet necessitated by global market forces be fully informed by an awareness of the very significant economic values—both to local economies and to individual participants—of sport and personal use fisheries.

The state agencies that oversee and regulate fisheries were originally designed to address the needs and interests of commercial fisheries. Substantive consideration of the needs of sport and personal use fisheries and informal representation of recreational fishing interests on the Board of Fisheries are relatively recent developments. Fisheries management in Upper Cook Inlet faces the ongoing challenge of adhering to policies and practices that recognize the central economic importance of sport and personal use fisheries in the region.

RC 77

Comments of the
Tyonek Fish and Game Advisory committee
To the
Board of Fisheries

Proposal 102 submitted by this committee, was based on all user groups' personal testimony and/or reports. I personally have witness, participated in the changes needed to bring equity of the WCI fishery, after the fishery was reinstated in 1980.
First our people volunteered to abstain from the commercial use of king salmon, 1960 – 1980, for the purpose of conservation and enhancement of the species.
Prior to that time, our people have always used a twenty five fathom X eight-ten inch mesh X 29 mesh deep net for both commercial and subsistence use.
The regulations after that time was for a net not to exceed 10 fathoms x 4.5 inch mesh x 45 mesh deep. After the new regulations were followed, it was noted by the user and biologist, the fishing gear was totally inadequate for the purposed need, conservation of species, and enhancement of the species. The present gear is in effect no different. This is already noted by reports from the Yukon River, Kuskokim River system and other areas of the State.

Proposal 104 is also our proposal, the present system of the management, conservation, equity and perpetuation of the species in the Cook Inlet is threatened.
First of all, how can the Northern district user compete within the system, when there is the mass inception of the species by the drift net fleet, which seem to grow as weed in the central district, since it inception. Your reports confirm the reports from 1980 -2007. Tyonek district salmon report, indicate the average catch is 41,000. While the central district average in the millions.
During the 1960's, the 41,000 was the average for one boat. We acknowledge the decline of the species as a whole system wide is in a decline, but the belief here is that we can have equity system wide here, by opening up a corridor through the central district to the northern district
Most of the salmon spawning streams in the northern district are on WCI. Year after year the reports indicate a decline in the system wide on WCI. The fingers are in chaos pointing to the believed abusive user. We believe the reports and the history behind the industry in the northern district. A meaningful corridor through the central district to the northern district would further the State compliance clause of "for the benefit of all…." In (salmon) resources.

Proposal 270 we oppose this on the indicated reports on the status reports of the area, the problem is, was and will continue to be the northern pike, and the lack of salmon allowed to the northern district.

We also oppose any proposal to diminish the time, location, or the means to harvest the salmon.

Other threats to the industry is the *northern pike*, in the ADF&G report on the problem it indicate the Department was studying the problem for the past 30 years. Now the State of Alaska has its own northern pike expert department. This is all and well, but what cost the State $1.00 thirty years, now cost 20.00. What can be known of the northern pike can be pulled up and studied in a fraction of a work day.

Salmon spawning stream destruction on the WCI;

The *oil and gas industry* has continued to build on the 280,000 plus barrels of drilling mud and waste pits on the WCI, a definite threat to the salmon streams adjacent to the problem.

The *timber industry* has left a myriad of culverts bridges and road system. That is now in serious decay, a threat to the salmon spawning stream. This problem now has been studied to death; all threats are not ignorant to anyone and should be dealt with decisively.

Hooligan industry; for the past few years the reports indicate that there was hundred of thousands of tons harvested in the northern district, for such a small and limited industry for a resource that is the main source of food for salmon and other marine mammals. Again the problem is very clear; history teaches us not to repeat mistakes. The Pollock industry development had a definitive impact on the mammals of the region

The total mismanagement of the Beluga should be a statue of illumination as to the ignorance, or greed that made man to decide to eliminate a species.

The need for natural resources is growing, and as studies have indicated on several reports indicate, were developed at the expense of the local people, animals, game and fish. Many have experience the pollution of fish streams, the extinction of fish species in certain areas of development, health problems are among a few statistics have reported.

As reported what the fishing industry, the oil and gas industry, the timber industry, and other industry are doing to the natural fish and game habitat of the WCI. Now the entire WCI is threatened by the proposed *development of coal*. With a threatened salmon species like the king salmon and the destruction of habitat What was once called the west side Kenai river, is threatened and need conservation and enhancement of the species, not the destruction of it.

Al Goozmer, Chairman
Tyonek Fish and Game Advisory Committee