Bering Sea Non-Chinook Salmon Bycatch Management

PRELIMINARY REVIEW DRAFT REGULATORY IMPACT REVIEW

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Abstract: The Regulatory Impact Review (RIR) provides decision-makers and the public with an evaluation of the social and economic effects of alternative measures to minimize chum and other salmon bycatch in the Bering Sea pollock fishery. This document addresses the requirements of Executive Order 12866, Executive Order 12898, and other applicable federal law. The Environmental Assessment that accompanies this document provides decision-makers and the public with an evaluation of the environmental effects of the alternative to address the requirements of the National Environmental Policy Act and other applicable federal law.

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ACRONYMS & ABBREVIATIONS

%	percent
‘	minutes
°	degrees
AAC	Alaska Administrative Code
ABC	acceptable biological catch
ADCCED	Alaska Department of Commerce, Community and Economic Development
ADFG (ADF&G)	Alaska Department of Fish and Game
ADOLWD	Alaska Department of Labor and Workforce Development
AEQ	adult equivalent impacts or adult equivalency
AFA	American Fisheries Act
AFSC	Alaska Fisheries Science Center (of the National Marine Fisheries Service)
AI	Aleutian Islands
AKFIN	Alaska Fisheries Information Network
AKU/DUT	Akutan and Dutch Harbor Port Group
ALT	Alaska Local Time
AMBCC	Alaska Migratory Bird Co-Management Council
AMEF	Alaska Marine Ecosystem Forum
ANCSA	Alaska Native Claims Settlement Act
ANILCA	Alaska National Interest Lands Conservation Act
AP	North Pacific Fishery Management Council’s Advisory Panel
APA	Administrative Procedure Act
APA	At-sea Processors’ Association
APICDA	Aleutian Pribilof Island Community Development Association
AYK	Western Alaska Yukon and Kuskokwim River Systems OR Arctic-Yukon-Kuskokwim
B	biomass
BASIS	Bering-Aleutian Salmon International Survey
BBEDC	Bristol Bay Economic Development Corporation
BBRAC	Bristol Bay Regional Advisory Council
BCC	Birds of Conservation Concern
BEG	Biological Escapement Goal
BFAL	black-footed albatross
BOF	Alaska Board of Fisheries
BS	Bering Sea
BSAI	Bering Sea and Aleutian Islands
BSIERP	Bering Sea Integrated Ecosystem Research Program
Bx%	biomass that results from a fishing mortality rate of Fx%
BY	brood year
C	celsius or centigrade
C.F.R. / CFR	Code of Federal Regulations
CAS	catch accounting system
CBD	Center for Biological Diversity
CBSFA	Central Bering Sea Fishermen’s Association
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CDP	community development plan
CDQ	community development quota
CEQ	council for environmental quality

CEY	constant exploitation yield
CGOA	Central Gulf of Alaska
CI	confidence interval
cm	centimeter(s)
CMCP	catch monitoring and control plan
COBLZ	*C. opilio* bycatch limitation zone
Council	North Pacific Fishery Management Council
CP	catcher processor
CPUE	catch per unit effort
CRITFC	Columbia River Inter-Tribal Fisheries Commission
CTD	conductivity-temperature-depth
CV	catcher vessel
CVM	contingent value method
CVOA	catcher vessel operational area
CVRF	Coastal Villages Region Fund
CWT	coded wire tag
CZMA	Coastal Zone Management Act
DAH	domestic annual harvest
DAP	domestic annual processed catch
DFO	Canadian Department of Fisheries and Oceans
DPS	distinct population segment
DSR	demersal shelf rockfish
E.	east
EBS	eastern Bering Sea
EEZ	exclusive economic zone
EFH	essential fish habitat
EFP	exempted fishing permit
EIS	environmental impact statement
EPIRB	emergency position indicating radio beacon
ELT	emergency locator beacon
EM	electronic monitoring
EO	Executive Order
ESA	Endangered Species Act
ESU	evolutionary significant units
F	fishing mortality rate
FMP	fishery management plan
FOCI	Fisheries-Oceanography Coordinated Investigations
FRFA	Final Regulatory Flexibility Analysis
ft	foot/feet
FIS	Fisheries Information Services
FIT	Fishery Interaction Team (of AFSC)
F_X%	fishing mortality rate at which the SPR level would be reduced to X% of the SPR level in the absence of fishing
GC	General Counsel (of NOAA)
GDP	Gross domestic product
GHL	guideline harvest level
GOA	Gulf of Alaska
GPS	global positioning system
GSI	genetic stock identification

HAPC	habitat area of particular concern
HAPC	Habitat Areas of Particular Concern
HSCC	High Seas Catchers' Cooperative
IAD	initial administrative determination
ICA	inter-cooperative agreement
IFQ	individual fishing quota
IMEG	interim management escapement goal
IPHC	International Pacific Halibut Commission
IQA	Information Quality Act
IQF	Individually Quick Frozen (fillets)
IR/IU	Improved Retention/Improved Utilization Program
IRFA	Initial Regulatory Flexibility Analysis
ITAC	initial total allowable catch
ITS	incidental take statement
IUCN	World Conservation Union
JTC	Joint Technical Committee
JEA	joint enforcement agreements
kg	kilogram(s)
km	kilometer(s)
LAPP	limited access privilege program
lb	pound(s)
LCFRB	Lower Columbia Fish Recovery Board
LCI	Lower Cook Inlet
LCR	Lower Columbia River
LLP	license limitation program
LKMA	Lower Kuskokwim Management Area
LOA	length overall
LOF	List of Fisheries
LYTF	Lower Yukon Test Fishery
m	meter(s)
M	mothership
M	natural mortality rate
Magnuson-Stevens Act or MSA	Magnuson-Stevens Fishery Conservation and Management Act
MHz	megahertz
MLE	maximum likelihood estimates
mm	millimeter(s)
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MRA	maximum retainable amount
MSC	Marine Stewardship Council
MSE	management strategy evaluations
MSM	multispecies statistical model
MSRA	Magnuson-Stevens Reauthorization Act
MSY	maximum sustainable yield
mt	metric ton(s)
N.	north
NAB	North Aleutian Basin (aka Bristol Bay)
NAK Penin	Northern Alaska Peninsula

NEPA	National Environmental Policy Act
nm	nautical mile
NMFS	National Marine Fisheries Service
NMML	National Marine Mammal Laboratory
NMCSMP	Nushagak-Mulchatna Chinook Salmon Management Plan
NOAA	National Oceanic and Atmospheric Administration
NPAFC	North Pacific Anadromous Fish Commission
NPFMC	North Pacific Fishery Management Council
NPGOP	North Pacific Groundfish Observer Program
NPPSD	North Pacific Pelagic Seabird Database
NPRB	North Pacific Research Board
NPS	National Park Service
NRSHA	Naknek River Special Harvest Area
NSEDC	Norton Sound Economic Development Corporation
NSF	National Science Foundation
NW	northwest
OCC	ocean carrying capacity program
OCS	outer continental shelf
OEG	optimal escapement goal
OFL	overfishing level
OLE	Office of Law Enforcement (of NOAA-NMFS)
OMB	Office of Management and Budget (of NOAA-NMFS)
OSP	optimal sustainable population
OSM	Office of Surface Mining, Reclamation and Enforcement, Department of the Interior
OSU	Oregon State University
OTF	ADF&G offshore test fishery
OY	optimum yield
P	offshore catcher processor
PBR	potential biological removals
PCC	Pollock Conservation Cooperative
pdf	probability density function
PFMC	Pacific Fishery Management Council
PNW	Pacific Northwest
POP	Pacific ocean perch
PPA	Preliminary Preferred Alternative
PPA1	Preliminary Preferred Alternative Annual Scenario 1
PPA2	Preliminary Preferred Alternative Annual Scenario 2
ppm	part(s) per million
ppt	part(s) per thousand
PRD	Protected Resources Division (of the National Marine Fisheries Service)
PSC	prohibited species catch
PSD	Prohibited Species Donation Program
PSEIS	Preliminary Supplemental Environmental Impact Statement
R/S	returning adults per spawner
REFM	Resource Ecology and Fisheries Management Division, Alaska Fisheries Science Center, National Marine Fisheries Service
RFA	Regulatory Flexibility Analysis
RIR	Regulatory Impact Review

RM	river mile
RO	regional office
RSW	Recirculating Seawater
S	shoreside (inshore catcher vessel)
S.	south
SAFE	Stock Assessment and Fishery Evaluation
SAR	stock assessment report
SBW	Salmon Bycatch Workgroup
SCS	Scientific Certification Systems, Inc
SE	southeast
SEG	sustainable escapement goal
SET	sustained escapement threshold
SSA	salmon savings area
SSC	Scientific and Statistical Committee
SSFP	Sustainable Salmon Fisheries Policy
STAL	short-tailed albatross
TAC	total allowable catch
TBR	transboundary river systems
TINRO	Pacific Scientific Research Fisheries Centre, North Pacific Anadromous Fish Commission
USDA Forest Service	U.S. Dept of Agriculture Forest Service
U.S.	United States
USC (U.S.C.)	United States Code
UCI	Upper Cook Inlet
UKMA	Upper Kuskokwim Management Area
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
USSR	United Soviet Socialist Republics
UWR	Upper Willamette River
VMS	vessel monitoring system
VRHS	voluntary rolling hotspot system
W.	west
WACDA	Western Alaska Community Development Association
W/LC TRT	Willamette/Lower Columbia Technical Recovery Team
WAK	western Alaska
WDF	Washington Department of Fisheries
YDFDA	Yukon Delta Fisheries Development Association
YRA	Yukon River Agreement
YRJTC	Yukon River Joint Technical Committee (OR U.S./Canada Joint Technical Committee)

1.0 INTRODUCTION

This preliminary draft Regulatory Impact Review (RIR) analysis is limited to development of the commercial chum salmon fishery background section, the subsistence analysis provided by the Alaska Department of Fish and Game (ADF&G), as well as providing a general layout of the document, and much of the boilerplate that will be used.

This analysis will be greatly expanded for the initial review draft to be presented in June of 2011. Much of the information that this RIR will rely on for impact analysis is being prepared concurrently and will appear in the preliminary draft of the Environmental Assessment. Given the concurrent development of the preliminary draft EA, information necessary to begin impact analyses was not available to the analyst for this preliminary RIR. This limitation is an unavoidable reality of staff tasking and timing of analytical packages currently underway. Nonetheless, the background sections provided herein on commercial chum salmon fisheries status in Western Alaska as well as the ADF&G provision of subsistence information are substantially informative and the reader is directed to limit review of this document to those sections.

This Regulatory Impact Review (RIR) examines the costs and benefits of a proposed regulatory amendment to change Chinook salmon bycatch reduction measures in the Bering Sea pollock trawl fishery. The preparation of an RIR is required under Presidential Executive Order (E.O.) 12866 (58 FR 51735: October 4, 1993). The requirements for all regulatory actions specified in E.O. 12866 are summarized in the following Statement from the E.O.:

> In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and Benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nonetheless essential to consider. Further, in choosing among alternative regulatory approaches agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.

Under the Magnuson-Stevens Act, the United States has exclusive fishery management authority over all marine fishery resources found within the exclusive economic zone (EEZ). The management of these marine resources is vested in the Secretary of Commerce and in the Regional Fishery Management Councils. The pollock fishery in the Bering Sea EEZ is managed under the Bering Sea and Aleutian Islands (BSAI) Fisheries Management Plan (FMP).

This RIR examines the costs and benefits of proposed alternatives which include eliminating the Chinook Salmon Savings Areas and, thereby, eliminating an exemption to the savings area for participants in the Voluntary Rolling Hotspot System (VRHS) Intercooperative Agreement (ICA), imposing a hard cap number of Chinook salmon that may be taken in the Bering Sea pollock trawl fishery, and/or implementing a new triggered closure area that would be managed by the National Marine Fisheries Service (NMFS). The alternative set also contains components that allow for sector level allocations of hard caps, transfers and/or rollover provisions, and cooperative management provisions. The complete alternative set is summarized in Chapter 4 described in detail in EIS Chapter 2.

1.1 What is a Regulatory Impact Review?

The preparation of an RIR is required under Presidential Executive Order (E.O.) 12866 (58 *FR* 51735: October 4, 1993). The requirements for all regulatory actions specified in E.O. 12866 are summarized in the following Statement from the E.O.:

> In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and Benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nonetheless essential to consider. Further, in choosing among alternative regulatory approaches agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.

E.O. 12866 requires that the Office of Management and Budget (OMB) review proposed regulatory programs that are considered to be "significant." A "significant regulatory action" is one that is likely to:

- Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, local or tribal governments or communities;
- Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
- Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this Executive Order.

1.2 Statutory Authority

Under the Magnuson-Stevens Act (16 USC 1801, et seq.), the United States has exclusive fishery management authority over all marine fishery resources found within the EEZ. The management of these marine resources is vested in the Secretary of Commerce (Secretary) and in the regional fishery management councils. In the Alaska Region, the Council has the responsibility for preparing FMPs and FMP amendments for the marine fisheries that require conservation and management, and for submitting its recommendations to the Secretary. Upon approval by the Secretary, NMFS is charged with carrying out the federal mandates of the Department of Commerce with regard to marine and anadromous fish.

The Bering Sea pollock fishery in the EEZ off Alaska is managed under the FMP for Groundfish of the Bering Sea and Aleutian Islands. The salmon bycatch management measures under consideration would amend this FMP and federal regulations at 50 CFR 679. Actions taken to amend FMPs or implement other regulations governing these fisheries must meet the requirements of federal law and regulations.

1.3 Purpose and Need for Action

The purpose of salmon bycatch management in the Bering Sea pollock fishery is to minimize salmon bycatch to the extent practicable while achieving optimum yield. Minimizing salmon bycatch while achieving optimum yield is necessary to maintain a healthy marine ecosystem, ensure long-term conservation and abundance of salmon, provide maximum benefit to fishermen and communities that

depend on salmon and pollock resources, as well as U.S. consumers, and comply with the Magnuson-Stevens Act and other applicable federal law. National Standard 9 of the Magnuson-Stevens Act requires that conservation and management measures shall, to the extent practicable, minimize bycatch. National Standard 1 of the Magnuson-Stevens Act requires that conservation and management measures prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry. EA Chapter 1 contains the detailed purpose and need statement.

1.4 Market failure rationale

The OMB guidelines for analysis under E.O. 12866 state that…

> in order to establish the need for the proposed action, the analysis should discuss whether the problem constitutes a significant market failure. If the problem does not constitute a market failure, the analysis should provide an alternative demonstration of compelling public need, such as improving governmental processes or addressing distributional concerns. If the proposed action is a result of a statutory or judicial directive (sic) that should be so stated.[1]

Pollock taken in the Bering Sea trawl fishery, and salmon caught incidentally to this fishery are both common property resources. However, both are subject to systems of stock and allocation management. These management systems include forms of ownership of access and harvest allocation privileges. Trawl vessel operations in the Bering Sea groundfish fisheries do not, by virtue of their groundfish access privileges, have ownership or access privileges to salmon. Similarly, salmon harvesters operating in the waters of and off Alaska do not have, by virtue of their salmon access privileges, ownership or access privileges to groundfish.

Bycatch of salmon in the Bering Sea pollock fishery reduces the common property pool of the salmon resource. Bycatch removals may reduce the targeted subsistence, commercial, personal use, and sport catch of salmon, and thereby the welfare (e.g., revenue, utility) of salmon harvesters who have recognized salmon access privileges (e.g., Alaska Limited Entry permits) and established priority harvesting rights and historical dependence (e.g. subsistence). Salmon removals may, over time, reduce the value of salmon access privileges as well as reducing the economic, social, and cultural benefits for subsistence and other non-commercial users of this resource. Under the prevailing fishery management structure, the market has no efficient mechanism by which groundfish harvesters may compensate salmon harvesters for the salmon lost to bycatch. Further, the market cannot readily measure many aspects of the value of salmon, such as the cultural significance of salmon to the subsistence user. Thus, salmon bycatch reduction measures are imposed through regulation to reduce, to the extent practicable, this market failure. The goal of the action considered in this RIR is to improve chum salmon avoidance in the Bering Sea pollock fishery and, thereby, further mitigate the market failure.

[1] Memorandum from Jacob Lew, OMB director, March 22, 2000. "Guidelines to Standardize Measures of Costs and Benefits and the Format of Accounting Statements" Section 1.

2.0 DESCRIPTION OF THE BERING SEA POLLOCK FISHERY

EDITORIAL NOTE: This section has not been updated with 2008 and 2009 data and is presently under construction. This section will be updated in the initial review draft of the RIR.

Pollock are widely distributed in the North Pacific, from Central California into the eastern Bering Sea, along the Aleutian arc, around Kamchatka, in the Okhotsk Sea, and into the southern Sea of Japan. In U.S. waters of the Bering Sea and Aleutian Islands (BSAI), NMFS manages pollock as three separate stocks: the Eastern Bering Sea (EBS) stock, found on the EBS shelf from Unimak Pass to the U.S.-Russia Convention line; the Aleutian Islands region stock, found on the Aleutian Islands shelf region from 170°W to the U.S.-Russia Convention line; and the Aleutian Basin or Bogoslof stock, which is a mixture of pollock that migrate from the U.S. and Russian shelves to the Aleutian Basin.

The largest of these is the EBS stock. The Aleutian Islands region pollock stock was closed to directed fishing between 1999 and 2003; in 2004, however, the total allowable catch (TAC) was reestablished for Aleutian Islands pollock to provide for economic development in Adak, Alaska. The Aleutian Basin pollock stock has been closed to directed fishing since 1991, due to low biomass levels.

Pollock continues to represent over 40 percent of the global whitefish production with the market disposition split fairly evenly between fillets, whole (head and gutted), and surimi. An important component of the commercial production is the sale of roe from pre-spawning pollock.

From 1954 to 1963, pollock were harvested at low levels in the Eastern Bering Sea and directed foreign fisheries began in 1964. Catches increased rapidly during the late 1960s and reached a peak in 1970-75 when they ranged from 1.3 to 1.9 million t annually. Following a peak catch of 1.9 million t in 1972, catches were reduced through bilateral agreements with Japan and the USSR.

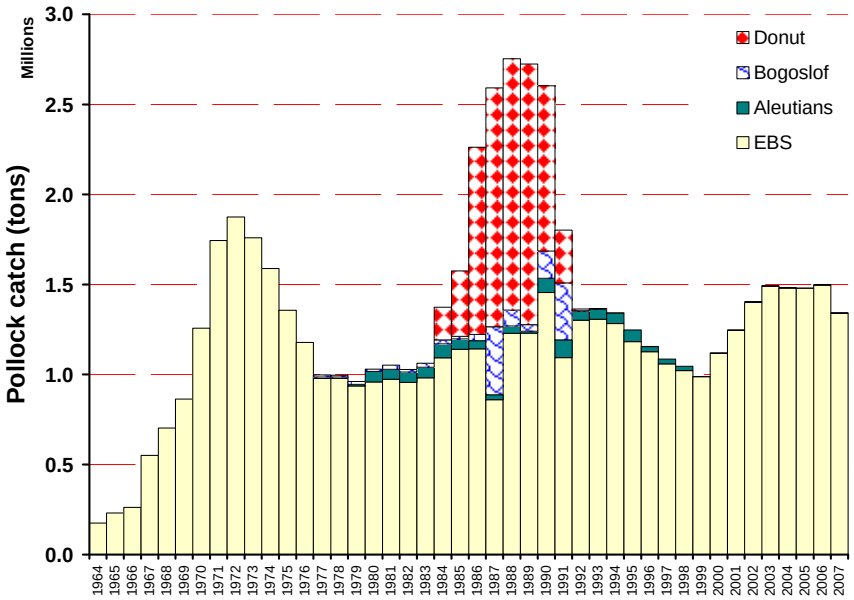


Fig. 2-1 Alaska pollock catch estimates from the Eastern Bering Sea, Aleutian Islands, Bogoslof Island, and Donut Hole regions, 1964-2007

Since the advent of the U.S. EEZ in 1977 the annual average Eastern Bering Sea pollock catch has been 1.2 million t and has ranged from 0.9 million t in 1987 to nearly 1.5 million t in 2006 but has declined in recent years. Stock biomass has apparently ranged from a low of 4-5 million t to highs of 10-12 million t (Fig. 2-1). United States vessels began fishing for pollock in 1980 and by 1987 they were able to take 99 percent of the quota. Since 1988, only U.S. vessels have been operating in this fishery. By 1991, the current NMFS observer program for north Pacific groundfish-fisheries was in place.

Foreign vessels began fishing in the mid-1980s in the international zone of the Bering Sea (commonly referred to as the "Donut Hole"). The Donut Hole is entirely contained in the deep water of the Aleutian Basin and is distinct from the customary areas of pollock fisheries, namely the continental shelves and slopes. Japanese scientists began reporting the presence of large quantities of pollock in the Aleutian Basin in the mid-to-late 1970's, but large scale fisheries did not occur until the mid-1980s. In 1984, the Donut Hole catch was only 181 thousand t. The catch grew rapidly and by 1987 the high seas catch exceeded the pollock catch within the U.S. Bering Sea EEZ. The extra-EEZ catch peaked in 1989 at 1.45 million t and has declined sharply since then. By 1991 the Donut Hole catch was 80 percent less than the peak catch, and data for 1992 and 1993 indicate very low catches. A fishing moratorium was enacted in 1993, and only trace amounts of pollock have been harvested from the Aleutian Basin by resource assessment fisheries.

2.1 The American Fisheries Act and Participation in the Pollock Fishery

Prior to passage of the Magnuson Fishery Conservation and Management Act of 1976 (now the Magnuson Stevens Act), foreign fisheries dominated the pollock fishery off Alaska. Pollock had been harvested at low levels in the Eastern Bering Sea until the 1950s. With perfected onboard freezing technology in the 1960s, the foreign fisheries conducted mainly by Japanese, Russian, and Korean trawlers expanded. Harvests by these foreign fleets increased rapidly during the late 1960s and, in 1972, reached a reported peak catch of 2.2 million mt of pollock, flatfish, rockfish, cod, and other groundfish (Fig. 2-1).

The Magnuson-Stevens Act

The Magnuson Stevens Act established federal authority over the 200-mile EEZ and, thus, effectively provided for the development of domestic fisheries. United States vessels began fishing for pollock in 1980 through, joint-ventures with foreign processing ships. By 1987, U.S. vessels were taking 99 percent of the quota. Since 1988, only U.S. vessels have been operating in this fishery, and pollock harvests now dominate the commercial groundfish fisheries in waters off Alaska. In 2006, pollock harvests in the BSAI and in the Gulf of Alaska (GOA) comprised 71 percent (1.57 million tons) of the region's total groundfish catch of 2.2 million tons. Approximately 95 percent of these pollock harvests occur in the BSAI.

The American Fisheries Act (AFA)

Until 1998, the Bering Sea directed pollock fishery had been a managed open access fishery, commonly characterized as a "race for fish." In 1998, however, Congress enacted the AFA to rationalize the fishery by limiting participation and allocating specific percentages of the Bering Sea directed pollock fishery TAC among the competing sectors of the fishery. After first deducting an incidental catch allowance and 10 percent of the TAC for the Community Development Quota (CDQ) program, the AFA allocates 50 percent of the remaining TAC to the inshore catcher vessels sector; 40 percent to the catcher processor sector; and 10 percent to the mothership sector.

The AFA also allowed for the development of pollock industry cooperatives. Ten such cooperatives were developed as a result of the AFA: seven inshore co-ops, two offshore co-ops, and one mothership co-op.

The first cooperative was formed in 1999 by a private-sector initiative, Pollock Conservation Cooperative (PCC), and is made up of nine catcher/processor companies that divide the sector's overall quota allowance among the companies.

In rationalizing the Bering Sea pollock fishery, the AFA also gave the industry the ability to respond more deliberately and efficiently to market demands than the "race for fish" previously allowed. The AFA also gave the fishery the means to compensate for Steller sea lion conservation measures that, beginning in 1992, created fishery exclusion zones around seal lion rookeries and haulout sites and implemented gradual reductions in seasonal proportions of the TAC taken in Steller sea lion critical habitat.

As of January 1, 2000, all vessels and processors wishing to participate in the non-CDQ Bering Sea pollock fishery are required to have valid AFA permits on board the vessel or at the processing plant. AFA permits are required even for vessels and processors specifically named in the AFA, and are required in addition to any other Federal or State permits. AFA permits also may limit the take of non-pollock groundfish, crab, and prohibited species, as governed by AFA "sideboard" provisions. With the exceptions of applications for inshore vessel cooperatives and for replacement vessels, the AFA permit program had a one-time application deadline of December 1, 2000, for AFA vessel and processor permits. Applications for AFA vessel or processor permits were not accepted after this date, and any vessels or processors for which an application had not been received by this date became permanently ineligible to receive AFA permits.

Salmon bycatch management

The existing management measures to control Chinook salmon bycatch in the Bering Sea pollock fishery are described in detail for Alternative 1 in EIS Chapter 2. The Chinook Salmon Savings Areas are closed upon attainment of Chinook salmon Prohibited Species Catch (PSC) limits. These area closures, which close two different Chinook salmon savings areas, are designed to reduce the total amount of Chinook incidentally caught by closing areas with historically high levels of salmon bycatch. Vessels are exempt from savings area closures if they participate in an VRHS ICA. This industry-initiated agreement requires vessels to stop fishing in areas of high salmon bycatch and move to other areas. An analysis of the VRHS ICA is provided in section 2.3.

Annual Pollock Fishing Seasons

The annual Bering Sea pollock fishery is divided into two seasons: the "A" season, which opens in January and typically ends in April, and the "B" season, which typically runs from July through the end of October. The "A" season fishery has historically focused on roe-bearing females, and is concentrated north and west of Unimak Island and along the 100-meter contour between Unimak and the Pribilof Islands. "A" season pollock also provide other primary products such as surimi and fillet blocks, but yields on these products are slightly lower than in the "B" season, when pollock carry a lower roe content and are thus primarily processed for surimi and fillet blocks. The "B" season fishery takes place west of 170°W.

2.1.1 Description of the Bering Sea Trawl Pollock Fleet

Number of Vessels

In the 2008 Bering Sea pollock trawl fishery, 80 catcher vessels participated in harvesting pollock, a slight decline since 2002 and 2004 when 86 catcher vessels participated in the fishery (Table 2-1). Catcher processor participation has remained nearly constant over that time period with either 16 or 17 vessels participating. Catcher vessels delivering to motherships have ranged from as few as 9, in 2005

and 2006, to 17 in both 2007 and 2008. Note that although the Bering Sea comprises a far larger proportion of the pollock catch than the GOA, the number of catcher vessels operating in each area is nearly equivalent. This result is due to the difference in size of vessels and the length of the season. For example, between the years 2002 and 2006 only two trawl vessels greater than 234 ft in length were fishing in the GOA compared to approximately 15 trawl vessels of this size fishing in the Bering Sea. (See Tables 41-44 of the 2007 Economic SAFE (i.e. Hiatt et.al., 2007) for additional information.)

Gear

In 1990, in response to concerns about bycatch and the impact of bottom trawls on seafloor habitat, the Council reduced non-pelagic or bottom trawling, by dividing the BSAI TAC between pelagic (88 percent) and non-pelagic trawling (12 percent). Although most vessels were voluntarily using pelagic trawls by the mid-1990s, non-pelagic trawls were still responsible for amounts of bycatch that were much larger than desirable, and in 1999, the Council banned the use of non-pelagic trawls entirely in the Bering Sea pollock fishery.

Ports of Delivery

The vast majority of inshore pollock landings takes place in the ports of Dutch Harbor/Akutan, which reported 699.8 million pounds in groundfish landings for 2000, "the highest landings by pound of any port in the United States" (Sepez et al. 2005, p. 49, as cited in Hiatt et.al. 2007).

Many of the west coast US-flag catcher/processors that mainly target Bering Sea pollock also target Pacific whiting (a.k.a. hake) off Washington or Oregon, as noted by the At-sea Processors Association (APA; http://www.atsea.org/).

2.1.2 Total Allowable Catch, Sector Allocations, Harvest, and Value.

2007-2008 Bering Sea Pollock Allocations

The Bering Sea pollock TAC is apportioned between inshore, offshore, and mothership sectors after allocations are subtracted for the CDQ program and incidental catch allowances. The pollock fishery is further divided into two seasons—the winter "A" roe season and the summer "B" season, which is largely non-roe. The 2007-2008 allocation of the TAC in the Bering Sea is as follows:

- 10 percent of TAC is reserved for the CDQ program.
- 2.8 percent of TAC is reserved for the incidental catch allowance
- The remaining TAC is divided between catcher vessels delivering inshore (50 percent); catcher processors processing offshore (40 percent); and deliveries to motherships (10 percent).

The following table (Table 2-1) exhibits the allocations and harvests (in metric tons) in the Bering Sea trawl fisheries from 2003 to 2008. The sectors identified here are the Catcher Vessels (CV), Catcher Processor (CP) Mothership (M), and CDQ sectors.

Table 2-1 Bering Sea pollock sector allocations, catch, and number of participating vessels; 2003–2008

Year/ TAC	Sector (# of vessels)	Allocation (metric tons)	Pollock Catch (metric tons)
2003	CV (86)	653,047	652,254
1,491,760	CP (16)	522,437	522,428
	M (10)	130,564	130,609
	CDQ	149,176	149,121
2004	CV (86)	649,580	637,971
1,492,000	CP (17)	519,664	519,570
	M (10)	129,916	129,222
	CDQ	149,200	149,173
2005	CV (84)	653,787	648,117
1,478,000	CP (16)	523,029	517,699
	M (9)	130,757	130,669
	CDQ	149,750	149,715
2006	CV (81)	660,318	645,606
1,487,756	CP (16)	528,254	527,134
	M (9)	132,063	131,404
	CDQ	150,400	150,374
2007	CV (82)	610,736	572,507
1,394,000	CP (16)	488,588	488,543
	M (17)	122,147	121,514
	CDQ	139,400	139,336
2008	CV (80)	434,250	427,741
1,000,000	CP (17)	347,400	346,998
	M (17)	86,850	85,364
	CDQ	100,000	99,964

2.1.3 Pollock Fishery Tax Revenue

The pollock fishery in waters off Alaska generates tax revenue collected by the State of Alaska in the form of a Fisheries business tax (shoreside processors) and a Fisheries Resource Landings Tax (CPs). Most of the tax revenue is collected from operations in the Aleutian and Pribilof Island areas and is derived from the Bering Sea pollock fishery. Unfortunately, confidentiality restrictions do not allow tax data to be shown for specific ports or communities. Table 2-2 provides pollock fishery tax revenue collection data, provided by the Alaska Department of Revenue. Also shown is the percent of the statewide pollock fishery total that the Aleutian Pribilof area tax collections represent.

Table 2-2 Pollock fishery tax revenues, 2000-2007

Fisheries Business Tax

Year	Aleutians/Pribilof Pounds	Value	Tax Liability
2000	1,132,905,560	$ 134,707,191	$ 4,395,129
2001	1,293,325,964	$ 143,045,862	$ 4,468,644
2002	1,335,417,000	$ 157,355,961	$ 4,889,743
2003	1,348,116,609	$ 145,173,409	$ 4,521,874
2004	1,340,620,622	$ 142,482,037	$ 4,435,921
2005	1,378,682,085	$ 170,218,664	$ 5,207,027
2006	1,355,936,834	$ 174,203,650	$ 5,293,490
2007	1,182,552,028	$ 159,601,604	$ 4,788,432

Fisheries Business Tax

Year	Aleutians Pribilof Percent of Statewide Total Pounds	Value	Tax Liability
2000	91%	89%	90%
2001	87%	86%	82%
2002	96%	96%	96%
2003	87%	88%	84%
2004	87%	87%	83%
2005	86%	85%	81%
2006	83%	83%	79%
2007	86%	85%	81%

Fisheries Resource Landing Tax

Year	Aleutians/Pribilof Pounds	Value	Tax Liability
2000	1,158,516,598	$ 127,436,689	$ 3,823,101
2001	1,431,627,204	$ 157,483,994	$ 4,724,520
2002	1,513,929,561	$ 181,667,682	$ 5,450,030
2003	1,560,823,799	$ 156,621,765	$ 4,698,653
2004	1,545,543,121	$ 170,004,347	$ 5,100,130
2005	1,563,018,143	$ 187,562,181	$ 5,626,865
2006	1,534,011,227	$ 199,421,458	$ 5,982,644
2007	1,360,483,103	$ 190,467,633	$ 5,714,029

Fisheries Resource Landing Tax

Year	Aleutians Pribilof Percent of Statewide Total Pounds	Value	Tax Liability
2000	79%	79%	79%
2001	85%	86%	86%
2002	84%	85%	85%
2003	86%	86%	86%
2004	86%	86%	86%
2005	86%	86%	86%
2006	84%	84%	84%
2007	80%	80%	80%

Total (Business + Landing Tax)

Year	Aleutians/Pribilof Pounds	Value	Tax Liability
2000	2,291,422,157	$ 262,143,881	$ 8,218,230
2001	2,724,953,168	$ 300,529,856	$ 9,193,164
2002	2,849,346,561	$ 339,023,643	$ 10,339,773
2003	2,908,940,407	$ 301,795,174	$ 9,220,527
2004	2,886,163,743	$ 312,486,384	$ 9,536,052
2005	2,941,700,228	$ 357,780,845	$ 10,833,893
2006	2,889,948,061	$ 373,625,108	$ 11,276,133
2007	2,543,035,131	$ 350,069,237	$ 10,502,461

Total (Business + Landing Tax)

Year	Aleutians Pribilof Percent of Statewide Total Pounds	Value	Tax Liability
2000	85%	84%	85%
2001	86%	86%	84%
2002	89%	90%	90%
2003	87%	87%	85%
2004	87%	87%	85%
2005	86%	86%	84%
2006	84%	84%	82%
2007	83%	83%	81%

Source: Alaska Department of Revenue, special data request.

2.2 Market Disposition of Alaska Pollock

Production

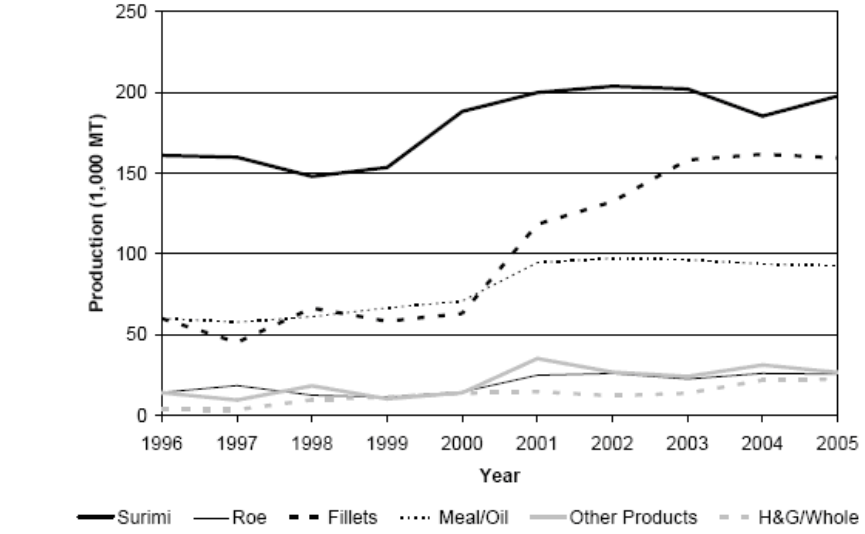
The pollock fishery in waters off Alaska is the largest U.S. fishery by volume, and the economic character of that fishery centers on a varied range of products produced from pollock. In the U.S., Alaska pollock catches are processed mainly for roe, surimi, and several varieties of fillet products. Fillet production has increased particularly rapidly due to more efficient rates of harvests, increased recovery rates, and the shift by processors from surimi to fillet production, all made possible, at least in part, by the AFA. The information in this section summarizes the more extensive information presented in the 2007 Economic SAFE Report, which incorporated by reference and to which readers are referred to for a more detailed discussion.

Prior to the implementation of the AFA, U.S. pollock catches were processed mainly into surimi. The Bering Sea pollock fishery was then managed as an "open-access" fishery in which vessels sought to harvest as large a share of the TAC as possible before the TAC or established bycatch limits were reached and the fishery closed. Because surimi production allows more raw material to be processed in a shorter period of time than fillet and fillet block production, committing catches for surimi production was to a vessel's operational advantage. With the operational and economic efficiencies gained through

rationalization of the fishery under the AFA, the industry was able to abandon practices compelled by the economics of open access and began developing more deliberate production strategies according to market demands.

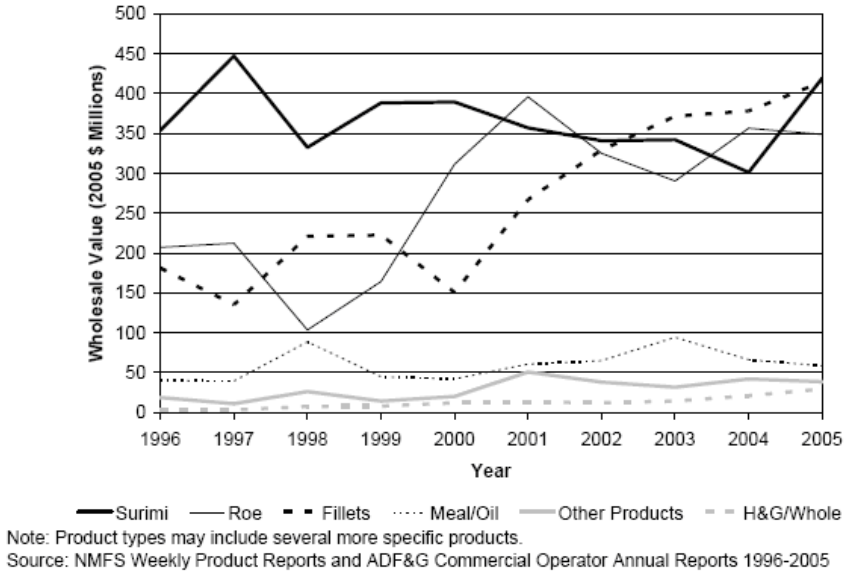
This shift in production practices led, as noted, primarily to a particularly rapid increase in fillet production during the early 2000s, to meet greater world demand for whitefish products created by several factors, including declining harvests in the Russian pollock fishery and a sharp decrease in the supply of fillets from Atlantic cod. The result has been increased fillet production and growth in wholesale gross revenues from U.S. pollock fillet production.

Fig. 2-2 shows the Alaskan production of pollock by product from 1996 to 2005. Fig. 2-3 shows the estimated wholesale value of these products over the same period. These figures show the dramatic increase in production and wholesale value of fillets from 2000 to present.



Note: Product types may include several more specific products.
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2005.

Fig. 2-2 Alaska primary production of pollock by product type, 1996-2005



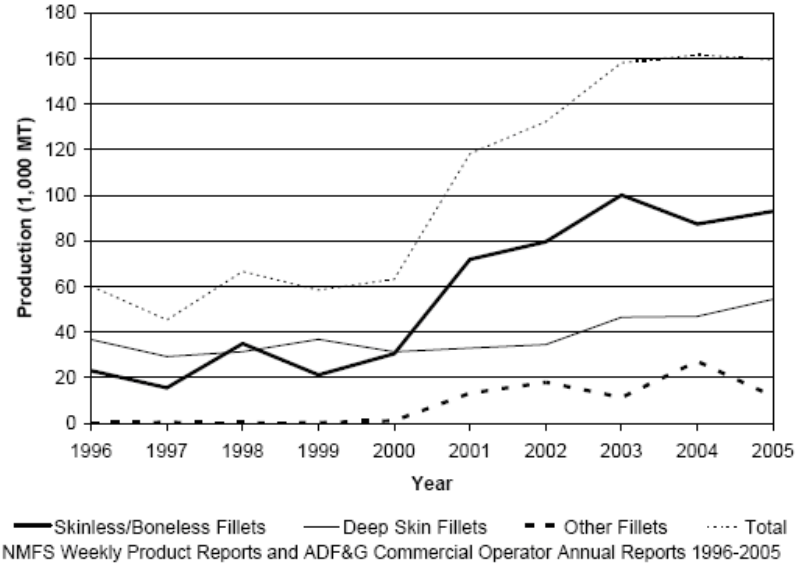
Note: Product types may include several more specific products.
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2005

Fig. 2-3 Wholesale value of Alaska pollock by product type, 1996-2005

Fillet Production

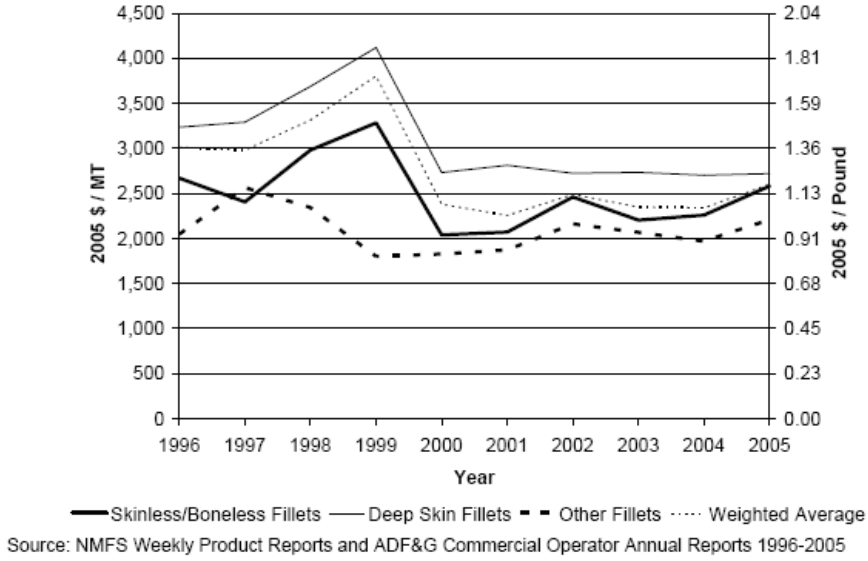
Pollock is a fragile fish that deteriorates relatively quickly after harvest, so little is sold fresh. Pollock fillets are typically frozen, as fillets and fillet blocks (frozen, compressed slabs of fillets used as raw material for value-added products, such as breaded items, including nuggets, fish sticks, and fish burgers). The price of pollock fillets also varies according to the freezing process: single-frozen and frozen-at-sea fillets fetch the highest prices, followed by single-frozen fillets processed by Alaska shoreside plants.

The following figures (Fig. 2-4 through Fig. 2-6) show the primary production, wholesale price, and wholesale gross value of pollock fillets by fillet type from 1996 through 2005.



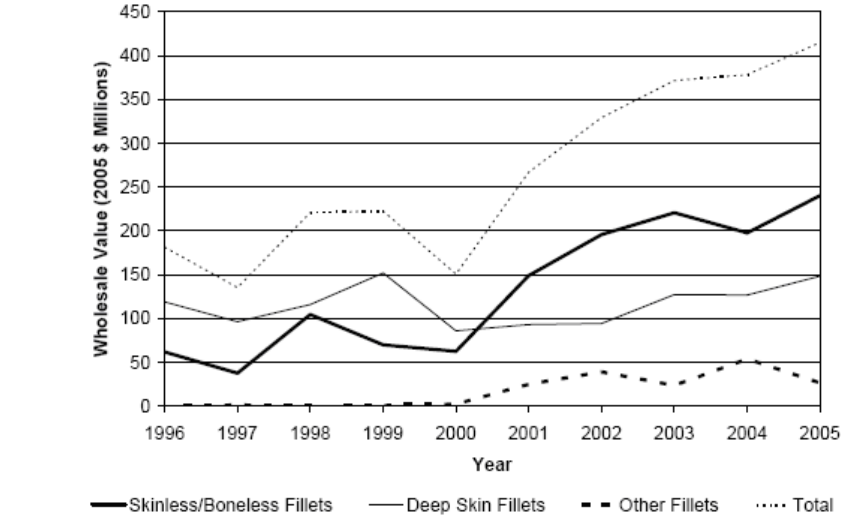
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2005

Fig. 2-4 Alaska production of pollock fillets by fillet type, 1995-2005.



Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2005

Fig. 2-5 Wholesale **p**rices for Alaska production of pollock fillets by fillet type, 1996-2005



Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2005.

Fig. 2-6 Wholesale value of Alaska production of pollock fillets by fillet type, 1995-2005.

Twice-frozen (also referred to as double-frozen or refrozen) pollock fillets, most of which are processed in China, have traditionally been considered the lowest grade of fillets and sell at a discount to single-frozen fillets frozen at sea. Twice-frozen fillets are reportedly greyer in color, and often have a fishy aroma, and can be stored for a maximum of six months, whereas single-frozen can be stored for nine to 12 months (Eurofish 2003, as cited in Hiatt et.al, 2007). However, industry representatives note that the acceptability of twice-frozen fillets is increasing in many markets, and the quality of this product is now considered, by some, to be similar to that of shoreside-frozen fillets, while still trailing at-sea product.

Historically, the primary market for pollock fillets has been the domestic market. Fillets made into deep-skin blocks were destined primarily for the U.S. foodservice industry, including fast food restaurants. Competition in this domestic market comes from imported twice-frozen pollock fillets and fillet blocks

produced from pollock caught in Russia and reprocessed in China. However, with Russian-caught pollock in short supply due to declining harvests, twice-frozen fillets from China have become more expensive, and imports into the U.S. markets have subsequently declined.

Fig. 2-7 shows the leading countries importing U.S.-produced Alaska pollock from 1996 to 2006, along with the estimated gross export value to the U.S. economy. A number of factors may affect the industry in coming years: species substitution, a decline in the Bering Sea pollock TAC, increasing standards in the Russian fisheries, and safety concerns about Chinese food products. At present, it is unclear how these factors will affect prices for the U.S. pollock industry.

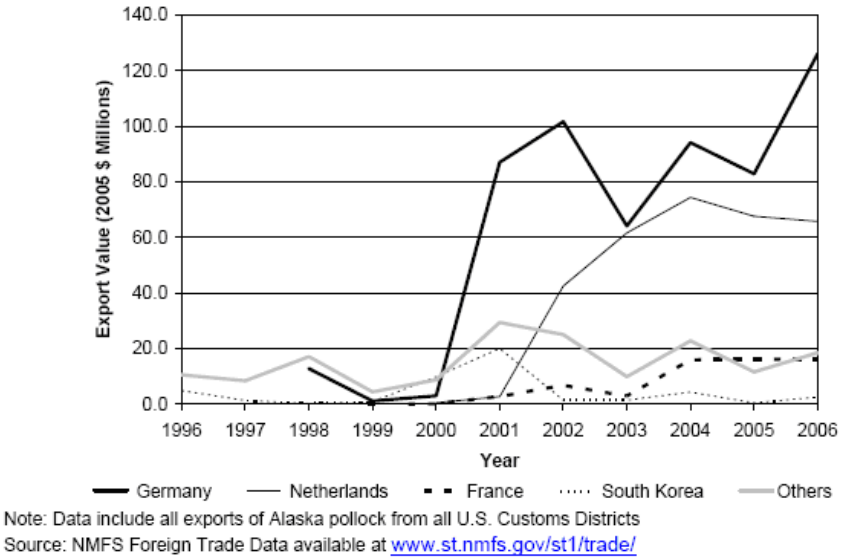
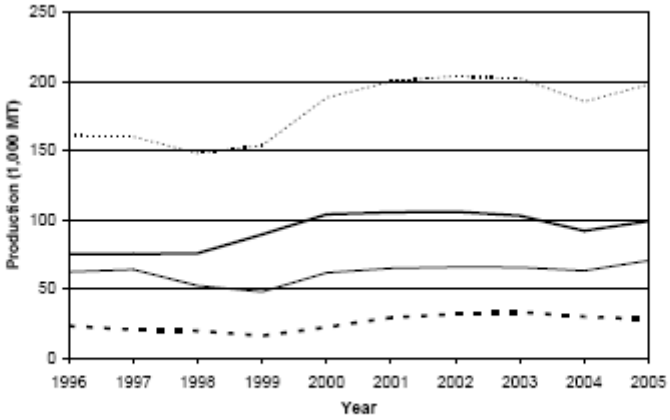


Fig. 2-7 U.S. exports of Alaska pollock fillets to leading importing countries, 1996–2006.

Surimi Production

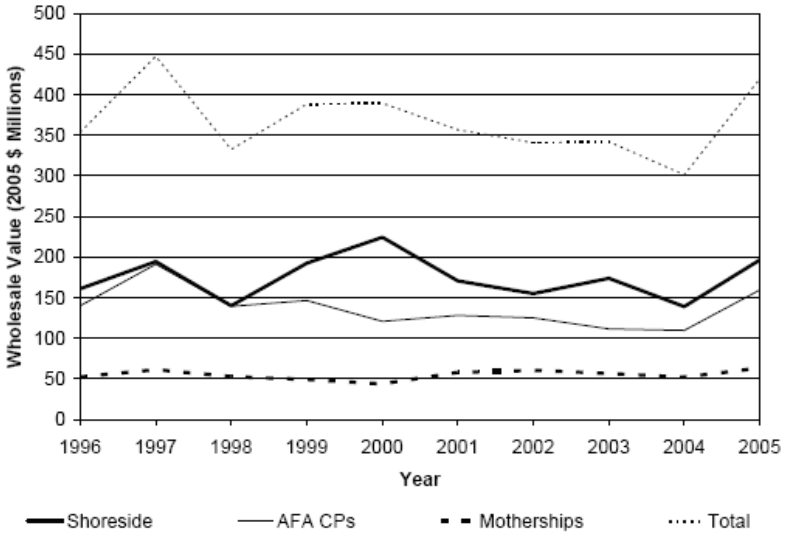
World surimi production has almost doubled in the last ten years. The chief market for surimi is Asia, particularly Japan, and the U.S. is the leading exporter of Alaska pollock surimi to the Japanese market. Chile, India, and China are increasing surimi production from other whitefishes, which now represent 25 percent of the total volume of surimi production. Nevertheless, approximately half of the surimi produced continues to come from Alaska pollock.

U.S. production of Alaska pollock surimi rose slightly in the late 1990s. As noted, the AFA's ending of open access occasioned the development of more efficient processing methods, which significantly increased product yields and allowed the volume and value of surimi from Alaska-caught pollock to remain fairly stable, while at the same time increasing pollock fillet production. Alaska pollock surimi wholesale prices spiked in 1999, possibly because the Bering Sea pollock TAC decreased, but have been relatively stable since 2001. Fig. 2-8 through Fig. 2-10 show the production, wholesale value, and wholesale price of U.S.-produced Alaska pollock surimi by sector for 1996 to 2006.



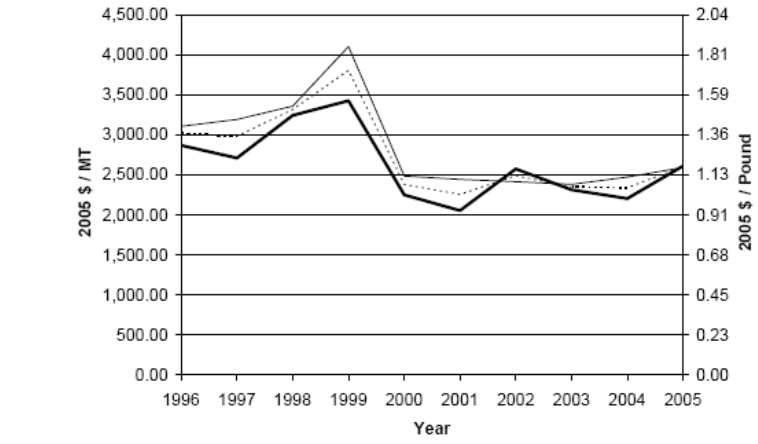
Note: Reported surimi production and value do not specify the grade of products.
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2005

Fig. 2-8 Alaska production of pollock surimi by sector, 1995-2006.



Note: Reported surimi production and value do not specify the grade of products.
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2005

Fig. 2-9 Wholesale value of Alaska production of pollock surimi by sector, 1995-2005.



Note: Reported surimi production and value do not specify the grade of products. AFA-eligible catcher/processors and motherships are treated as a single sector for the purpose of price calculations.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2005

Fig. 2-10 Wholesale prices for Alaska production of pollock surimi by sector, 1996-2005.

The quality of pollock surimi is graded by the National Surimi Association in Japan, which established a quality-ranking system that has been adopted by many suppliers. The highest quality surimi is designated as SA grade, and the grade second highest in quality designated as FA. The third quality grade is designated with A or AA, and the labels KA or K and RA or B are used to denote lower and lowest quality grades.

In Japan, SA grade surimi yields a price approximately 10 percent higher than FA grade surimi. Researchers note that the Japanese generally believe that ship-processed surimi is of higher quality than surimi processed at shoreside (Sproul and Queirolo 1994, as cited in Hiatt, et.al. 2007), and even SA grade surimi commands a lower price if produced by shoreside processors. In addition to grade, other factors such as inventory levels and seasonal production influence the price of U.S. Alaska pollock surimi.

Roe Production

Roe is extracted from the fish after heading, separated from other viscera, and frozen. After being stripped of roe, the remaining fish can be further processed into surimi or fillets. One of the most important products of Alaska pollock, roe actually accounts for a small share of the volume of pollock products. But its high price accounts for a large share of the total value, and for some producers their highest-margin business comes from pollock roe. U.S. pollock roe production has been significantly higher since 2001 as a result of increased harvests and roe yields following the implementation of the AFA. The value of this increased production, however, has been offset by a decline in Russian harvests of pollock and a subsequent reduction in Japanese imports of pollock roe. Fig. 2-11 and Fig. 2-12 exhibit the harvests, primary production, and wholesale value of roe from Alaska-caught pollock.

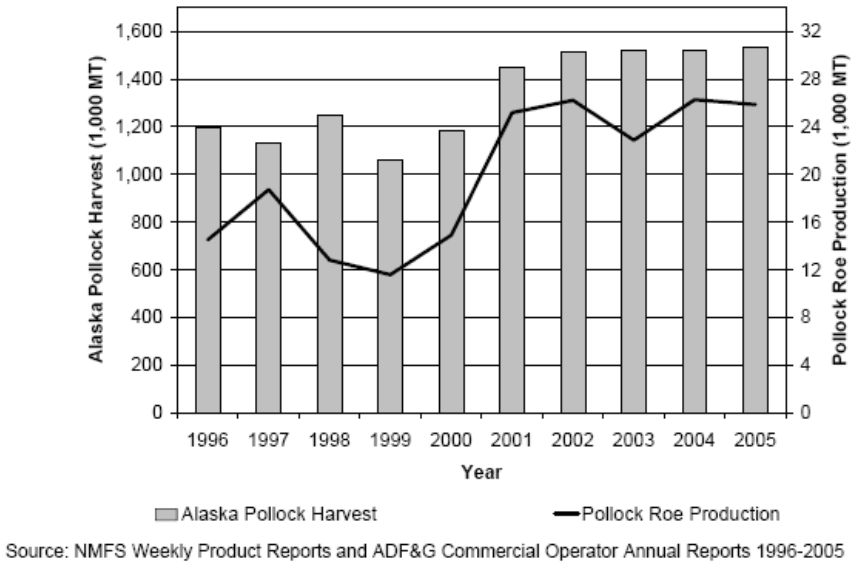


Fig. 2-11 Alaska pollock harvests and production of pollock roe, 1996–2005.

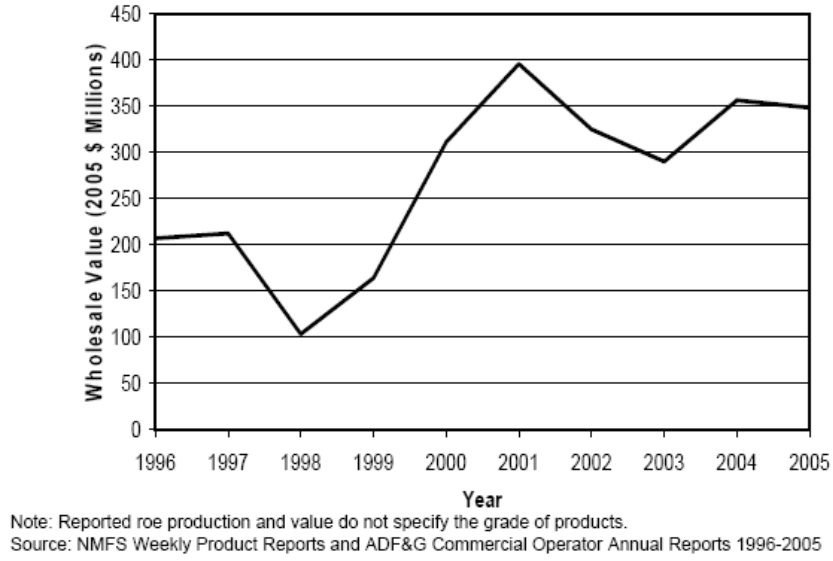


Fig. 2-12 Wholesale value of Alaska production of pollock roe, 1996–2005.

Catcher processors are more likely to produce higher quality roe because they process the fish within hours of harvest, rather than within days as is typical for fish delivered to shoreside processors. Prices for roe processed at sea are generally $1.50-$2.00/lb higher than roe processed at shoreside processors. Most U.S. pollock roe is sold at auction in Seattle and Busan, South Korea. Once purchased and exported to its destination, principally Japan and Korea, the roe is processed into salted roe or, for lower-grade roe, seasoned or spicy roe.

U.S. pollock roe commands premium prices in Japan because of its consistent quality, and the volume of U.S. exports to Japan is expected to remain high. As noted above, the decline in Russian production of Alaska pollock has reduced competition for U.S. roe producers and helped strengthen the markets. The factors that may affect the roe industry in the future are difficult to predict. Certainly, any change in the

tastes and demands of Asian consumers or in Russian production will have an effect on the U.S. pollock, especially the roe industry. So, too may the relative value of the U.S. dollar, as compared to other currencies.

International Trade

As the preceding discussions suggest, export of Alaska pollock products constitutes a major aspect of the U.S. pollock industry. Almost all U.S. pollock roe is exported, primarily to Japan and Korea, along with a substantial part of U.S. surimi; and American producers of fillets also have increased exports, especially to Europe where a stronger market for U.S. pollock has emerged from the declining catch of other whitefishes in European waters and the depreciation of the dollar against the Euro.

The single most important export market for pollock fillets has been Germany since 2001. The Netherlands, also, is an important European destination for Alaska-caught pollock because it has two of Europe's leading ports (Rotterdam and Amsterdam) and is in close proximity to other countries in Western Europe; most pollock product imported by the Netherlands is further processed and re-exported to other EU countries.

An increasing amount of headed and gutted pollock is being exported to China, which has been rapidly expanding imports of raw material fish becoming the world's "seafood processing plant" since the latter half of the 1990s. Transport costs to China can be offset by significant presentational and yield improvements achieved by use of a highly skilled labor force (Hiatt et.al. 2007). This is in contrast to the need for mainly mechanical filleting and preparation by U.S. processors, with consequent yield loss and forgone value added opportunities.

U.S. seafood companies are increasingly taking advantage of the higher recovery rates and lower labor costs associated with outsourcing some fish processing operations. For example, Premier Pacific Seafoods built a new facility on its 680-ft. mothership M/V *Ocean Phoenix* to prepare Alaska pollock for sale to re-processors in China. The fish are headed and gutted, then frozen and sent to China for further processing (Choy 2005, as cited in Hiatt et.al. 2007). The vast majority of this value added pollock product then returns to U.S. consumer markets.

2.3 Voluntary Rolling Hotspot System

Under Alternative 1, NMFS and the Council have implemented a number of FMP amendments to reduce overall salmon bycatch in the BSAI trawl fisheries. Despite these efforts, salmon bycatch numbers increased until 2008. In 2003, 44,425 Chinook salmon and 173,963 chum and other salmon were taken incidentally in the trawl fisheries. In 2004, bycatch further increased to 51,248 Chinook and 427,653 chum and other species of salmon. Bycatch amounts remained high in 2005, totaling 68,178 Chinook and 638,531 chum and other salmon. High bycatch amounts continued in 2006 with 81,661 Chinook and 277,989 chum and other salmon taken incidentally. And in 2007, bycatch of Chinook increased to 122,000 fish, while bycatch of chum and other salmon species, although down considerably from previous years, remained high at 90,679 fish taken incidentally. In 2008 and 2009, Chinook salmon bycatch in the Bering Sea pollock fishery decreased substantially from these historic high levels. The 2008 Chinook salmon bycatch estimate was 20,559 Chinook salmon.

Since establishment of the Chum Salmon Savings Area in 1995, the bycatch of chum and other non-Chinook salmon triggered closures in each of the five years from 2002 through 2006. Table 2-3 exhibits pollock catch and salmon bycatch for full years from 2000 through 2007, compiled from plant landing information for catcher vessels delivering to shoreside processors and from observer data for mothership catcher vessels and catcher-processors. The "Other salmon" category includes all non-Chinook salmon,

and observer data for both offshore and shoreside deliveries show only small numbers of salmon other than chum in this category (for example, in the 2006 B Season EFP, only 152 unidentified salmon, 31 pink salmon, and 5 silver salmon).

Table 2-3 Pollock catch and Chinook and non-Chinook salmon bycatch in the pollock fishery by season and for full years, 2000–2007.

Year	A Season pollock	A Season Other salmon	A Season Chinook	B Season pollock	B Season other salmon	B Season Chinook	Full year pollock	Full year other salmon	Full year Chinook
2000	418,285	235	3,418	631,755	57,228	1,793	1,050,039	57,463	5,210
2001	538,107	1,867	16,464	813,022	50,948	13,663	1,351,130	52,815	30,126
2002	570,464	387	21,989	866,034	83,033	13,309	1,436,498	83,420	35,298
2003	576,868	3,274	30,981	876,784	170,688	13,444	1,453,651	173,963	44,425
2004	579,816	419	22,011	858,799	427,234	29,238	1,438,615	427,653	51,248
2005	573,887	574	26,678	878,618	637,957	41,499	1,452,505	638,531	68,178
2006	579,112	1,210	57,637	874,435	276,779	24,024	1,453,547	277,989	81,661
2007	544,273	8,038	70,845	775,261	82,641	49,020	1,319,534	90,679	119,866

Estimates of salmon bycatch for 2000-2007 (compiled by SeaState, Inc.) are for the pollock fishery only and were made using observer data when available and from numbers of salmon counted at shore plants and reported on fish tickets for unobserved inshore CV vessels.

Source: Adapted from SeaState, Report to the North Pacific Fishery Management Council for the BSAI Groundfish Fishery Exempted Fishing Permit #07-02.

Amendment 84 to the BSAI FMP provides for the pollock cooperatives to enter into voluntary, contractual agreements for reducing salmon bycatch by the pollock fleet. These ICAs exempt participating non-CDQ and CDQ pollock vessels from closures of the Chinook and Chum Salmon Savings Areas in the Bering Sea and allow those vessels to use real-time salmon bycatch information to avoid high incidental catch rates of chum and Chinook salmon.

All parties to the ICA agree to abide by all tenets of the ICA, which provides for retaining the services of a private contractor to gather and analyze data, monitor the fleet, and report necessary bycatch information to the parties of the ICA. The ICA requires that the bycatch rate of a participating cooperative be compared to a pre-determined bycatch rate (the base rate). All ICA provisions for fleet bycatch avoidance behavior, closures, and enforcement are based on the ratio of the cooperative's actual salmon bycatch rate to the base rate.

Each cooperative participating in the ICA is assigned to one of three tiers, based on its salmon bycatch rate relative to the base rate. Higher tiers correspond to higher salmon bycatch rates. Tier assignments determine access privileges to specific areas. A cooperative assigned to a high tier is restricted from fishing in a relatively larger geographic area, to avoid unacceptably high salmon bycatch areas. A cooperative assigned to a low tier (based on relatively low salmon bycatch rates) is granted access to a wider range of fishing areas. The private contractor tracks salmon bycatch rates for each cooperative. A participating cooperative is assigned to a tier each week based on its salmon bycatch rate for the previous week. Thus, vessels have economic and operational incentives to avoid fishing behavior that results in high salmon bycatch rates.

Parties to the ICA include the following AFA cooperatives: Pollock Conservation Cooperative, the High Seas Catchers Cooperative, the Mothership Fleet Cooperative, the Inshore Cooperatives (Akutan Catcher Vessel Association, Arctic Enterprise Association, Northern Victor Fleet Cooperative, Peter Pan Fleet Cooperative, Unalaska Fleet Cooperative, UniSea Fleet Cooperative, and Westward Fleet Cooperative) and all six CDQ groups. Additionally, two western Alaskan groups that have an interest in the

sustainability of salmon resources would be parties in the ICA. All these groups have participated in meetings to develop the ICA and have a compliance responsibility in the agreement.

2.3.1 Exempted Fishing Permit for the VRHS ICA

To address the immediate need to implement a program to reduce salmon bycatch during directed fishing for pollock, and to explore the efficacy of the VHRS ICA, the AFA Catcher Vessel Intercooperative and the PCC applied for and were granted an exempted fishing permit (EFP) for the time period August 2, 2006, through November 1, 2006. The 2006 EFP exempted CDQ and non-CDQ pollock vessels operating under a salmon bycatch ICA from closures of the salmon savings areas. The EFP allowed the participants to conduct operations under the salmon bycatch reduction EFP during the ‘‘B’’ season.

Preliminary results indicated that salmon bycatch was reduced under the EFP, although it could not be determined whether those reductions were due to decreases or movements in overall salmon biomass.

On October 16, 2006, the applicants submitted a request for a second EFP that would continue the work of the 2006 EFP. Because chum salmon is the predominant bycatch problem during the ‘‘B’’ season (the season investigated under the initial EFP) and Chinook salmon bycatch is the predominant bycatch problem during the ‘‘A’’ season, the applicants expected the new EFP to allow them to evaluate the impact of the ICA program on Chinook salmon bycatch in the 2007 A season.

SeaState, Inc., the private contractor tracking the results of the EFP, submitted their draft report to the Council in 2008. The following summarizes the information in that report, to which readers are referred for additional information. During the course of the fishery, the pollock Intercooperative group closed 13 areas to fishing in the 2007 A season and 52 areas during the 2007 B season, based on high bycatch rates for Chinook or chum salmon by vessels fishing in the areas.

2.3.2 Evaluation of Salmon Savings Under the VRHS (PLACEHOLDER: Analysis not yet complete.

2.4 Donation of Bycaught Salmon: Prohibited Species Donation Program

The Prohibited Species Donation (PSD) program was initiated to reduce the amount of edible protein discarded under PSC regulatory requirements for salmon and halibut. Some groundfish fishing vessels cannot sort their catch at sea, but deliver their entire catch to an onshore processor or a processor vessel. In these cases, sorting and discarding of prohibited species occurs at delivery, after the fish have died. One reason for requiring the discard of prohibited species is that some of the fish may live if they are returned to the sea with a minimum of injury and delay (e.g., halibut and crab). However, all incidentally caught salmon die in the Alaska groundfish trawl fisheries (NMFS 1996). Therefore, to reduce the waste of edible protein, the PSD program was begun. NMFS implemented the PSD program for salmon in 1996, and expanded the program in 1998 to include Pacific halibut delivered to shoreside processors by CVs using trawl gear. The first donations were received under the PSD program in 1996.

The PSD program allows enrolled seafood processors in the Bering Sea and Gulf of Alaska trawl groundfish fisheries to retain salmon and halibut bycatch for distribution to economically disadvantaged individuals through tax-exempt hunger relief organizations. Regulations prohibit authorized distributors and persons conducting activities supervised by authorized distributers from consuming or retaining prohibited species for personal use. They may not sell, trade, or barter any prohibited species that are retained under the PSD program. However, processors may convert offal from salmon or halibut that has been prepared for the PSD program, into fish meal, fish oil, or bone meal, and retain the proceeds from

the sale of these products. Fish meal production is not necessarily a profitable venture. The costs for processing and packaging the salmon are donated by the processors participating in the PSD program.

The NMFS Regional Administrator, Alaska Region, may select one or more tax-exempt organizations to be an authorized distributor of the donated prohibited species. The number of authorized distributors selected by the Regional Administrator is based on the following criteria: (1) the number and qualifications of applicants for PSD permits; (2) the number of harvesters and the quantity of fish that applicants can effectively administer; (3) the anticipated level of bycatch of salmon and halibut; and (4) the potential number of vessels and processors participating in the groundfish trawl fisheries. After a selection notice is published in the *Federal Register*, a PSD permit is valid for three years, unless suspended or revoked. Regulations at 50 CFR 679.26 describe numerous requirements for authorized distributors; reporting and recordkeeping requirements for vessels or processors retaining prohibited species under the PSD program; and processing, handling, and distribution requirements for PSD program processors and distributors.

Several inshore pollock processors participate in the PSD program. This program donates salmon, after being seen by an observer, to authorized distributors. Regulations require that donated salmon be headed, gutted, and frozen in a manner fit for human consumption. Generally, per regulatory design, the fishing industry may not gain economic benefit from the catch or disposition of prohibited species. However, the National Oceanic and Atmospheric Administration (NOAA) Office of Law Enforcement (NOAA OLE) has a policy that allows the heads and guts of these salmon to be processed into fish meal even though these may mean that prohibited species heads and guts could be sold in the form of fish meal. This policy allows processors to accrue a small economic benefit from the offal of prohibited species. Any salmon found at the plant that are not fit for human consumption are returned to the vessel and discarded whole during the vessel's next trip.

Since the program began, in 1996, SeaShare (formerly Northwest Food Strategies) of Bainbridge Island, Washington, has been the sole applicant for a PSD permit for salmon from NMFS, and, therefore, the only recipient of a PSD permit for salmon. The NOAA presented SeaShare with a Marine Stewardship Award in 2006, evidence that the PSD program and its distributor SeaShare are effective. SeaShare is a 501(c)(3) tax-exempt organization that distributes seafood products through America's Second Harvest and its national network of food banks. The most recent selection notice for SeaShare was published in the *Federal Register* on July 15, 2005 (70 FR 40987). SeaShare applied for a permit renewal on March 20, 2008.

Many trawl vessels and all three major shoreside processors operating from Dutch Harbor have participated in the PSD program since its inception as a pilot program in 1994. The shoreside processors Alyeska Seafoods, Inc., and Unisea, Inc., have participated every year; Westward Seafoods, Inc., has participated less frequently. Thirty-six trawl catcher vessels are qualified to participate in the PSD program and deliver to these shoreside processors. Additionally, there are 17 trawl catcher/processors that currently participate in the salmon PSD program; however, catcher/processors may not participate in the halibut PSD program. With existing staff, SeaShare has stated that it could administer up to 40 processors and associated catcher vessels, about twice as many processors as it currently administers (SeaShare 2008).

There is limited information available on the volumes of Chinook salmon entering this distribution network. Program statistics do not discriminate between Chinook and chum salmon, although very little salmon of other species is believed to enter the system. The total processed or finished weight of

Chinook and chum salmon distributed has ranged from about 38,700 pounds in 1999 up to about 483,400 pounds in 2005. In 2007, 87,300 pounds were distributed (SeaShare, personal communication 2008).[2]

Table 2-4 lists the annual net amount of steaked and finished pounds of PSD salmon received by SeaShare and donated to the food bank system from 1996 through 2008 (SeaShare, personal communication 2009). NMFS does not have the information to accurately convert the net weight of salmon to numbers of salmon. Note that salmon may be consolidated in temporary cold storage in Dutch Harbor awaiting later shipment, so salmon donated in November or December may appear in the results for the following year.

Table 2-4 Net weight of steaked and finished PSD salmon received by SeaShare 1996-2008

Year	Salmon (lbs.)	
1996	89,181	
1997	99,938	
1998	70,390	
1999	38,731	
2000	62,002	
2001	32,741	*
2002	102,551	
2003	248,333	
2004	463,138	
2005	483,359	
2006	171,628	
2007	87,330	
2008	74,237	

*For a time in 2001, processors stopped retaining salmon under the PSD program because regulations prohibited them from processing and selling waste parts of salmon not distributed under the PSD program. The regulations were revised through a final rule published August 27, 2004, to allow processors to use this material for commercial products (69 FR 52609).

The packaged PSD salmon is distributed through SeaShare to food banks located primarily in the Puget Sound area of the Pacific Northwest. Less than full truckload quantities of fish are distributed to Seattle-area food banks that use their freezer trucks to pick up the frozen salmon directly from the freight carriers. Sometimes full truckloads are made available to any qualified food bank within the America's Second Harvest network that is willing to pick it up with a freezer truck and pay for shipping expenses. Due to transportation costs, donated salmon usually stays in the western U.S. Individual food banks distribute the salmon to soup kitchens, shelters, food pantries, and hospices (SeaShare 2008). Over the 12 years that the salmon PSD program has been in place, nearly 2 million pounds of steaked and finished salmon have been donated through the program. Using an estimated four meals per pound of salmon, nearly 650,000 meals have been donated on average, per year. The donated salmon provides a highly nutritious source of protein in the diets of people who have access to only meagre, and often inadequate, food (NMFS 1996).

Expenses for processing the salmon and delivery to the food banks are covered by donations. Fishermen participating in the PSD program must sort, retain, and deliver to an approved storage facility, all salmon destined for the PSD program. Their costs include space on the vessel to store the fish, and maintenance of the fish in suitable condition. Processors must accept delivery, fill out the appropriate paper work and process, refrigerate, package, and store the donated fish, incurring costs in time, labor, and equipment that

[2] Jim Harmon, Program Manager for SeaShare. Personal communication, April 25, 2008.

must be borne by the processor. The PSD salmon must then be delivered from the processor to SeaShare, which then coordinates the temporary storage of the fish, its transportation, and routing to eligible food banks. The transportation costs to Seattle are usually donated by various freight carriers. Participation in the PSD program is entirely voluntary, so an entity that found the program requirements onerous could stop participating without financial cost to itself (NMFS 2003a).

The PSD program reduces waste of salmon PSC catch. Without this program, these fish would be discarded at sea, and would not be directly used by anyone (although discards would be available to scavengers, potentially benefitting future fish productivity). The PSD program encourages human consumption of these fish, without creating an economic incentive for fishing operations to target them. Under the PSD program, salmon that are unavoidably killed as PSC bycatch are directly utilized as high quality human food, improving social welfare and reducing fishery waste.

2.5 The Community Development Quota (CDQ) Program

A portion of the Federal pollock TAC in the Bering Sea is allocated for harvest by participants in the CDQ Program. The CDQ Program was designed to improve the social and economic conditions in western Alaska communities by facilitating their economic participation in the BSAI fisheries. The large-scale commercial fisheries of the BSAI developed in the eastern Bering Sea without significant participation from rural western Alaska communities. These fisheries are capital-intensive and require large investments in vessels, infrastructure, processing capacity, and specialized gear. The CDQ Program was developed to redistribute some of the BSAI fisheries' economic benefits to adjacent communities by allocating a portion of commercially important BSAI species including pollock, crab, halibut, and various groundfish, to such communities. The percentage of each annual BSAI catch limit allocated to the CDQ Program varies by both species and management area. These allocations, in turn, provide an opportunity for residents of these communities to participate in and benefit from the BSAI fisheries.

A total of 65 communities are authorized under Section 305(i)(1) of the Magnuson-Stevens Act to participate in the program through six CDQ entities.[3] These CDQ entities are non-profit corporations that manage and administer the CDQ allocations, economic development projects, and investments, including ownership interest in the at-sea processing sector and in catcher vessels. Annual CDQ allocations provide a revenue stream for CDQ entities through various channels, including the direct catch and sale of some species, leasing quota to various harvesting partners, and income from a variety of investments.

Geographically dispersed, the members communities extend westward to Atka, on the Aleutian Island chain, and northward along the Bering Sea coast to the village of Wales, near the Arctic Circle. The 2000 population of these communities totaled over 27,000 persons of whom approximately 87 percent were Alaska Native. In general economic terms, CDQ communities are remote, isolated settlements with few commercially valuable natural assets with which to develop and sustain a viable, diversified economic base. As a result, economic opportunities are few, unemployment rates are chronically high, and communities and the region are economically depressed. The CDQ Program ameliorates some of these circumstances by providing an opportunity for residents of CDQ communities to directly benefit from the BSAI fishery resources.

The CDQ Program was implemented by the Council and NMFS in 1992 with allocations of 7.5 percent of the pollock TAC. Allocations of halibut and sablefish were added to the program in 1995. Authorization

[3] The CDQ entities include the Aleutian Pribilof Island Community Development Association (APICDA), the Bristol Bay Economic Development Corporation (BBEDC), the Central Bering Sea Fishermen's Association (CBSFA), the Coastal Villages Region Fund (CVRF), the Norton Sound Economic Development Corporation (NSEDC), and the Yukon Delta Fisheries Development Association (YDFDA).

for the CDQ Program was added to the Magnuson-Stevens Act by the U.S. Congress in 1996. In 1998, the Council expanded the CDQ Program by adding allocations of the remaining groundfish species, prohibited species, and crab. Currently, the CDQ Program is allocated portions of the groundfish fishery that range from 10.7 percent for Amendment 80 species, 10 percent for pollock, and 7.5 percent for most other species.

In 2007, the six CDQ entities held approximately $543 million in assets. Since inception of the CDQ Program in 1992, the CDQ entities have generated more than $204 million in wages, education, and training benefits. CDQ entities fund fisheries infrastructure investments such as docks, harbors, seafood processing plants, fisheries support centers, and vessels such as motherships and catcher/processors that operate in crab, halibut, and groundfish fisheries. In 2007 fisheries and fishery related investments by the six CDQ entities totaled more than $140 million, primarily in the BSAI. Local programs purchase limited access privileges in the fishery and acquire equity position in existing fishery businesses. The six CDQ entities had total revenues in 2007 of approximately $170 million, of which 41 percent ($70 million) was derived from CDQ royalties. Income from sources other than royalties has exceeded royalty income since 2004, with direct income accounting for 54-59 percent of revenue annually (WACDA 2007).

Pollock royalties are a very important source of CDQ Program revenues that directly fund investments in the region. Table 2-5 shows the estimated total royalties from all CDQ allocations, from pollock CDQ allocations, and an estimate of the average royalty rate ($/mt) for pollock. Pollock royalties have historically represented about 80 percent of total annual royalties from the CDQ allocations and, in 2005, were approximately $50 million. Specific information about total annual pollock royalties for all CDQ entities combined has not been publically available since 2005.

Table 2-5 CDQ pollock royalties for 2001-2008

Year	Total royalties all species (millions $)	Total pollock royalties	% pollock of total royalties	Harvested pollock (mt)	Average royalty ($/mt)
2001	$ 42.6	$ 36.7	86%	139,946	$ 262
2002	$ 46.3	$ 36.6	79%	148,427	$ 247
2003	$ 53.5	$ 42.8	80%	149,121	$ 287
2004	$ 55.4	$ 45.9	83%	149,169	$ 307
2005	$ 61.4	$ 48.5	79%	149,720	$ 324
2006	N/A	N/A	N/A	150,376	N/A
2007	$ 69.7*	$ 43.2*	62%*	139,400	$ 310*
2008	N/A	N/A	N/A	99,959	N/A

Note: No pollock royalty data is available for 2006 or 2008.
*This table contains calculated or estimated values where data were incomplete.

The average annual royalty value to the CDQ entities was calculated from the audited financial statements and data available through public reports and financial statements. CDQ royalty data was collected by species until 2006 therefore no further calculation necessary for 2001-2005. Although NMFS records the weight of pollock harvested by sector annually, insufficient aggregate royalty data are publicly available to estimate forgone pollock royalties for 2006 and 2008. The 2007 estimates are base on an average of Aleutian Pribilof Island Community Development Association (APICDA) and Coastal Villages Region Fund (CVRF) total royalties derived from pollock. We applied the average royalty value to the estimates of pollock catch by pollock weight to get our estimates of pollock royalties for the CDQ sector annually. The percentage of pollock royalties was calculated from the total royalty statistics provided in the Western Alaska Community Development Association (WACDA) 2007 report, 41 percent of total revenue ($170 million).

Accurate royalty data was collected by NMFS in the CDQ entities audited financial statements. Annually until 2005, NMFS received information about royalties paid, by species or species group, for the CDQ

allocations. NMFS not been authorized to require submission of accurate royalty information since the 2006 amendments to the Magnuson-Stevens Act. Therefore, we now rely on royalty information from the CDQ entities publically available annual reports prepared primarily for residents of the member communities. Some of the CDQ entities choose to include specific information about royalties, while others choose not to provide this level of detail in their annual reports. Additional information that would improve the analysis of the impacts of the alternative would be to estimate the forgone values of pollock royalties to the CDQ entities under each alternative.

Table 2-6 below provides information about the investments that the CDQ entities have made in vessels and companies (LLCs) that participate in the Bering Sea pollock fisheries. These are significant investments that have been largely funded by pollock royalty revenues.

Table 2-6 CDQ entity ownership of pollock vessels and regional importance

Region	Percent of population in CDQ group(s) of this Region	Name of CDQ group	Name of Company or Limited Liability Company (LLC)	Percent Company or LLC owned by CDQ	CDQ Vessel ownership (wholly owned or partially owned)
Norton Sound	Fifteen communities - 8,488 persons. About 98% of the population in this area (Nome census area, exclude Shishmaref).	Norton Sound Economic Development Corporation (NSEDC)	Glacier Fish Company, LLC	50%	Northern Glacier 201' trawl CP
					Pacific Glacier 276' CP
					Alaska Ocean 376' CP
Yukon River and delta	Six communities with 3,123 persons. Approximately 23% of population in Wade Hampton and Yukon-Koyukuk census, minus Takotna, McGrath and Nikolai).	Yukon Delta Fisheries Development Association (YDFDA)[4]	American Beauty, LLC	75%	American Beauty 123' CV and CDQ pollock quota for Golden Alaska
			Ocean Leader, LLC	75%	Ocean Leader 120' CV and CDQ pollock quota for Golden Alaska
			Golden Alaska, LLC	30.2%	Golden Alaska 305' MS
Kuskokwim River and delta	Twenty communities with about 7,855 persons account for 47% of the regional population (Bethel census area plus Takotna, McGrath, and Nikolai)	Coastal Villages Region Fund (CVRF)	American Seafoods, LLC	46%	American Dynasty 272' CP
					American Triumph 285' CP
					Katie Ann 296' CP
					Ocean Rover 256' CP
					Northern Eagle 341'
					Northern Jaeger 336' CP
					Northern Hawk 341' CP
Bristol Bay, Alaska Peninsula, Aleutians, Pribilofs	Twenty-three communities with 7,605 persons account for about 57% of the regional population (Aleutians East and West, Lake and Peninsula, and Dillingham census districts, minus certain communities around Lake Iliamna.	Central Bering Sea Fishermen's Association (CBSFA)	American Seafoods, LLC	4.54% [5]	CBSFA has ownership interests in some portion of AFA CPs
			Fierce Allegiance LLC	75%	Starlite 123' CV
			Star Partners LLC	75%	Starward 123' CV
		Aleutian-Pribilof I. Community Development Association[6]	F.V. Golden Dawn, LLC	25%	Golden Dawn
			Starbound LLC	20%	Starbound 149'CV
		Bristol Bay Economic Development Corporation (BBEDC)	Defender Fisheries LLC	49%	Defender 195' CV
			Doña Martita LLC Investment	50%	Dona Martita 165' CV
			Arctic Fjord, Inc.	30%	Arctic Fjord 275' CP
			Neahkahnie, LLC	30%	Neahkahnie 110' CV
			No LLC	50%	Morning Star 148' CV
					Morning Star 57'CV
					Arctic Wind 157' CV

[4] Personal communication, Eric Olson, Larry Cotter, Paul Peyton and Morgen Crow, July 2009
[5] CBSFA Annual Report 2006 http://www.cbsfa.com/imageuploads/file72.pdf
[6] Personal communication, Larry Cotter, July 2009

CDQ entities have invested in inshore processing plants, for halibut, salmon, Pacific cod, and other species. For example, CVFR owns Coastal Villages Seafoods' 8 salmon and halibut processing plants, Bristol Bay Economic Development Corporation (BBEDC) holds 50 percent ownership in Ocean Beauty Seafoods, APICDA owns processing plants in False Pass and Atka, and the Yukon Delta Fisheries Development Association (YDFDA) has invested in a salmon processing barge in Emmonak. CDQ entities have invested in other local fisheries development activities as well. For example,

> A number of CDQ entities have also promoted investment in local, small-scale operations targeting salmon, herring, halibut or other species. Activities include funding permit brokerage services to assist with retention of limited entry salmon permits in CDQ communities, capitalizing revolving loan programs to provide financing to resident fishermen for the purchase of boats and gear and supporting market development for locally-harvested seafood products (Northern Economics 2002).

CDQ entities have also worked to develop regional fisheries infrastructure. The Norton Sound Economic Development Corporation (NSEDC) has provided funding for a Nome seafood center; the YDFDA has provided funding for the Emmonak Tribal Council's fish plant, the CBSFA purchased a custom halibut vessel, and the CVRF owns 14 fisheries support centers. In some cases these projects are completely funded with earnings from investments in the BSAI pollock fishery (Northern Economics 2002 & 2009; WACDA 2007, Pollock Provides 2008).

CDQ entities invest in projects that directly or indirectly support commercial fishing for halibut, salmon, and other nearshore species. This includes substantial investments in seafood branding and marketing, quality control training, safety and survival training, construction and staffing of maintenance and repair facilities that are used by both fishermen and other community residents, and assistance with bulk fuel procurement and distribution. Several CDQ entities are actively involved in salmon assessment or enhancement projects, either independently or in collaboration with the Alaska Department of Fish and Game (ADF&G). Salmon fishing is a key component of western Alaska fishing activities, both for subsistence and at the commercial level. The CDQ Program provides a means to support and enhance both commercial and artisanal fishing opportunities.

Increasingly CDQ entities contribute to the region by providing educational and training opportunities, contributing to community capital investments, and expanding the state and local tax base. Investments are made to support targeted vocational training and providing post secondary educational scholarship opportunities to residents. CDQ and Non-CDQ villages benefit from a trained workforce well-suited for sustaining a fisheries-based economy. In 2007 CDQ entities invested approximately $2.5 million dollars to create over 1,200 scholarships and training opportunities. Community capital has been expanded in Western Alaska through investment in infrastructure projects such as docks and clinics. In 2007, the increased economic activity generated by the CDQ Program contributed $800,000 in state and regional taxes and fees in addition to the aggregated community capital investments of $40 million (WACDA 2007).

One of the most tangible direct benefits of the CDQ Program has been employment opportunities for western Alaska village residents. CDQ entities provide career track employment opportunities for residents of qualifying communities, and have opened opportunities for non-CDQ Alaskan residents, as well. Jobs generated by the CDQ Program included work aboard a wide range of fishing vessels, internships with the business partners or government agencies, employment at processing plants, and administrative positions. Many of the jobs are associated with shoreside fisheries development projects in CDQ communities. This includes a wide range of projects, including those directly related to commercial fishing. Examples of such projects include building or improving seafood processing facilities,

purchasing ice machines, purchasing and building fishing vessels, gear improvements, and construction of docks or other fish handling infrastructure. In 2007 more than 3,000 crew members, commercial fisheries permit holders and wage and salaried employees received payments and wages totaling more than $30 million (WACDA 2007).

CDQ wages vary as a percent of total adjusted gross income within the region. A Northern Economics study from 2002 found that, in 1999, CDQ wages were about 2 percent of total adjusted gross income within the NSEDA communities, about 10 percent within the YDFDA communities, about 5 percent within the CVRF communities, about 2 percent within the BBEDC communities, about 10 percent with in the APICDA communities, and about 9 percent within the CBSFA. It is expected that continued investments, in various fisheries assets, will increase capacity for earnings within these communities and this trend will continue to increase in future years (SWAMC 2007, Northern Economics 2002 & 2009, ADCCED).

CDQ revenues benefit member communities and provide benefits to non-member communities. Non-member fishermen contribute catch to CDQ processing plants and residents of non-member communities gain employment in CDQ related projected. For example, in 2008, 16 percent of the CVRF fish processing employees were residents of non-CDQ communities. There are many non-member communities that may be affected by this action including regional hubs like Bethel that provide salmon buying stations for both member and non-member communities. Communities on the mid to upper Yukon, and tributary rivers of the Yukon and communities above the lower fifty miles or so of the Kuskokwim are not members of CDQ entities. Most communities in Kotzebue Sound would not be included; however, communities in this area are more dependent on chum salmon and may not be greatly affected by an action to minimize Chinook salmon bycatch in the Bering Sea pollock fishery (CVRF, 2008).

3.0 POTENTIALLY AFFECTED SALMON FISHERIES

This section provides an overview of the management of salmon fisheries in Western Alaska. It also provides an overview of the subsistence salmon fisheries in Western and Interior Alaska and a description of the subsistence fishery existing conditions by region. Fourth, it provides an overview of potentially affected chum salmon commercial fisheries and a description of the commercial fishery existing conditions by region.

It is important to note that ADF&G is a participating agency in the preparation of this document. Thus, the data used in this analysis are from published ADF&G reports as well as from data specifically provided by ADF&G in response to a special data request. Specifically, the subsistence section was drafted by ADF&G staff and, further, some text from management reports are adopted herein as originally written by ADF&G area management staff. However, much of the tabular data in the commercial fisheries section, and many of the figures depicting trends in the data are original to this analysis. Considerable effort has been made to include original table footnotes, where appropriate, and to include a long range historical perspective. The purpose of these background sections is to provide the baseline existing conditions so that impact analyses that project the numbers of chum salmon that may be "saved" by the various mitigation alternatives can be evaluated with respect to potential effects on the various chum salmon fisheries.

3.1 Management of chum salmon

The State of Alaska manages subsistence, sport/recreational (used interchangeably), commercial, and personal use harvest on lands and waters throughout Alaska. The Alaska Department of Fish and Game (ADF&G) is responsible for managing subsistence, commercial, sport, and personal use salmon fisheries. The first priority for management is to meet spawning escapement goals in order to sustain salmon resources for future generations. The highest priority use is for subsistence under both state and federal law. Salmon surplus above escapement needs and subsistence uses are made available for other uses. The Alaska Board of Fisheries (BOF) adopts regulations through a public process to conserve and allocate fisheries resources to various user groups. Subsistence fisheries management includes coordination with the Federal Subsistence Board and Office of Subsistence Management, which also manages subsistence uses by rural residents on federal lands and applicable waters under Title VIII of the Alaska National Interest Lands Conservation Act (ANILCA). Yukon River salmon fisheries management includes obligations under an international treaty with Canada. Salmon fisheries management in southeast Alaska also includes international obligations under the Pacific Salmon Treaty.

3.1.1 State Subsistence Management

ADF&G, under the direction of the Alaska BOF, manages subsistence, personal use, and commercial chum salmon harvests in waters within the State of Alaska out to the three mile limit. The State has 82 local fish and game advisory committees that review, make recommendations, submit proposals, and testify to the Alaska BOF concerning subsistence and other uses in their areas.

The state defines subsistence uses of wild resources as noncommercial, customary, and traditional uses for a variety of purposes. These include:

> Direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation, for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption, and for the customary trade, barter, or sharing for personal or family consumption (AS 16.05.940[33]).

Under Alaska's subsistence statute, the BOF must identify fish stocks that support subsistence fisheries and, if there is a harvestable surplus of these stocks, determine the amount of the harvestable surplus that is reasonably necessary for subsistence uses, and adopt regulations that provide reasonable opportunities for these subsistence uses to take place. The Alaska BOF is required by the state subsistence statute to provide reasonable opportunities for subsistence uses; "reasonable opportunity" is defined in statute to mean an opportunity that allows a subsistence user to participate in a subsistence fishery that provides a normally diligent participant with a reasonable expectation of success of taking of fish (AS 16.05.258(f)). The BOF evaluates whether reasonable opportunities are provided by existing or proposed regulations by reviewing harvest estimates relative to the "amount reasonably necessary for subsistence use" (ANS) findings as well as subsistence fishing schedules, gear restrictions, and other management actions. Whenever it is necessary to restrict harvest, subsistence fisheries have a preference over other uses of the stock (AS 16.05.258). ADF&G, Division of Commercial Fisheries, manages subsistence fisheries in the area of potential effect. Subsistence and other uses may be restricted or closed to provide for sustainability based upon relevant adopted fishery management plans.

Alaska subsistence fishery regulations do not, in general, permit the sale of resources taken in a subsistence fishery. State law recognizes 'customary trade' as a legal subsistence use. Alaska statute defines customary trade as "…the limited noncommercial exchange, for minimal amounts of cash, as restricted by the appropriate board, of fish or game resources…" (AS 15.05.940(8)). This is applicable in certain regions of Alaska, including the customary trade in finfish (including salmon) within the Norton Sound-Port Clarence Area (5 AAC 01.188). Presently, the BOF has not received regulatory change proposals to allow customary trade in salmon resources under state subsistence regulations in other areas under consideration in this document.

ADF&G, Division of Commercial Fisheries, prepares annual fishery management reports (FMRs) for most fishery management areas in the state. Although FMRs focus primarily on commercial fisheries, most also routinely summarize basic data for programs that collect harvest information for subsistence fisheries. Detailed annual reports about subsistence fisheries harvest assessment programs are prepared for the Norton Sound/Kotzebue, Yukon River, and Kuskokwim areas; however, it is important to recognize the limitations associated with the effort to present a comprehensive annual report on Alaska's subsistence fisheries. Because of such limitations, harvest data may be a conservative estimate of the number of salmon being taken for subsistence uses in Alaska. These limitations include: Annual harvest assessment programs do not take place for all subsistence fisheries although programs are in place for most salmon fisheries such as the Yukon and Kuskokwim river drainages through post-season household surveys and for Bristol Bay Area through subsistence salmon permits. There is no longer an annual subsistence harvest monitoring program for the Kotzebue Fisheries Management Area. Similarly, since 2004 annual harvest monitoring in the Norton Sound-Port Clarence Area has been limited to post-season household surveys in Shaktoolik and Unalakleet and through catch and gear information obtained from subsistence fishing permits in other parts of Norton Sound-Port Clarence Area.

- Annual subsistence harvest data are largely dominated by fish harvested under efficient gear types authorized by regulation, which, especially for salmon, generally means fish taken with gillnets, beach seines, or fish wheels. However, in portions of the Kotzebue Fisheries Management Area (5 AAC 01.120(b) &(f)), Norton Sound-Port Clarence Area (5 AAC 01.170(b) & (h)), and Yukon-Northern Area (5 AAC 01.220(a) & (k)), as well as the entire Kuskokwim Fisheries Management Area (5 AAC 01.270(a)), hook and line attached to a rod or pole (i.e. rod and reel) are recognized as legal subsistence gear under state subsistence fishing regulations. In these areas significant numbers of households take salmon for subsistence uses with rod and reel or retain salmon from commercial harvests for home use. Where the BOF has recognized rod and reel gear as legal subsistence gear, annual harvest assessment programs or subsistence fishing permits also document salmon harvested with rod and reel. Federal subsistence management represents different subsistence gear regulations in some cases. For example, in Kotzebue Sound federally qualified users are authorized under federal

subsistence regulations to harvest salmon by gillnet, beach seine, or rod and reel, but these harvests are not documented through either a state or federal harvest monitoring program and the numbers of salmon (largely chum salmon) harvested by gillnet or beach seine compared to rod and reel is unknown.

- Annual harvest assessment programs are generally limited to post-season household surveys in communities located within the fisheries management area or through subsistence permits such that harvests by other Alaskans in the Kotzebue Area, Kuskokwim river drainage or areas where permits are not required along the Yukon River drainage, for example, are not reflected in the annual harvest assessment programs.

- Between management areas, and sometimes between districts within management areas, there is inconsistency in how subsistence harvest data are collected, analyzed, and reported.

- In some areas there are no routine mechanisms for evaluating the quality of subsistence harvest data. For example, in some areas it is not known if all subsistence fishermen are obtaining permits and providing accurate harvest reports. This can result in an underestimation of harvests.

- There are few programs for contextualizing annual subsistence harvest data so as to interpret changes in harvests. However, in some cases, FMRs do contain discussions of data limitations and harvest trends.

For more information on state management of salmon subsistence fisheries, refer to the ADF&G website at www.adfg.state.ak.us/ and the Alaska Subsistence Salmon Fisheries 2007 Annual Report.[7] The 2008 annual report will be available to the public in late January 2011.

3.1.2 State Management of Personal Use and Sport Salmon Fisheries

Alaska Statue defines personal use fishing as the taking, fishing for, or possession of finfish, shellfish, or other fishery resources, by Alaska residents for personal use and not for sale or barter, with gill or dip net, seine, fish wheel, long line, or other means defined by the BOF (AS 16.05.940(25)). Personal use fisheries are different from subsistence fisheries because they either do not meet the criteria established by the Joint Board for identifying customary and traditional fisheries (5 AAC 99.010), or because they occur within nonsubsistence areas.

The Joint Board of Fisheries and Game is required to identify 'nonsubsistence areas', where 'dependence upon subsistence is not a principal characteristic of the economy, culture, and way of life of the area or community." (AS 16.05.258(c)). The BOF may not authorize subsistence fisheries in nonsubsistence areas. Personal use fisheries provide opportunities for harvesting fish with gear other than rod and reel in nonsubsistence areas.[8,9]

Generally, fish may be taken for personal use purposes only under authority of a permit issued by ADF&G. Personal use fishing is primarily managed by ADF&G, Sport Fish Division, but some regional or area fisheries for various species of fish are managed by the Division of Commercial Fisheries. For more information on State management of the personal use fisheries, refer to the ADF&G website: http://www.adfg.state.ak.us/special/special_fisheries/personal_use.php.

[7]Available on the state of Alaska website at: www.subsistence.adfg.state.ak.us/TechPap/TP346.pdf.
[8]Refer to Alaska Subsistence Salmon Fisheries 2006 Annual Report. (p. 1).
[9] The Joint Board has identified five nonsubsistence areas in (5 AAC 99.015): Ketchikan, Juneau, Anchorage-Matsu-Kenai, Fairbanks, and Valdez.

The ADF&G Sport Fish Division also manages the state's sport (recreational) fisheries. Alaska statute defines sport fishing as the taking of or attempting to take for personal use, and not for sale or barter, any fresh water, marine, or anadromous fish by hook and line held in the hand, or by hook and line with the line attached to a pole or rod which is held in the hand or closely attended, or by other means defined by the Board of Fisheries (AS 16.05.940(30). By law, the Division's mission is to protect and improve the state's recreational fisheries resources. For more information on State management of recreational fisheries, refer to the ADF&G website: http://www.sf.adfg.state.ak.us/statewide/index.cfm.

Also per Alaska Statute (5 AAC 75.075(c)), the ADF&G Division of Sport Fish is responsible for overseeing the annual licensing of sport fish businesses and guides. A "sport fishing guide" means a person who is licensed to provide sport fishing guide services to persons who are engaged in sport fishing (AS 16.40.299). "Sport fishing guide services" means assistance, for compensation or with the intent to receive compensation, to a sport fisherman to take or to attempt to take fish by accompanying or physically directing the sport fisherman in sport fishing activities during any part of a sport fishing trip. Salmon is one of the primary species targeted in the States' recreational fisheries, and most anglers sport fishing for anadromous (sea-run) Chinook (king) salmon must have purchased (and have in their possession) a current year's king salmon stamp. For further information, refer to the ADF&G website: http://www.sf.adfg.state.ak.us/Guides/index.cfm/FA/guides.home. This site contains information important to the State of Alaska, Department of Fish and Game requirements for sport fish charter businesses, sport fish guides, and saltwater charter vessels.

3.1.3 State Commercial Chum Salmon Fishery Management

Finally, commercial fisheries of Alaska fall under a mix of State and Federal management jurisdictions. In general, the State has management authority for all salmon, herring, and shellfish fisheries, and for groundfish fisheries within 3 nautical miles of shore. The Federal government has management authority for the majority of groundfish fisheries from 3 to 200 nautical miles off shore.

The State manages a large number of commercial salmon fisheries in waters from Southeast Alaska to the Bering Strait. Management of the commercial salmon fisheries is the responsibility of the ADF&G Commercial Fisheries Division, under the direction of the BOF, and the fisheries are managed under a limited entry system. Participants need to hold a limited entry permit for a fishery in order to fish, and the number of permits for each fishery is limited. The State originally issued permits to persons with histories of participation in the various salmon fisheries. Permits can be bought and sold, thus new persons have entered since the original limitation program was implemented, by buying permits on the open market.

Like the sport, subsistence, and personal use fisheries managed by the State, Alaska's commercial salmon fisheries are administered through the use of management districts throughout the state. The value of the commercial salmon harvest varies both with the size of the runs and with foreign currency exchange rates. Average annual value of the 2000 – 2004 harvest was in excess of $230 million.[10] Because of the magnitude of commercial fisheries for salmon, state biologists collect extensive information and statistics for management decisions. For information on commercial regulations refer to: http://www.cf.adfg.state.ak.us/geninfo/regs/cf_regs.php.

[10]http://www.cf.adfg.state.ak.us/geninfo/finfish/salmon/salmhome.php.

3.1.4 Federal subsistence management

The Alaska National Interest Lands Conservation Act (ANILCA), passed by Congress in 1980, mandates that rural residents of Alaska be given a priority opportunity for customary and traditional subsistence use, among consumptive uses of fish and wildlife, on federal lands. In 1986, Alaska amended its subsistence law mandating a rural subsistence priority to bring it into compliance with ANILCA. However, in 1989, in the *McDowell* decision, the Alaska Supreme Court ruled that the priority in the state's subsistence law could not be exclusively based on location of residence under provisions of the Alaska Constitution. Other federal court cases regarding the state's administration of Title VIII of ANILCA ruled that the state would not be given deference in interpreting federal statute. Proposed amendments to ANILCA and the constitution were not adopted to rectify these conflicts, so the Secretaries of Interior and Agriculture implemented a duplicate regulatory program to assure the rural subsistence priority is applied under ANILCA on federal lands. As a result, beginning in 1990, the state and federal governments both provide subsistence uses on federal public lands and waters in Alaska, which is about 230 million acres or 60% of the land within the state. In 1992, the secretaries of the Interior and Agriculture established the Federal Subsistence Board (FSB) and ten Regional Advisory Councils (RACs) to administer the responsibility. The FSB's composition includes a chair appointed by the Secretary of the Interior with concurrence of the Secretary of Agriculture; the Alaska Regional Director, U.S. Fish and Wildlife Service; the Alaska Regional Director, National Park Service; the Alaska State Director, Bureau of Land Management; the Alaska Regional Director, Bureau of Indian Affairs; and the Alaska Regional Forester, USDA Forest Service. See Figure 13 for the subsistence fisheries areas in Alaska.

Through the FSB, these agencies participate in development of regulations which establish the program structure, determine which Alaska residents are eligible to take specific species for subsistence uses, and establish seasons, harvest limits, and methods and means for subsistence take of species in specific federal areas. The RACs provide recommendations and information to the FSB; review proposed regulations, policies, and management plans; and provide a public forum for subsistence issues. Each RAC consists of residents representing subsistence, sport, and commercial fishing and hunting interests.

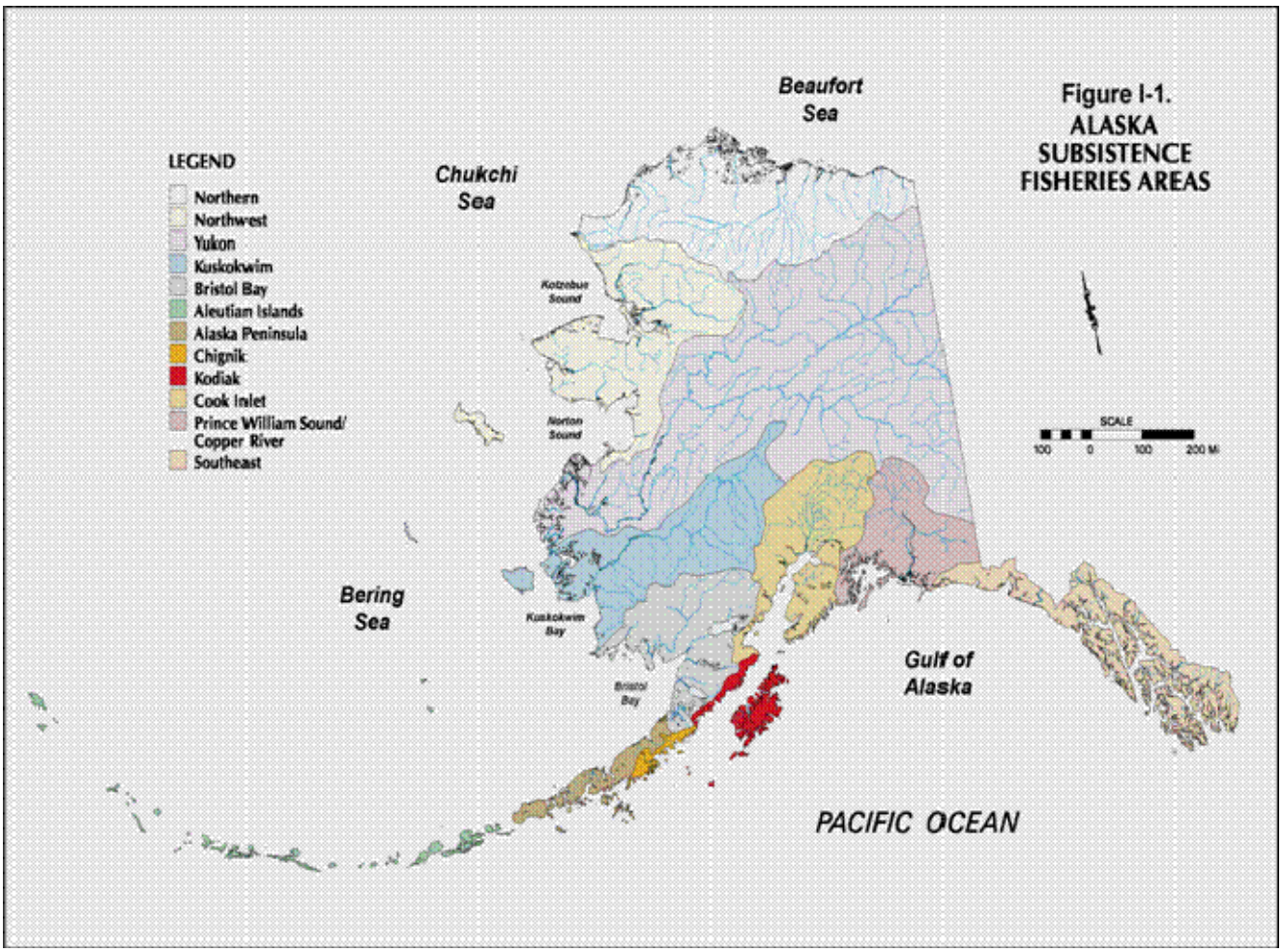


Figure 13 Alaska Subsistence Fisheries Areas

3.2 Importance of subsistence harvests

The following sections on subsistence (Sections 3.2 and 3.3) were developed by ADF&G, at the request of the National Marine Fisheries Service and in consultation with the North Pacific Fishery Management Council staff.

ADF&G, Division of Subsistence, estimates that approximately 43.7 million pounds of wild foods are harvested annually by residents of rural Alaska, representing on average 375 usable pounds per person. Communities throughout the various regions of rural Alaska rely upon various resources, based upon resource availability and customary and traditional resource use patterns (e.g., Wolfe 2004). For example, Wolfe (2000) documented 92% to 100% of the rural households in Arctic, Interior, Western, and Southwestern Alaska use fish, while only 75% to 86% of households actually harvest fish, which testifies to the importance of sharing within subsistence-based economies. Similarly, based upon an analysis of comprehensive data on wild resource harvests from the 1980s and 1990s, ADF&G found that on average, fish (mostly salmon) represent 60% of the total subsistence harvests by rural residents, followed by land mammals (20%), marine mammals (14%), birds, shellfish, and plants (each 2%).

Annual per capita subsistence harvest rates range from 516 pounds of wild foods per person in Arctic communities to 613 pounds per person in rural Interior Alaska communities, to 664 pounds per person among

Yukon-Kuskokwim Delta communities. Average per capita harvests in Bristol Bay/Aleutians area is estimated at 373 pounds per person (Wolfe 2000).

The BOF has made ANS findings for salmon throughout the areas under discussion here, which provides a perspective on the importance of salmon harvests to subsistence economies of rural Alaska given that these findings are based upon historical harvest patterns within each fisheries management area (Table 7).

Table 7 Alaska Board of Fisheries Findings pertaining to non-Chinook salmon amounts reasonably necessary for subsistence findings

Fisheries Management Area	Year of ANS Finding	Chum Salmon	Summer Chum Salmon	Fall Chum Salmon	Sockeye Salmon	Coho Salmon	Salmon
Kotzebue	1993	-	-	-	-	-	43,500
Norton Sound-Port Clarence	1998	-	-	-	-	-	96,000-160,000
Nome Subdistrict	1999	3,430-5,716	-	-	-	-	-
Yukon River	2001	-	83,500-142,192	89,500-167,900	-	20,500-51,980	-
Kuskokwim River	2001	39,500-75,500	-	-	27,500-39,500	24,500-35,000	-
Remainder of Kuskokwim Area	2001	-	-	-	-	-	7,500-13,500
Bristol Bay	2001[11]	-	-	-	55,000-65,000[12]	-	157,000-172,171
Alaska Peninsula	1998	-	-	-	-	-	34,000-56,000

The number of summer chum salmon harvested for subsistence from the Yukon River has fallen below the lower limit of the ANS 4 times between the years 1998 and 2008. Similarly, fall chum salmon harvests have fallen below the lower limit of the ANS 8 times between 1998 and 2008. Yukon River coho salmon harvests have fallen below the lower limit of the ANS five times between the years 1998 and 2008. Chinook salmon harvests from the Yukon River drainage have fallen below the lower limit of the ANS three times between the years 1998 and 2008 (refer to Section 3.3.4 for further discussion). Some of the reasons for not meeting an ANS threshold in a given year may include poor salmon abundance for that year, or a decline in commercial chum salmon harvest opportunity in an effort to preserve Chinook salmon numbers (personal communication, C. Brown, ADF&G, 2010). In years of poor salmon abundance, restrictions or closures to the subsistence fishery reduced harvest success in order to achieve adequate escapements and likely resulted in the lower bound of ANS ranges not being achieved. However, it should be noted that in some years when ANS was not achieved, total summer chum, fall chum, and coho salmon runs were adequate to provide for subsistence harvests and no additional restrictions were in place on the subsistence fishery.

[11] The current ANS finding for Bristol Bay dates to 2001, with the embedded Kvichak sockeye ANS. The finding for all salmon for the entire area dates to 1993.

[12] The ANS finding for Bristol Bay sockeye salmon represents a nested ANS finding for the Kvichak river drainage, from the overall Bristol Bay area finding of 157,000-172,171 salmon (5 AAC 01.336(b)(1)).

Since 1950, the rural population has grown within the Yukon drainage. Yukon River villages increased from 4,316 people in 1950 to 11,204 people in 2008, an increase of about 259%. While the overall rural population has grown, downriver and upriver areas have displayed different population trends. Most recent growth has occurred in villages of the lower river (a five-fold increase from 1950 to 2008), while village populations of the middle and upper river have shown no growth after about 1980 (Wolfe, 2009). Refer to Section 3.3.4 for a map detailing the lower, middle, and upper sections of the Yukon River. The Yukon River drainage area of western Alaska comprises the largest land area encompassing rural communities, as well as the greatest number of Alaska Native and rural population numbers. The Yukon's drainage encompasses over 850,000 km^2 and includes dozens of tributaries. It also includes approximately 50 rural and urban communities scattered up and down the river (Loring and Gerlach, 2010). As such, much of the discussion that follows focuses upon this area.

Despite the trend of decreasing harvests of salmon (other than Chinook) from the Yukon river drainage during the recent decade, ADF&G, Division of Subsistence, estimates for the time period 2000-2009 that 65% of the total subsistence harvests by rural Interior Alaska communities is of salmon, followed by 17% large land mammals, 12% other fish, 3% small land mammals, 2% birds and eggs, and 1% wild plants. During this same time period, ADF&G estimates that rural Interior Alaska communities harvested on average 623 usable pounds of wild foods per person annually, which is comparable to the estimate of 613 pounds per person derived from research conducted in the 1980s and 1990s (personal communication, Jim Fall, 2010).

3.2.1 Cultural context

Approximately 20 percent of Alaska's population, about 125,000 people, lives in rural areas. These people live in about 225 communities, most of which have fewer than 500 people and are not connected by road. About half of this rural population is made up of Alaska Native peoples (Caulfield, 2002).

For Alaska Natives and others throughout rural Alaska, harvesting and eating wild subsistence foods are essential to personal, social, and cultural identity. For purposes of this section, subsistence harvest by rural Alaskan communities is limited to the regions of western Alaska and includes: Norton Sound/Kotzebue (the Arctic Area); the Yukon River; the Kuskokwim Area; Bristol Bay; and the Alaska Peninsula (Figure 13). For example, rural economies of villages in the Yukon River drainage (as well as other regions in western Alaska) are characterized by a high production of wild foods for local use and low per capita monetary incomes. Salmon is a substantial part of the mix of wild foods that supports these communities. Specifically, in 2008, 40 villages of the Yukon River drainage depended upon annual harvests of salmon as dietary mainstays; this included 11,204 people, of which 89% were Alaska Native. Salmon harvests for subsistence use and commercial sale have been central to the economic and cultural well-being of this rural population (Wolfe, 2009).

Family Production and Fish Camps

Subsistence catches are directed primarily to meeting the food needs of local residents and sled dogs. Harvests tend to be self-limiting; families typically quit fishing when their family's food requirements or other social obligations are met. Unlike commercial fishing, subsistence fishing is primarily harvested for local use, including sharing. Because of this, subsistence catch levels have displayed considerably more stability over time unlike commercial participation and catches whose levels are determined more by run sizes, external markets, variable costs of operation, and income potential (Wolfe, 2009).

The production of salmon for subsistence uses typically occurs within family groups. Households commonly work together to catch and process salmon. These are most often households of children working with parents. Labor is typically unpaid for subsistence fishing; the finished product is divided and consumed among members of the participating family group. Family members from other communities sometimes visit during

salmon fishing season, often to participate in fishing and processing and in bringing products back to their home communities (Wolfe, 2009; see also Ellanna and Sherrod 1984).

Some families use fish camps as bases for fishing and/or processing salmon. Fish camps are generally located near setnet sites, fish wheel sites, or drifting areas. Seasonal camps commonly have facilities such as cabins, wall tents, wood racks for drying fish, and smokehouses for curing salmon. In the past, fish camps commonly had yards for sled dogs, but these are found less often today (Wolfe, 2009).

In recent years fewer people have resided at fish camps along the Yukon River. More and more, people are living in their main community during the fishing season; however, fish camps still provide seasonal bases of operation for many people, though they may not reside or smoke fish there. Generally, fish camps have fallen into disuse with fewer sled dogs (discussed below), the loss of market for the commercial roe fishery, increased restrictions placed on subsistence fishing (discussed in Section 3.2.4), and the press of monetary employment during the summer (discussed in Section 3.2.3). Those who continue to use fish camps have done so for long tenures; aside from fishing, camps continue to be used because of the valued cultural activities attached to the camp (e.g., families enjoy camping and having the opportunity to share knowledge about living off the land) (Wolfe, 2009).

While consumption of traditional foods, including salmon, is typically widespread within rural communities, often there are certain particularly productive households in a community that procure far more foods than they themselves can consume. These households typically make up about 30 percent of a community's households, and yet they commonly produce about 70 percent or more of the community's traditional foods (Wolfe, 1987). In this way, the harvest of traditional foods is extremely important to kinship and social organization; food is shared and divided as a way of life (Wolfe, 1987). Similarly, customary barter and trade is a way for families to distribute subsistence harvests to people outside their usual sharing networks, in return for goods, services, or, under specific circumstances, cash. Like sharing, customary barter and trade provides traditional foods to individuals and families who are unable to harvest. Many of the exchanged foods (i.e. dried whitefish) are not available in commercial harvests. As noted in Section 3.1.1, customary trade for cash is not expected to be conducted for profit, nor is it conducted in isolation from other subsistence activities (Moncrieff, 2007; see also e.g., Magdanz et al. 2007, and Krieg et al. 2007).

In a recent study of household patterns and trends in subsistence salmon harvests within 10 Norton Sound communities representing harvest data from 7,838 household surveys from 1994-2003, Magdanz et al. (2009:424) found a pattern similar to that described above where 21% of the households harvested 70% of the salmon by edible weight. During the study period, subsistence salmon harvests were estimated to have declined 5.8% annually. Most of the declines occurred during the first 5 years (1994-1998), when harvests trended lower by about 8% annually. During the latter years (1999-2003), harvests trended lower by about 1% annually across all communities. Household salmon harvests increased with the age of household heads, and households headed by couples reported higher average harvests than households headed by single persons, especially single men (Magdanz et al. 2009).

Dog Teams

Ethnographic and historic accounts from the 100-year period 1850 to 1950 show that dogs were traditionally used to support a variety of activities including trapping, exploration, commercial freighting, individual and family transportation, racing, and military application in interior Alaska. Throughout this period, fish, specifically dried salmon, was the standard diet for working dogs and became a commodity of trade and currency along the Yukon River and elsewhere. The first four decades of the 20th century encompasses the peak of the dog sled era in the Yukon River drainage. For individuals and families in rural Alaska, sled dogs were essential to the seasonal round of activities that provided food and cash income. Since the late 1960s, ADF&G has conducted annual post-season salmon harvest surveys in all Yukon River salmon fishing

communities. These surveys provide estimates of the total number of dogs in each survey community (Andersen, 1992).

Since their introduction in the 1960s and 1970s, snowmachines have become a dominant mode of winter transportation for most rural Alaska residents, but have not eliminated the use of dog teams. For individuals with access to wage employment, the speed and convenience of a snowmachine allows them to work a wage-earning job and engage in more efficient hunting and fishing activities during time off in order to provide their families with preferred wild foods. While the use and popularity of snowmachines has grown since the 1970s, dog populations declined but did not disappear. Dog teams continue to be maintained in most Yukon River drainage communities today to support activities such as general transportation, trapping, wood hauling, and racing. During the mid to late 1970s, an era of renewed interest in dog mushing began, largely sparked by highly publicized events such as the Iditarod Trail Race (Andersen, 1992).

In 1991, there were 95 mushing[13] households in seven study communities along the Yukon River. In 2008, the number of mushing households dropped to 42, a decline of 56%. In 1991, the total number of sled dogs owned by the mushing households in the seven communities was estimated at 1,363 dogs. In 2008, the number of sled dogs owned by the mushing households was 671 dogs, a decline of 51% (Table 8) (Andersen and Scott, 2010). A complex set of economic and social changes in rural communities has eroded the ability and need of many rural dog mushers to maintain such a lifestyle; however, rural dog teams in 2008 remain highly reliant on locally caught fish, particularly chum salmon, for food.

The overall harvest of salmon in the Yukon River drainage that is fed to dogs is viewed as a subset of the drainage-wide subsistence harvest of salmon (non-Chinook). Strategies related to fishing for dog food, timing of fishing activities, gear used, preservation methods, and the fish species targeted, vary between mushers based largely on geographic location. From the lower to upper Yukon River drainage, there is variability in the fish species utilized for dog food. In the lower part of the drainage, non-salmon species (e.g., eels/Artic lampreys, blackfish, pike) are more commonly fed to dogs than salmon. Along the middle Yukon, summer chum salmon is the most commonly harvested species of fish for use as dog food. Along the upper Yukon and Tanana rivers, fall chum salmon and coho salmon were the most common fish species harvested for dogs (Andersen, 1992).

The number of fish needed to maintain a working dog for a year varies depending upon the size of the dog, the work the dog is doing, the outside temperature, the species and condition of the fish when it was harvested, and the way the fish was preserved. As a general rule, however, there are approximately 200 feeding days for which dog food must be preserved. This is generally defined at the seven month period between mid-October when all salmon fishing ceases and mid-May when fishing activities start again. Along the upper Yukon, mushers generally allow for ½ to ¾ of a dried chum salmon or coho salmon in order to feed each dog each day during the winter. This is equivalent to approximately 100 to 150 salmon per dog for the winter feeding period. Along the middle Yukon, the availability of commercially-caught salmon carcasses from a summer chum commercial roe fishery greatly influences the number of fish used to feed dogs because the dried salmon used to feed dogs are a product of the commercial fishery and not a subset of the subsistence fishery. Along the lower Yukon, salmon comprise only a small part of the fish used to feed dogs (Andersen, 1992).

Data gathered in 2008 from mushers in the seven Yukon River study communities shows that 97% report using fish to some extent to feed their dogs and 78% report the fish comprise half or more of their dog's annual diet. In addition, 41% of mushers report that locally caught fish make up 75% or more of their dog's diet. Overall, an estimated 492,465 pounds (round weight) of fish (all species) were harvested for dog food by mushers. Chum salmon, alone, contributed almost 65% (316,360 pounds) of this total (Table 8). For

[13] In this context, dog musher is being used as a general term encompassing all users of dog and dog teams and not distinguishing amongst the specific various uses of sled dogs in rural villages.

comparison, the total quantity of all fish species utilized for dog food in 1991 was estimated at 1,211,907 pounds (round weight), a decline of 59% (Andersen and Scott, 2010).

Table 8 Population, households, sled dogs, and chum salmon harvest in select Yukon River drainage communities, 1991 and 2008

Community	Population		Number of Mushing Households		Number of Sled Dogs		Estimated Pounds of Chum Salmon Harvested for Dog Food, 2008
	1990	2008	1991	2008	1991	2008	
Fort Yukon	580	587	22	10	245	135	80,400
Huslia	207	227	11	5	153	83	42,000
Kaltag	240	188	11	0	113	0	0
Manley	96	77	9	8	234	114	41,952
Russian Mission	246	362	10	5	100	74	10,800
Saint Mary's	441	541	9	3	91	28	1,728
Tanana	345	252	23	11	427	237	139,480
Total	2,155	2,234	95	42	1,363	671	316,360

As important as fish are as a high-quality, low-cost food base for working sled dogs, all dog team owners supplement fish with purchased foods and non-fish food sources. The list of non-fish food items commonly fed to dogs includes rice and other bulk grains; commercially manufactured dry dog food; dog-grade chicken, beef, and lamb meat products; furbearer carcasses and wild game cutting scraps; and various fat, vitamin, and nutrient supplements (Andersen and Scott, 2010).

As previously mentioned, dog teams continue to play an important role in the mixed subsistence-cash economy of many rural communities despite the availability of snowmachines. Five reasons are most commonly cited by mushers as to why snowmachines have not completely replaced dog teams in their communities: 1) preference; 2) economy; 3) tradition; 4) sport and entertainment; and 5) social health. Mushers agree that the major advantages of snowmachines include speed; the fact that they do not need to be fed or maintained when not in use; they are ideal for short trips, breaking or setting trail in deep snow conditions, and hauling heavy loads on level trails; and are an easier mode of transportation for the elderly. However, the advantages of dogs center on their reliability and dependability, especially in extremely cold temperatures. There are specific areas, terrain, and/or snow conditions in which snowmachines cannot be operated and only accessed by dog teams. In addition, dogs can be acquired without a large cash outlay and can be operated without the use of costly gasoline and oil. In harsh conditions, snowmachines have a reported useful life of only two or three years. Dog teams are used to guard camps from bears, minimize waste by eating scraps, can generate income when raced or sold, and provide companionship. Dog mushing provides social benefits to individuals and communities; raising, training, caring for, and fishing for dogs is likened to a full time job, which keeps participants involved in a culturally relevant, useful, and healthy past-time on a year-round basis (Andersen, 1992).

In responding to years of low salmon runs, dog mushers outlined several strategies for maintaining the ability to feed and care for their dog teams. Overall, the option of buying more commercial food is the strategy most often employed for dealing with low salmon runs. Increasing the use of other fish species as well as fishing longer and harder to obtain appropriate salmon quantities are also common compensation strategies. Mushers

are reluctant to decrease the number of dogs owned as they already maintain the minimum number of dogs needed for the ways in which in the dogs are used (Andersen and Scott, 2010).

3.2.2 Diet and Nutrition

The diet of Alaska Natives has traditionally consisted of foods obtained by hunting, fishing, trapping, and gathering. These include fish, land and marine mammals, birds and eggs, plants and berries and are referred to as Native, customary and traditional, or subsistence foods. The present-day diet of Alaska Native people also includes available store-bought foods tied to the mixed subsistence-cash economy that characterizes most rural Alaskan communities (e.g., Wolfe 1983; Wolfe 1991; Wolfe et al., 1984).

Consumption of traditional foods is greater in rural Alaska than anywhere else in the United States. About 43.7 million pounds of traditional foods are taken each year. This amounts to a per capita consumption of 375 pounds or just over one pound a day. In comparison, the average American uses about 222 pounds of store-bought meat, fish, and poultry annually (Caulfield, 2002). According to the U.S. Census Bureau, for 2007, the per capita consumption of red meat was 110.6 pounds; 73.7 pounds of poultry; and 16.3 pounds of fish (www.census.gov/compendia/statab/2010/tables/10s0212.pdf).

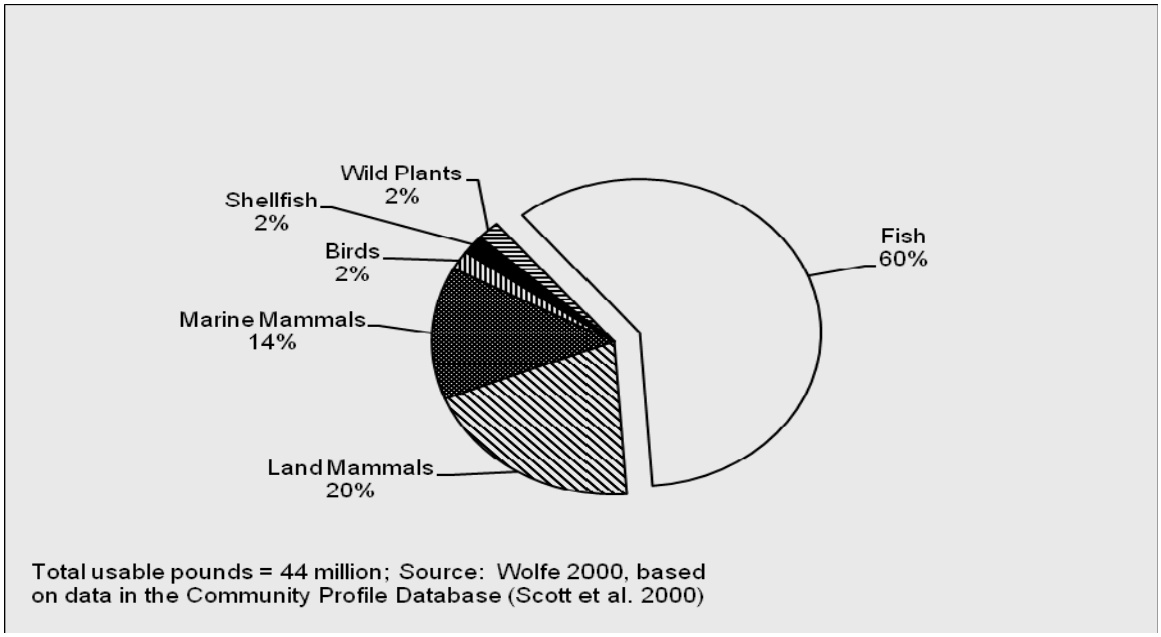


Figure 14 Composition of subsistence harvest by rural Alaska residents

Source: Fall et al., *in prep*.

Native foods are especially nutritious as they are dense in protein, iron, vitamin B12, polyunsaturated fats, monounsaturated fats, and omega-3 fatty acids. ADF&G, Division of Subsistence, estimates that the annual rural harvest of 375 pounds per person contains 242% of the protein requirements of the rural population, containing about 118 grams of protein per person per day. The subsistence harvest contains 35% of the caloric requirements of the rural population (Wolfe 2000). In addition, they are low in saturated fat, added sugar, and salt. Native meats are generally lean and berries and greens are high in water content and micronutrients and low in empty calories. Hunting, gathering, harvesting, and preserving Native foods are energy intensive, providing physical activity. Furthermore, Native foods are highly valued and contribute to the spiritual, cultural, and social well-being of Alaska Native people as well as to the health of individuals, families, and

communities. There is a trend, however, towards a greater dependency on store-bought foods and less on traditional foods (Johnson et al., 2009). This shift to increased reliance on imported store-bought foods is referred to as dietary westernization, which is officially defined as "the diffusion and adoption of western food culture" (Bersamin et al., 2007).

As a part of a traditional diet, fish and seafood especially contribute to energy, protein, mono- and polyunsaturated fatty acids, selenium, magnesium, and vitamins D and E. A decrease in traditional foods has important health implications. Higher intakes of omega-3 fatty acids may afford a greater degree of protection against coronary heart disease. Prior to the availability of store-bought foods, there were few carbohydrate sources in the diet. Much of the current carbohydrate consumption comes from foods rich in simple sugars. The relationship between increasing consumption of fructose and sucrose and the increases in type 2 diabetes and obesity in the U.S. is under active discussion. Increased consumption of added sugars can result in decreased intakes of certain micronutrients as well. Additionally, the low intake of calcium, dietary fiber, fruits, and vegetables could be contributing to the increased incidence of cancers of the digestive system (Johnson et al., 2009).

Populations in developing countries and minority and disadvantaged populations in industrialized countries are at the greatest risk for type 2 diabetes. Between 1990 and 1997, the number of Native Americans and Alaska Natives of all ages with diagnosed diabetes increased from 43,262 to 64,474 individuals. Throughout 1990 - 1997, the number of Native Americans and Alaska natives with diabetes was greatest among individuals aged 45-64 years and the prevalence of diabetes and the number of diabetic cases was higher among Native American and Alaskan Native women than men. Although the Alaska region had the lowest age-adjusted prevalence of diabetes throughout the period, it had the highest relative increase (76%) in prevalence (Burrows et al., 2000).

National health surveys used to monitor diabetes in the U.S. population are not useful for monitoring diabetes prevalence among Native Americans and Alaska natives because of small sample sizes. The prevalence of diagnosed diabetes among Native Americans and Alaska Natives served by health facilities may not be representative of the total Native American and Alaskan population. Information on diabetes prevalence is currently lacking for approximately 40% of the Native American and Alaskan Native population (Burrows et al., 2000).

In a 2004 study conducted by the Alaska Native Health Board and the Alaska Native Epidemiology Center, researchers sought to measure the usual intake of a wide variety of foods, both subsistence and purchased, over the period of one year. The Alaska Traditional Diet Project (ATDP) had participants from villages located in the following Regional Health Corporations: 1) Norton Sound Health Corporation; 2) Tanana Chiefs Conference; 3) Yukon-Kuskokwim Health Corporation; 4) Bristol Bay Health Corporation; and 5) Southeast Alaska Regional Health Consortium.[14]

Prior to the ATDP study, there were few published data on the dietary intakes of Alaska Natives; however, some general trends can be identified. First, there is substantial regional and seasonal variation in food intake patterns among Alaska natives. Second, there has been an increasing use of store foods and particularly in the consumption of sugared beverages over many years. Third, the intakes of some nutrients are reported to be low including fiber, vitamin A, B vitamins, vitamin C, folate, iron, and calcium. Fourth, many important nutrients in the diets of Alaska natives come from subsistence foods, notably vitamin A, vitamin B12, omega-3 fatty acids, iron, and protein (Ballew et al., 2004).

[14] Data from the Southeast Alaska Regional Health Consortium are not included here since this area falls outside the focus on western Alaska.

Food and beverage data from responses of all participants in each region of the ATDP were ranked (top 50) by total amount consumed and by the estimated contribution of particular foods to nutrient intakes. In terms of total amounts of food consumed, sugared beverages (e.g., soda pop) were in the top four items in all regions. White rice, white bread, and pilot bread were a staple in nearly all regions; however, the finding of eight species of fish in the Norton Sound and Yukon-Kuskokwim regions, seven species of fish in the Bristol Bay region, and two species of fish in the Tanana Chiefs region indicates the importance of fish in the diet of Alaska natives. Table 9 below outlines the importance of salmon in the diet of participants of the ATDP study (Ballew et al., 2004).

Table 9 Total consumption (in pounds) of salmon species consumed by participants in each of the Regional Health Corporations

	Chum Salmon		King Salmon		Coho Salmon		Sockeye Salmon		Pink Salmon	
	Total Consumption (lbs)	Percent Participants	Total Consumption (lbs)	Percent Participants	Total Consumption (lbs)	Percent Participants	Total Consumption (lbs)	Percent Participants	Total Consumption (lbs)	Percent Participants
Norton Sound	2,729 (26)	85% (25)	1,384 (42)	94% (7)	3,875 (18)	88% (17)	4,162 (16)	~	3,206 (23)	69% (48)
Yukon-Kuskokwim	8,296 (12)	84% (29)	15,722 (5)	98% (2)	5,968 (16)	~	~	~	~	~
Bristol Bay	2,532 (29)	~	5,076 (12)	93% (9)	3,486 (17)	86% (33)	6,354 (10)	93% (12)	2,261 (31)	~
Tanana Chiefs Conference	~	~	583 (16)	97% (1)	243 (26)	79% (24)	~	~	~	~

Note: 'Percent participants' indicates the number of people (out of those surveyed) who reported eating the salmon species. Numbers in parenthesis indicate where that species of salmon ranked among the Top 50 foods consumed.

The reasons given by ATDP participants for eating less subsistence foods now include not having anyone to hunt for the family, working at a job or not having time to hunt and gather, living away from the village, lack of transportation to hunt and gather, and not having the traditional knowledge to hunt and gather. The most common reason given, however, was a reduction in the availability or quality of fish and animals. The most common concerns expressed about subsistence foods were observations of fish and animals with parasites, diseases, or lesions; reduced numbers of fish and animals; and the possible presence of contaminants in fish and animals (Ballew et al., 2004).

3.2.3 Mixed Economy

Alaska Natives historically moved within traditional areas in response to changes in regional subsistence opportunities. During the second half of the twentieth century, however, increased connections with other regions brought social and economic changes, accompanied by movement of people into and out of the rural regions of Alaska.

Rural Alaska presents an economic environment distinct from that of the other states in the U.S. The majority of the population is Alaska Native living in small, relatively isolated villages. There are few road connections between villages and the primary transportation connection with the state's cities is by air. This region has a mixed economy in which residents allocate time between subsistence and wage work; however, there is limited resource based market activity. This region has a large subsistence economy in which residents provide a significant share of their real income through hunting, fishing, and harvesting local wild products (Huskey et al., 2004). Rural hub communities of Dillingham, Bethel, Nome, Kotzebue, and Barrow are the locus of many wage jobs and are regional service centers for health services, retail stores, government agencies, and

transportation. They have regular service from scheduled aircraft and receive shipments of goods and equipment by barge during summer months (Caulfield, 2002; see also Fall et al., 1986; Magdanz and Olanna 1986; Wolfe et al., 1986).

To make a living on the Yukon River requires families to integrate subsistence activities with wage employment, commercial fishing, or other types of money-making activities (i.e., furbearer trapping). At a household level, these two components of the mixed economy are often combined by family members. Income produced by family members typically pays for the equipment and fuel used in the production of wild foods (Wolfe, 2009). Cash enables household members to purchase boats, outboard motors, rifles, and fishnets. With these, people living in rural Alaska are able to procure and consume traditional foods (Caulfield, 2002). Cash may also be used to pay for housing, utilities, transportation, and a variety of other goods and services.

In a mixed economy, people often move to improve their employment opportunities. Improving job opportunities and the chance of finding work were the reason most frequently cited for moving among inter-community migrants on Alaska's North Slope and for Native migration within and into the Canadian Northwest Territories (Huskey et al., 2004). A study conducted by the Institute of Social and Economic Research also found that the pursuit of economic and educational opportunities appears to be the predominant cause of migration. Rural Alaska (all communities state-wide) net migration shows an increase in net out-migration from about 1,200 per year during the period 2002-2005 to about 2,700 per year in 2006 and 2007 (Martin et al., 2008).

Place amenities, such as public and environmental goods, influence the pattern of migration. The subsistence economy in rural North Alaska provides a good example of the interaction of culturally defined preferences and place amenities in migration. Subsistence activities, such as hunting, fishing, and gathering, add substantially to the real income of rural Natives. Subsistence may limit the effect of relative market opportunities on Native migration (Huskey et al., 2004).

In Alaska, cities offer employment opportunities while the rural villages are places with high levels of unemployment and few prospects for economic growth. While net migration out occurs, people continue to move to rural villages. The additional real income earned by rural residents in subsistence activities may compensate for the potential money income earned in the cities. Productivity in subsistence activities depends on place specific knowledge or human capital. Natives move to improve their economic opportunities; however, subsistence activities provide rural Natives with significant real income. This affects movement into and out of rural areas because subsistence productivity is place dependent (Huskey et al., 2004).

The cash sector appears to be the weaker of the two economic sectors. As a general rule, households struggle to find ways to make enough money to enable them to live. Wage-paying jobs tended to be scarce, seasonal, and intermittent and finding employment in the private sector is difficult. In villages along the Yukon River, the percentage of adults who earn some money through employment ranges from 50% to 80%. Mean household income (earned and unearned sources) in 2007 ranged from $27,286 to $38,936. On a per capita basis, total incomes from earned and unearned sources ranged from $6,357 per person to $14,807 per person. This is substantially lower than the per capita incomes in Alaska's urban areas at $24,525 per person in Fairbanks and $20,166 per person in Anchorage (based upon 2000 U.S. Census) (Wolfe, 2009).

When villages become too small, maintaining a local public school and other facilities becomes problematic. Migration between village and town (dual residencies) and seasonal moves for employment and subsistence fishing has become a well-established pattern for some villages along the Yukon River. Poor prospects for local employment pushes families away from a village, while traditional pursuits like subsistence fishing tend to pull them back. Low salmon runs and restricted subsistence fishing time are contributing factors to increased mobility and migration in order to be more economically productive. In the past people could make a living along the Yukon River (Wolfe, 2009).

Food Budgets

ADF&G, Division of Subsistence, estimates that approximately 43.7 million pounds of wild foods are harvested annually by residents of rural Alaska, representing on average 375 usable pounds per person. Regarding the economic value of traditional foods to the economies of rural Alaska, the estimated replacement cost of traditional foods in rural Alaska, if assumed to be $3 per pound, equates to over $131 million for all of rural Alaska. If a replacement value of $5 per pound is used, still likely a low figure, the estimated wild food replacement value for rural Alaska is estimated to be more than $218 million annually (Wolfe 2000). In a study by Wolfe and Walker (1987) that developed a predictive model of rural community subsistence harvests, a $100 decrease in mean taxable income per income tax return resulted in an estimated one pound increase in community subsistence harvests per person per year.

3.2.4 Vulnerabilities

Food security is defined as having access to sufficient, safe, healthful, and culturally preferred foods. Food security is a condition and a constantly unfolding process, one through which people try to align short-term needs and long-term goals of health and sustainability. Numerous circumstances and drivers of change limit the ability of rural and urban Alaskans to reliably procure traditional foods including vulnerabilities to regional environmental change, external market shifts in the price or availability of imported fuel and supplies, environmental contamination, and land use changes such as oil, natural gas, and minerals development. According to the USDA's 2008 report on household food security in the United States, approximately 11.6 percent of Alaskan households are food insecure; at some time during the year these households had difficulty providing enough food for all members of their household. This measure captures a portion of those of in Alaska coping with food insecurity. While little data is available regarding food insecurity in rural communities, other indicators of food insecurity are present in rural areas of the state including trends for various diet- and lifestyle-related health issues (e.g. type 2 diabetes and obesity) (Loring and Gerlach, 2010).

ADF&G, Division of Subsistence, recently began including questions related to food security in comprehensive wild resource research in two Kotzebue Sound communities in 2007. Based upon a modified national food security data collection protocol, 88% of surveyed Kivalina households and 82% of Noatak households reported high or marginal levels of food security; this is compared to 89% in the United States as a whole. Subsistence harvests clearly contributed to that food security, and when food insecurities were reported they were twice as likely to be related to store-bought foods as to subsistence foods (Magdanz et al. 2010:69).

In Alaska, 90% of the rural population, which represents 20% of the state's total population and 49% of the Alaska Native population, rely on locally procured fish for at least part of the year (Loring and Gerlach, 2010). Five factors are found to be significantly related to household salmon production: fishing fuel (gallons); equipment holdings; number of harvesters; number of households eating salmon; and the number of people eating salmon. The amount of fuel expended by households while fishing was the factor most strongly associated with household subsistence salmon productivity. The strong correlation of fuel expenditures and salmon output is consistent with concerns about the rising monetary costs of subsistence fishing. To be successful fishing, a household had to expend money in boat fuel to reach fishing sites, to check setnets, to drift gillnets, and to transport fish. Difficulties are encountered given the higher costs of fuel coupled with poor salmon runs; households cannot afford to travel to set and check nets that are catching only small numbers of fish. As such, a lack of money may limit the extent of fishing, and by extension, the amount of salmon harvested (Wolfe, 2009).

While there has been a recent dramatic increase in fuel prices throughout Alaska, total utility costs, including heat, electricity, water, and sewer, paid by residents of remote Alaska communities increased from a median value of 6.6% of total income to 9.9% of total income from 2000 to 2006. By comparison, the median amount spent by urban Anchorage households increased from 2.6% to 3.1% of household income during the same

period from 2000 to 2006. It is estimated that in rural Alaska, the overall consumption of diesel fuel and gasoline for all end uses equates to about 1,000 gallons of fuel per person. Increasing fuel costs equate to an additional economic burden of several thousand dollars per household in rural Alaska; however, fuel cost alone is not a definitive driver of migration through 2007. Because migration is related to earnings (see previous section), the people most impacted by high fuel costs may be least able to afford to move and unable to afford as much fuel to hunt and fish (Martin et al., 2008).

Salmon Shortages and Species Substitution

Salmon is part of a mix of wild foods that supports communities in the rural Alaska. Since the late 1990s, depressed salmon runs have been associated with substantial changes in salmon fisheries of the Yukon River drainage. Commercial salmon fishing has been restricted or closed on the lower and middle river. Incomes to village residents from commercial fishing have fallen. Subsistence fishing times have been shortened and staggered to achieve salmon escapements and provide for U.S. and Canadian harvest allocations. Catching a mix of wild foods helps to buffer against shortfalls due to annual variability in particular species. Low harvests in one type of salmon might be replaced by higher harvest of other types of fish or wildlife; however, taking into account the level of subsistence dependence on salmon, it is also possible that other wild foods do not compensate for low subsistence salmon harvests during a poor year. Some households may buy more store foods to compensate, if they have the income. Persons in other households may leave the village in search of employment because of such difficult economic circumstances (Wolfe, 2009).

Specifically, in Alakanuk (coastal district of the lower Yukon drainage) and Stevens Village (upper Yukon drainage, District Y-5), between-year comparisons of wild food harvest suggest that the low harvests of salmon may not be made up by increased harvests of other types of wild resources. Comparing 1980 with 2007, food production was lower across all major species groups in Alakanuk, including marine mammals (-48.8%) and fish (-81.4%). There was no evidence of increased production in other wild foods to make up for low subsistence salmon catches. Comparing 1985 with 2007 in Stevens Village, harvests were up for land mammals (+45.2%), but down for fish (-71.4%). The depressed local economy at Stevens Village has resulted in a significant out-migration of families from the community and a loss of population. In general, harvests of other wild food species in 2007 had not increased in order to compensate for the greater costs of catching salmon in any village (Wolfe, 2009).

Fishing Regulations

Fishing regulations mediate access to salmon stocks throughout western Alaska. Custom guides the activities of extended families at the local level, including conventions regarding harvest areas, harvest methods, and disposition of catch. Alongside these local customs, subsistence fishing is regulated by state and federal entities, and by an international agreement between the U.S. and Canada under the Pacific Salmon Treaty.

Among the various agencies responsible for management of Yukon River salmon fisheries, ADF&G has the lead role in managing fisheries within the U.S. portion of the drainage and is the lead agency in negotiations between the U.S. and Canada for trans-boundary salmon stocks. The priorities of management are to first ensure adequate escapement to sustain future runs; second, provide reasonable opportunity for subsistence fishermen to meet their needs; and third, provide opportunity to commercial, sport, and personal use fishermen to harvest fish in excess of escapement and subsistence needs. ADF&G uses an adaptive management process to achieve these priorities that starts with development of management strategies based on pre-season forecasts, then transitions into evaluation of run strength in season and adjusting management strategy implementation based on in-season performance of annual salmon runs. Pre-season forecasts and management strategies are developed based on guidelines and directives as outlined in state and federal management plans and regulations, and in cooperation with federal subsistence managers, fishermen, tribal council representatives, and other stakeholders within guidelines (personal communication, J. Linderman, 2010).

While forecasts and pre-season management strategies are made each year, these are frequently revised based on in-season run assessments. For example, the structure and implementation of fishing windows may be adjusted in-season by Emergency Order based on run strength and run timing estimates derived from in-season run assessment programs. By default, subsistence fishing is open on the river and is closed by regulatory Emergency Orders; while commercial fisheries are closed by default and must be opened by Emergency Order. Management decisions often need to be made before fish have reached the areas, districts, or communities affected. Managers use test fisheries, sonar projects, genetic stock identification and age-sex-length composition, and in-season harvest reports to assess and project salmon run timing and run strength in-season to inform management decisions (personal communication, J. Linderman, 2010).

In the Yukon River Management Area, the core projects and associated platforms collecting run assessment information in-season are (in chronological order moving upstream) a nearshore marine test fishery operated near Dall Point south of the mouth of the Yukon River, inriver drift and set net test fisheries operated out of Emmonak near the mouth of the river, a drift test net fishery near the community of Mountain Village, Pilot Station Sonar operated approximately 123 miles from the mouth, test fish wheels operated at the Rapids approximately 731 mile from the mouth, and Eagle Sonar operated near the Canadian border near the community of Eagle approximately 1,200 miles from the mouth. Additional projects are operated in Yukon River tributaries spread throughout the drainage, which are primarily designed to assess escapements and assess results of management actions. The combined in-season information provided by these programs allows managers to identify trigger points that when reached prompt actions (i.e. restrictions or closures on subsistence fisheries or openings for commercial fisheries) in the various Yukon River management districts. The information provided by these projects also assists managers in determining the level of management action required, such as the duration of time warranted for commercial periods to ensure subsistence opportunity is not impacted and adequate escapements are achieved, or any reduction in subsistence fishing time needed to ensure adequate escapements (personal communication, J. Linderman, 2010).

Among the primary concerns often expressed by subsistence fishers are limitations on fishing times (open and closed seasons and periods), limitations on gear (mesh size and net depth), and the lack of effective regulations on high-seas bycatch (Wolfe, 2009). Other concerns amongst subsistence users in rural communities includes: impacts of closures on food security, economic security, and on ecosystems; observations of ecological change including fish abundance, fish size, fish health, and spawning grounds; and problems in existing management priorities/approaches including the inefficacy of radar[15] and the role of at-sea bycatch by the commercial groundfish fishery (Loring and Gerlach, 2010).

Families along the lower Yukon River often prefer to put up subsistence Chinook salmon soon after river breakup. With the bulk of Chinook salmon subsistence catch drying, families with commercial permits could then fish for sale during commercial openings. Families catch additional fish for subsistence uses between commercial periods, as needed. When schedules and locations allow, subsistence fishing would get an initial week or so jump on commercial fishing (Wolfe, 2009). Directed summer chum salmon commercial openings are initiated and managed also based upon the timing of Chinook runs. When Chinook salmon runs are weak, a directed commercial fishery is typically not prosecuted. In weak Chinook salmon years, a commercial fishery is directed at summer chum salmon in mid to late June and is initiated and managed based on the strength of the chum salmon run in consideration of the impacts on Chinook salmon from incidental harvest. While communities along the entire Yukon River focus on Chinook salmon, there is considerable variation in the patterns of summer and fall chum salmon harvest and use throughout the river area. These differences result from a range of issues including species distribution and quality throughout the river drainage and cultural patterns of use (e.g., more dog teams along the upper river. The state and federal management strategy has

[15] While the term radar is often used by subsistence stakeholders when expressing various concerns, it is assumed by area management biologists that they are referring to the use of sonar for monitoring fish passage along the Yukon River (personal communication, John Linderman, 2010).

sought to take fishing pressure off the earliest pulses of Chinook salmon runs in order to get fish upriver to meet escapement goals, achieve Canadian border passage obligations under the Yukon River Salmon Agreement, and provide for subsistence uses in upriver districts. At the mouth of the Yukon River, when there has been uncertainty regarding the strength of Chinook and summer chum salmon runs, management has not scheduled openings until the runs have developed and uncertainty over sonar count and test fishery information is reduced. In addition, in years of strong summer chum salmon runs, but weak Chinook runs, fishing times tend to be restricted in the lower river commercial chum fishery to avoid incidental catch of Chinook salmon (Wolfe, 2009 and personal communications, Caroline Brown and John Linderman, 2010).

Subsistence fishing is open seven days a week until the first large pulse of Chinook salmon appears in each district, which then triggers implementation of the regulatory subsistence fishing schedule in each district in the lower river. In some mainstream upper river districts (i.e. Coastal District and Subdistricts 5D), the regulatory subsistence fishing schedule remains seven days per week unless additional conservation measures are warranted. The general management strategy is to reduce fishing pressure on the earliest portions of Chinook runs while providing for subsistence fishing, and secondarily, for commercial fishing. This strategy is employed to spread subsistence harvest over the entire run to provide for escapements by reducing the potential for differential harvest of specific spawning stocks, provide for subsistence harvest throughout the drainage, and provide for Canadian border passage obligations (Canadian escapement and harvest allocation combined). As a consequence, subsistence fishing periods can have negative effects on subsistence salmon processing; fish harvested in widely-spaced batches of salmon create difficulties for successfully drying and smoking salmon. There is risk involved in drying fish in smaller batches, rather than a larger, single batch because the different quality of fish drying at different rates can result in over-drying and excessively hard fish. In addition, subsistence openings may occur during bad weather creating problems with drying and processing because of an increased potential for spoilage. Without a regulatory fishing schedule, fishermen would have more flexibility in choosing appropriate weather to catch and process subsistence fish (Wolfe, 2009 and personal communication, John Linderman, 2010) but at the potential sacrifice of Yukon River treaty obligations with Canada, overall escapement, and upriver subsistence harvest needs. In extreme circumstances (i.e., scheduled fishing periods coupled with high fuel prices), individual fishermen may feel forced to fish outside regulations in order to meet their family's food needs (Wolfe, 2009). This could come at the potential cost of international treaty obligations, the overall health of Yukon River salmon populations, and upriver subsistence users.

Based upon the Alaska subsistence law, the BOF made separate customary and traditional use findings for Yukon River Chinook salmon, summer chum salmon, fall chum salmon, and coho salmon and established separate ANS findings for each (see Table 7). Harvests of one species that consistently fall below the lower limit of the ANS may suggest that a reasonable opportunity for subsistence uses can no longer be provided, or may suggest that the need for that level of harvest has decreased and no longer applies (i.e., with the decrease in the presence and use of dog teams, the need for historical levels of chum salmon harvest for dog food has also decreased). If it is determined reasonable opportunity can no longer be provided because of resource limitations, state statute would require that non-subsistence uses be eliminated (AS 16.05.258). Under such circumstances, like that which occurred with Nome Subdistrict chum salmon through the late 1990s and early 2000s, subsistence fishing participation would be limited through a Tiered management scenario where individual Alaskans would be ranked against one another according to their customary and traditional dependence upon the fish stock in question to determine who would be provided an opportunity to fish for subsistence uses. Therefore, those Alaskans who do not qualify for a Tiered subsistence fishery where there is insufficient harvestable surplus to provide a reasonable opportunity for all subsistence uses generally would shift to other salmon stocks or other resources to ensure sufficient wild resources are obtained to support household economies (Wolfe, 2009 and personal communications, John Linderman and Jim Simon, 2010). In such cases, harvest and use of another species may then increase such that the amount necessary for subsistence for the replacement species may need to be adjusted by the BOF.

3.3 Chum salmon subsistence harvests by region in western Alaska

3.3.1 Overview of regional subsistence harvests

Of the total number of pounds of wild foods harvested annually for subsistence purposes in rural Alaska communities, subsistence fisheries contribute about 60% from finfish and 2% from shellfish. On average, subsistence fisheries harvests provide about 230 lb of food per person annually in rural Alaska. Although producing a major portion of the food supply, subsistence harvests represent just a small part of the annual harvest of all wild resources in Alaska, approximately 2%. Commercial fisheries take 97% of the wild resource harvest, and sport fisheries and hunts take about 1% (Fall et al., 2009).

The estimated total subsistence harvest of salmon throughout Alaska in 2008, based on annual harvest assessment programs, was 1,014,923 fish. The estimated statewide harvest of chum salmon was 257,371 fish (25%) (Figure 15). In 2008, fisheries in the management areas encompassing western Alaska accounted for the following portions of the total estimated statewide subsistence salmon (all species) harvest: the Yukon Area (247,936 salmon; 24% of the statewide total); the Kuskokwim Area (252,642 salmon; 25%); the Bristol Bay Management Area (134,924 salmon; 13%); and Arctic Alaska (105,933 salmon; 11%)[16] (Figure 16). In 2008, as in recent years, three areas dominated the subsistence chum salmon estimated harvest: the Yukon Area (176,190 salmon; 69% of the statewide harvest), the Kuskokwim Area (58,332 salmon; 23%), and Arctic Alaska (14,004 salmon; 5%) (Table 4 and Figure 17). Statewide eligibility criteria require individuals to be Alaskan residents for the preceding 12 months before harvesting salmon for subsistence uses (Fall et al., *in prep*).

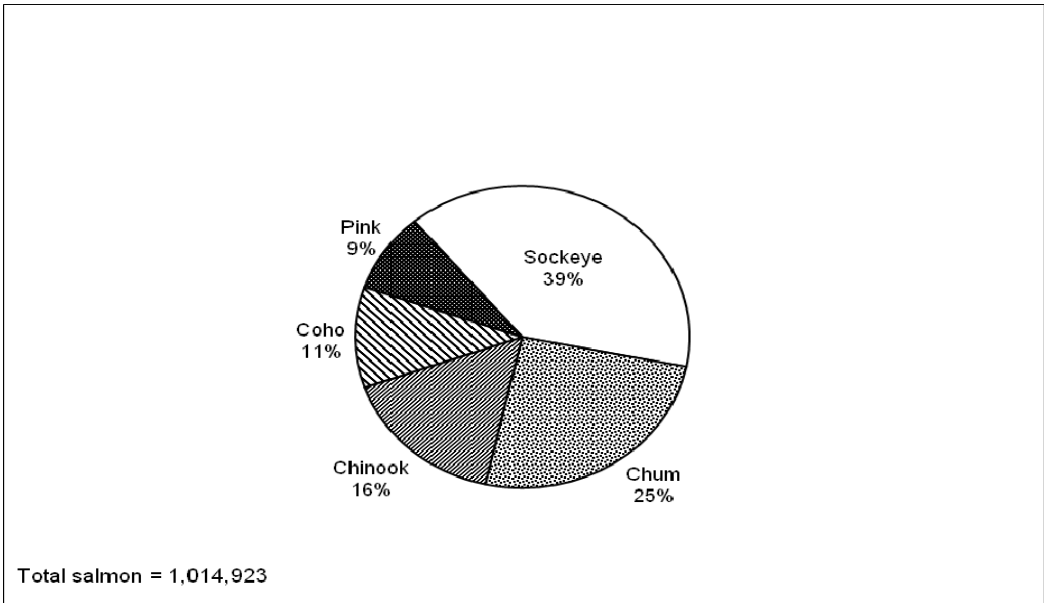


Figure 15 Alaska subsistence salmon harvest by species, 2008

Source: Fall et al., *in prep*.

[16] Subsistence harvest estimates for Arctic Alaska for 2003 and 2004 do not include the regional center of Kotzebue, which had been included in the harvest assessment program since 1994. No subsistence fisheries harvest data were collected in the Kotzebue area for 2005 through 2007; therefore, the estimated harvest totals for Northwest Alaska as reported since 2003 are incomplete.

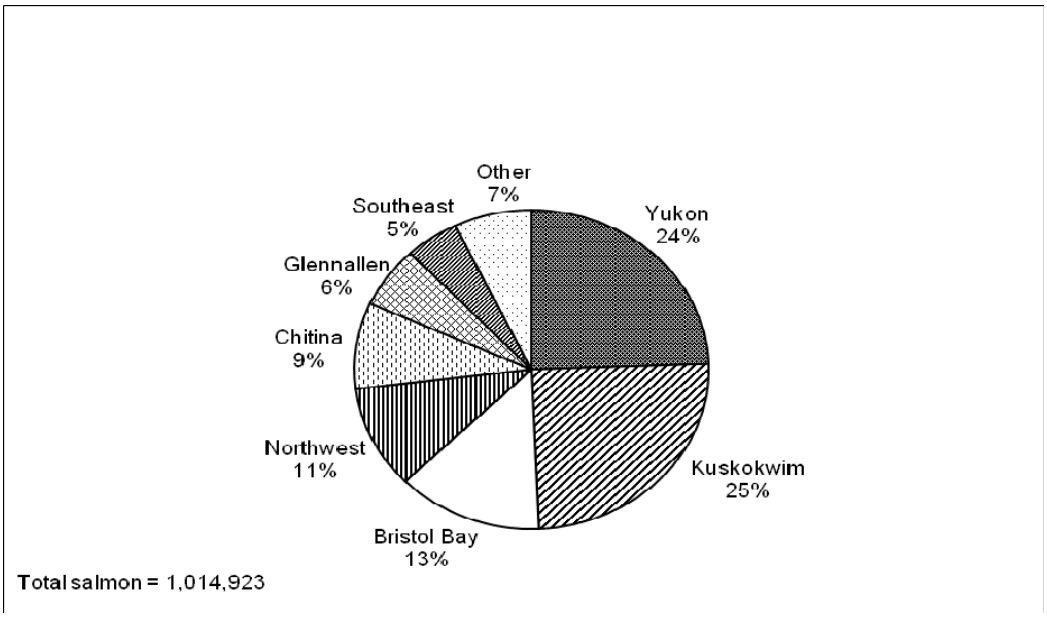


Figure 16 Alaska subsistence salmon harvest by area, 2008

Source: Fall et al., *in prep*.

Table 10 Subsistence chum salmon harvest for western Alaska, 2008

Area	Chum Salmon
Alaska Peninsula	857
Bristol Bay	5,710
Kuskokwim	58,332
Arctic Alaska	14,004
Yukon River	176,190

Note: Estimates for Arctic Alaska do not include the Kotzebue Area.

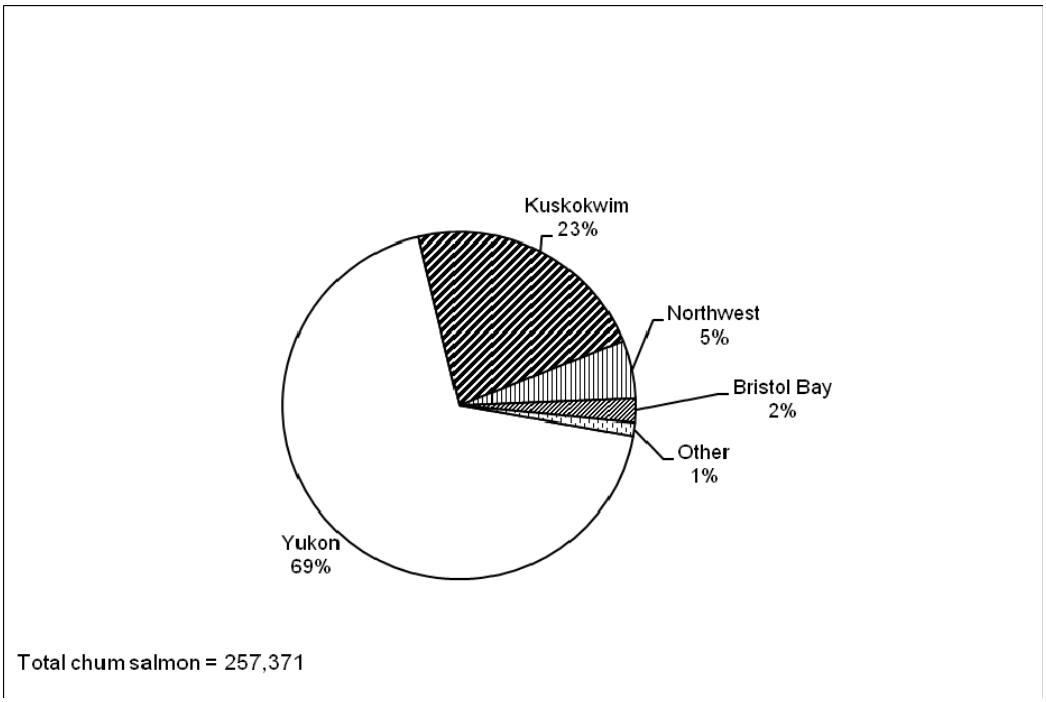


Figure 17 Subsistence chum salmon harvest by area, 2008

Source: Fall et al., *in prep*.

Further information on subsistence harvest of chum salmon by region in Western Alaska can be found in the Subsistence Salmon Fisheries 2007 Annual Report, available on the State of Alaska website at www.subsistence.adfg.state.ak.us/TechPap/TP346.pdf. The 2008 annual report will be available to the public in late January 2011.

3.3.2 Bristol Bay

Description of Management Area

The Bristol Bay management area includes all coastal and inland waters east of a line from Cape Newenham to Cape Menshikof. The area includes nine major river systems: Naknek, Kvichak, Alagnak, Egegik, Ugashik, Wood, Nushagak, Igushik, and Togiak. The Bristol Bay area is divided into five management districts (Naknek-Kvichak, Egegik, Ugashik, Nushagak, and Togiak) that correspond to the major river drainages (Morstad et al., 2010).

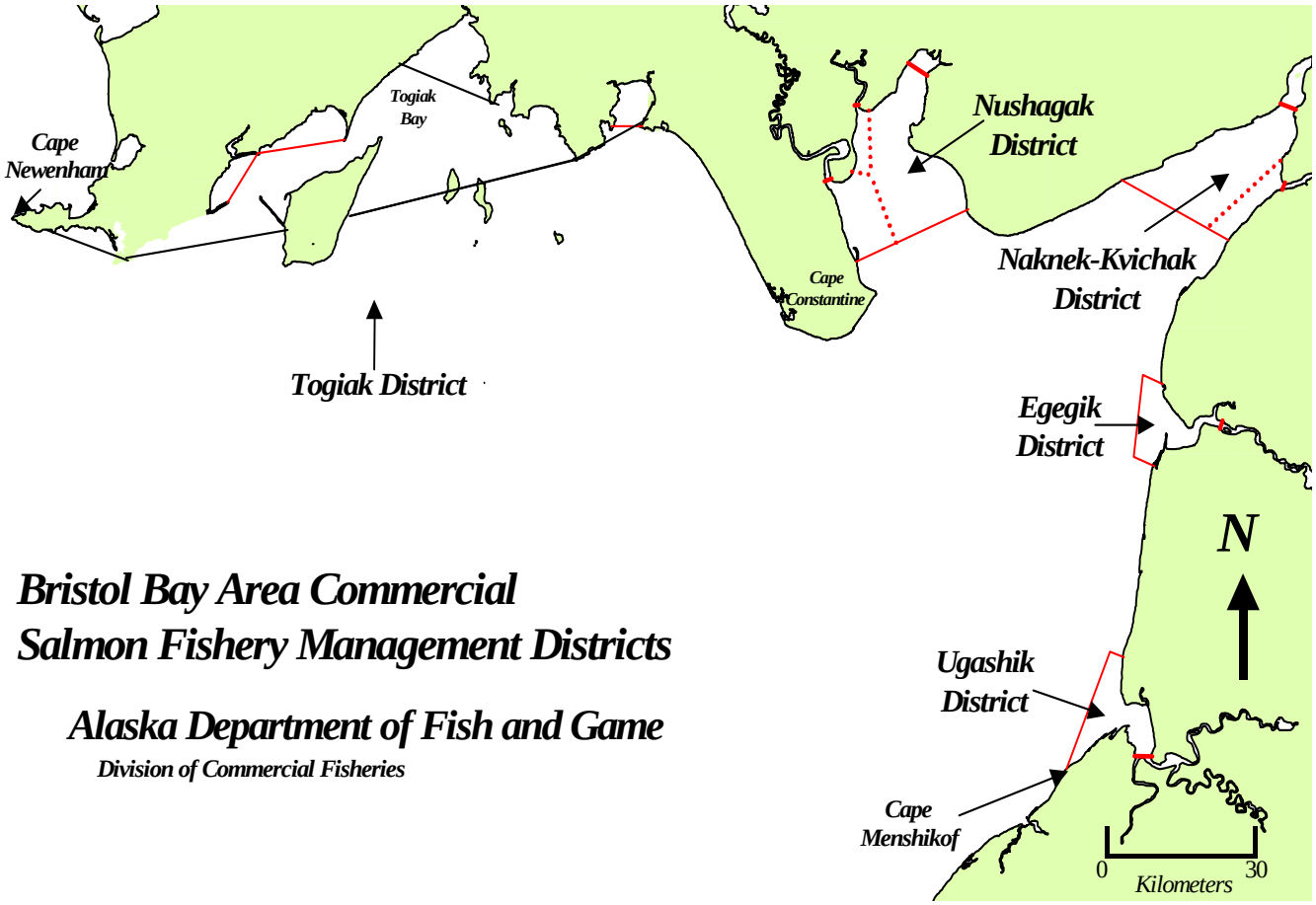


Figure 18 Bristol Bay Area Commercial Salmon Fishery Management Districts

All five Pacific salmon species found in Alaska are utilized for subsistence purposes in Bristol Bay, but the most popular are sockeye, Chinook, and coho salmon. Many residents continue to preserve large quantities of fish through traditional methods such as drying and smoking; fish are also frozen, canned, salted, pickled, fermented, and eaten fresh.

Subsistence Regulations

Permits are required to harvest salmon for subsistence purposes in Bristol Bay Management Area. Standard permit conditions include prohibition of fishing within 300 feet of a dam, fish ladder, weir, culvert, or other artificial obstruction. Since 1990, under state regulations, all Alaska state residents have been eligible to participate in subsistence salmon fishing in all Bristol Bay drainages, including the Lake Clark area. However, under National Park Service regulations, only qualified rural Alaska residents may participate in subsistence fisheries in the waters of Lake Clark National Park and Preserve. Prior to 2007, with a few exceptions, only gillnets were recognized as legal subsistence gear. In the Togiak District, spear fishing was also allowed. In portions of Naknek Lake in the Naknek District, spears and dip nets, in addition to gillnets, could be used during designated periods. In the Bristol Bay area, gillnet lengths are limited to 10 fathoms in the Naknek, Egegik, and Ugashik rivers, Dillingham beaches, and within the Nushagak commercial district during openings regulated by emergency order. Gillnet lengths up to 25 fathoms could be used in the remaining areas (Morstad et al., 2010).

At its regulatory meeting in December 2006, the BOF adopted three changes to subsistence salmon fishing regulations that affected portions of the Bristol Bay Area. The first change allowed salmon to be taken with drift gillnets no more than 10 fathoms in length in the lower two miles of the Togiak River. The second change allowed spears to be used to take salmon in Lake Clark. The third change allowed use of beach seines and seining with gillnets, in addition to set gillnets, to take salmon in Iliamna Lake, Six Mile Lake, and Lake Clark (Morstad et al., 2010).

In the Bristol Bay Management Area, subsistence fishing is permitted in all districts during commercial openings. In addition, all commercial districts were open for subsistence fishing in May and September, from Monday to Friday. In the late 1990s and early 2000s, declining Chinook salmon and coho salmon stocks resulted in longer commercial closures and some residents had difficulty obtaining fish for home uses. Since 2004, there have been improvements in abundance of all salmon species. Since 1988 in the Nushagak District, subsistence salmon fishing has been allowed by emergency order during periods of extended commercial fishing closures (Morstad et al., 2010).

Subsistence Harvest Assessment Methods

A permit program was gradually introduced throughout the Bristol Bay region in the late 1960s to document the harvest of salmon for subsistence uses. Much of the increase in the number of permits issued during these years reflects: 1) a greater compliance with the permitting and reporting requirements; 2) an increased level of effort expended by ADF&G in making permits available (including issuance by area vendors working as volunteers to distribute permits); 3) contacting individuals to remind them to return the harvest forms; and 4) a growing regional population. Most fishers are obtaining permits and reporting their harvests, and overall permit returns have averaged between 85% and 90%. However, fish removed for home uses from commercial catches are not included in most reported subsistence harvest totals (Morstad et al, 2010).

In 2008, a total of 1,178 permits were issued for the Bristol Bay Management Area; of those 1,083 (92%) were returned. The largest number of permits were issued for the Nushagak (571 permits) and Naknek–Kvichak (481 permits) districts. The number of permits issued in 2008 was above both the five-year average (2003-2007) of 1,094 permits and the 10-year average (1998-2007) of 1,146 permits (Fall et al., *in prep*).

Chum Salmon Subsistence Harvest

Estimated total Bristol Bay subsistence salmon harvests in 2008 were 134,924 fish. The 2008 subsistence harvest was above both the five-year (2003 - 2007) average of 126,717 fish and the 10-year (1998 -2007) average of 127,069 salmon, and below the historical average (1983 – 2007) of 150,405 salmon. The estimated harvest of 5,710 chum salmon was above both the five year average (5,285 fish) and the 10-year average (4,940 fish) (Figure 19, Table 11). In 2008, the Bristol Bay subsistence salmon harvest was composed of 77% sockeye salmon, 11% Chinook salmon, 6% coho salmon, 4% chum salmon, and 2% pink salmon (Figure 20) (Fall et al., *in prep*).

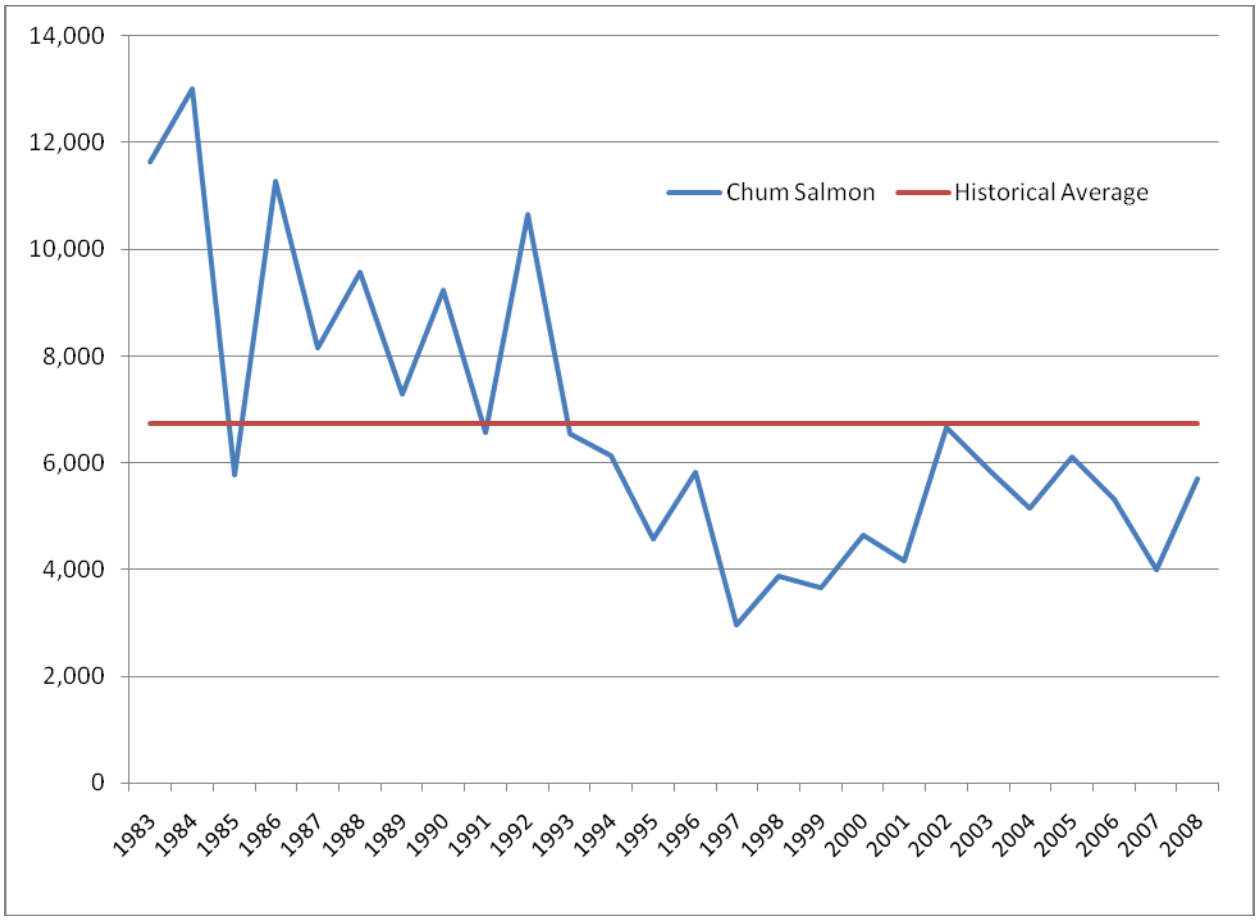


Figure 19 Estimated historical chum salmon subsistence harvest, Bristol Bay area, 1983-2008

Table 11 Estimated historical subsistence salmon harvests, Bristol Bay area, 1983-2008

	Permits		Estimated salmon harvest					
Year	Issued	Returned	Chinook	Sockeye	Coho	Chum	Pink	Total
1983	829	674	13,268	143,639	7,477	11,646	1,073	177,104
1984	882	698	11,537	168,803	16,035	13,009	8,228	217,612
1985	1,015	808	9,737	142,755	8,122	5,776	825	167,215
1986	930	723	14,893	129,487	11,005	11,268	7,458	174,112
1987	996	866	14,424	135,782	8,854	8,161	673	167,894
1988	938	835	11,848	125,556	7,333	9,575	7,341	161,652
1989	955	831	9,678	125,243	12,069	7,283	801	155,074
1990	1,042	870	13,462	128,343	8,389	9,224	4,455	163,874
1991	1,194	1,045	15,245	137,837	14,024	6,574	572	174,251
1992	1,203	1,028	16,425	133,605	10,722	10,661	5,325	176,739
1993	1,206	1,005	20,527	134,050	8,915	6,539	1,051	171,082
1994	1,193	1,019	18,873	120,782	9,279	6,144	2,708	157,787
1995	1,119	990	15,921	107,717	7,423	4,566	691	136,319
1996	1,110	928	18,072	107,737	7,519	5,813	2,434	141,575
1997	1,166	1,051	19,074	118,250	6,196	2,962	674	147,156
1998	1,234	1,155	15,621	113,289	8,126	3,869	2,424	143,330
1999	1,219	1,157	13,009	122,281	6,143	3,653	420	145,506
2000	1,219	1,109	11,547	92,050	7,991	4,637	2,599	118,824
2001	1,226	1,137	14,412	92,041	8,406	4,158	839	119,856
2002	1,093	994	12,936	81,088	6,565	6,658	2,341	109,587
2003	1,182	1,058	21,231	95,690	7,816	5,868	1,062	131,667
2004	1,100	940	18,012	93,819	6,667	5,141	3,225	126,865
2005	1,076	979	15,212	98,511	7,889	6,102	1,098	128,812
2006	1,050	904	12,617	95,201	5,697	5,321	2,726	121,564
2007	1,063	917	15,444	99,549	4,880	3,991	815	124,679
2008	1,178	1,083	15,153	103,583	7,627	5,710	2,851	134,924
5-year average (2003-2007)	1,094	960	16,503	96,554	6,590	5,285	1,785	126,717
10-year average (1998-2007)	1,146	1,035	15,004	98,352	7,018	4,940	1,755	127,069
Historical average (1983-2007)	1,090	949	14,921	117,724	8,542	6,744	2,474	150,405

Source: ADF&G Division of Subsistence, ASFDB 2009 (ADF&G 2009).

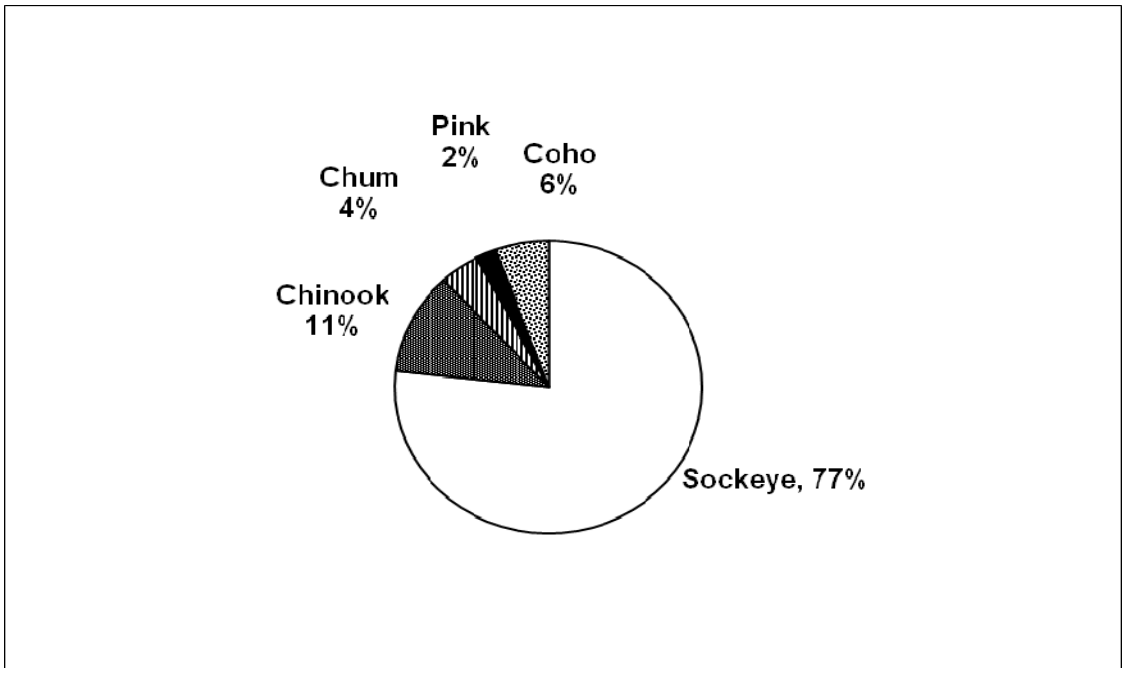


Figure 20 Composition of Bristol Bay area subsistence salmon harvest by species, 2008

Source: Fall et al., *in prep*.

In 2008, as over the last several decades, most of the Bristol Bay area subsistence harvest was taken in the Naknek–Kvichak (54%) and the Nushagak (38%) districts (Figure 21). The Naknek–Kvichak total harvest of 73,184 salmon in 2008 was slightly higher than in 2007 (72,280 salmon), 2006 (71,796 salmon), and 2005 (72,302 salmon). It was substantially higher than the 2003 harvest of 63,934 salmon. In the Nushagak District, the total estimated subsistence harvest in 2008 was 51,395 salmon. This was higher than the 2007 harvest of 44,944 salmon and the 2006 harvest of 40,373 salmon (Table 11) (Fall et al., *in prep*).

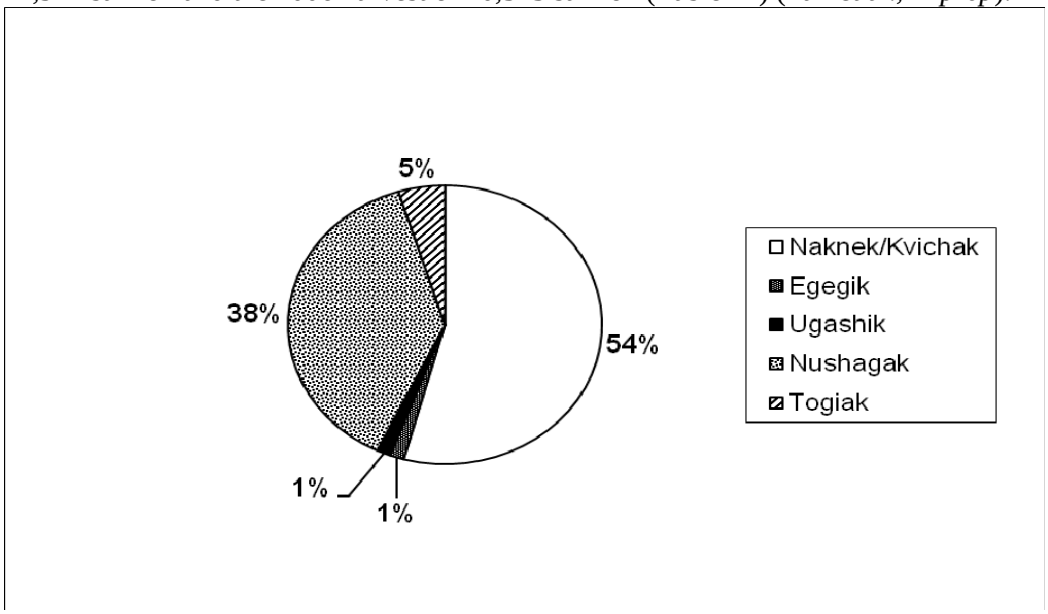


Figure 21 Subsistence salmon harvests by district, Bristol Bay area, 2008

Source: Fall et al., *in prep*.

Table 12 Estimated subsistence salmon harvests by district and location fished, Bristol Bay area, 2008

Area and River System	Number of permits issued[a]	Estimated salmon harvest					
		Chinook	Sockeye	Coho	Chum	Pink	Total
Naknek-Kvichak District	481	719	69,823	1,437	404	801	73,184
Naknek River Subdistrict	271	684	20,260	1,397	345	769	23,456
Kvichak River/Iliamna Lake Subdistrict:	215	35	49,563	40	59	31	49,728
Igiugig	10	5	1,595	0	29	0	1,629
Iliamna Lake-General	35	0	6,638	0	0	0	6,638
Kijik	1	0	300	0	0	0	300
Kokhanok	25	26	14,142	10	10	6	14,194
Kvichak River	10	0	405	0	0	0	405
Lake Clark	47	0	4,027	0	0	0	4,027
Levelock	1	4	30	30	20	25	109
Newhalen River	58	0	10,984	0	0	0	10,984
Pedro Bay	20	0	5,388	0	0	0	5,388
Six Mile Lake	18	0	6,054	0	0	0	6,054
Egegik District	37	91	1,502	295	35	4	1,928
Ugashik District	14	47	1,660	222	17	9	1,955
Nushagak District	571	12,960	26,828	5,133	4,552	1,923	51,395
Wood River	163	2,726	6,780	816	468	260	11,051
Nushagak River	109	4,564	6,209	804	2,547	211	14,334
Nushagak Bay Noncommercial	232	4,469	8,119	2,294	1,259	801	16,942
Nushagak Bay Commercial	42	346	1,435	761	164	582	3,288
Igushik/Snake River	63	855	4,285	458	114	69	5,780
Togiak District	91	1,337	3,770	541	701	114	6,463
Total	1,178	15,153	103,583	7,627	5,710	2,851	134,924

Source: ADF&G Division of Subsistence, ASFDB 2009 (ADF&G 2009).
Note: Harvests are extrapolated for all permits issued, based on those returned and on the area fished as recorded on the permit. Due to rounding, the sum of columns and rows may not equal the estimated total. Of 1,178 permits issued for the management area, 1,083 were returned (91.9%).
[a]Sum of sites may exceed district totals, and sum of districts may exceed area total, because permittees may use more than one site.

3.3.3 Kuskokwim Area

Description of Management Area

The Kuskokwim Management Area is approximately 50,000 square miles in size, including the Kuskokwim River drainage and all waters of Alaska that flow into the Bering Sea between Cape Newenham and the Naskonat Peninsula, plus Nunivak and St. Matthew Islands. There are fishing districts within the Kuskokwim Area. Districts 1 and 2 are within the Kuskokwim River; Districts 4 and 5 are in Kuskokwim Bay (Estensen et al., 2009).

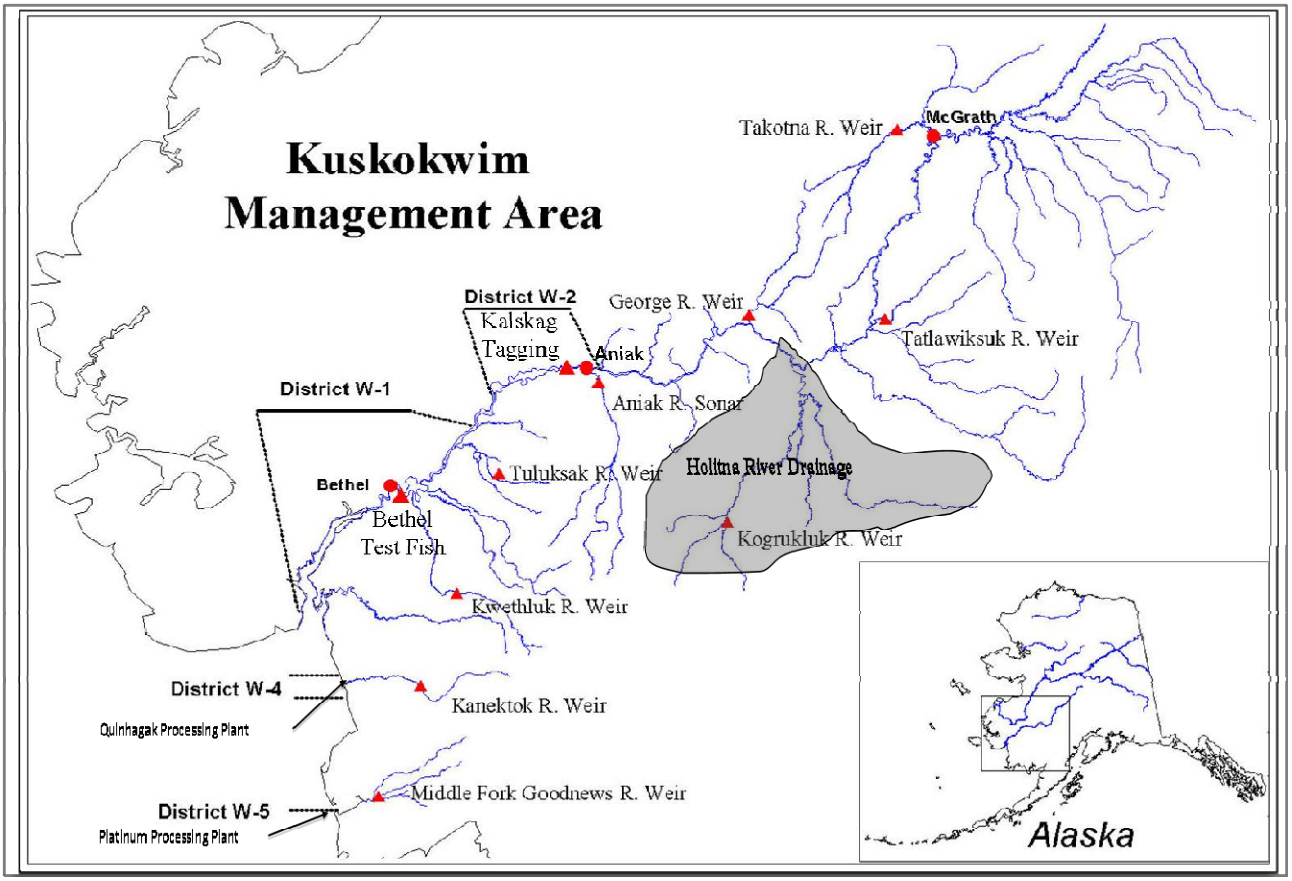


Figure 22 Kuskokwim Management Area

The Kuskokwim area subsistence salmon fishery is one of the largest in the state. From June through August, daily activities of many Kuskokwim area households revolve around harvesting, processing, and preserving salmon and non-salmon fishes for subsistence uses. The movement of families from permanent winter residences to summer fish camps situated along rivers and sloughs continues to be a significant element of the annual subsistence harvest effort in this area, even though many subsistence salmon fishers also fish directly from their home community. Division of Subsistence studies in the region indicate that fish (salmon and non-salmon) contribute 67% to 85% of the total wild resource harvest (in pounds) in a community, and salmon contribute 49% to 53% of the total pounds of fish and wildlife harvested in this area. The harvest of salmon for subsistence ranges from 241 usable pounds per person in some communities (e.g., Nunapitchuk, 1983) to 446

pounds per person (e.g., Kwethluk, 1986) and 649 pounds per person (e.g., Akiachak, 1998) in other Kuskokwim river communities (Andrews 1989, 1994; Coffing 1991; Coffing et al. 2001).

Subsistence Regulations

Most subsistence salmon fishers in the region are Kuskokwim area residents; however, some subsistence fishers are domiciled in other parts of Alaska, but return to fish on their own or assist family or friends with the harvesting or processing of salmon. Licenses and permits have never been required for subsistence salmon fishing in the Kuskokwim Area. Standard conditions include prohibition of fishing within 300 ft of a dam, fish ladder, weir, culvert, or other artificial obstruction. There are no restrictions on the number of salmon allowed to be taken by individual fishers or households for subsistence uses in the Kuskokwim area. Salmon can be harvested for subsistence uses by set and drift gillnets, beach seines, fish wheels, handline, and rod and reel, except that salmon may also be taken by spear in the Holitna, Kanektok, Arolik river drainages, and the drainage of Goodnews Bay (5 AAC 01.270(a)). Set or drift gillnets in use by individual fishers cannot exceed a total length of 50 fathoms, and each subsistence gillnet operated in tributaries of the Kuskokwim River must be attached to the bank, fished substantially perpendicular to the bank and in a substantially straight line. In that portion of the Kuskokwim river drainage from the north end of Eek Island upstream to the mouth of the Kolmakoff River, no part of a set gillnet located within a tributary to the Kuskokwim River may be set or operated within 150 feet of any part of another set gillnet. A gillnet may not obstruct more than one-half the width of any fish stream and any channel or side channel of a fish stream. A stationary fishing device may not obstruct more than one-half the width of any salmon stream and any channel or side channel of a salmon stream. Gillnets used for harvesting salmon could be of any mesh size. Nets with six inch or smaller mesh could not be more than 45 meshes deep, and nets with mesh greater than six inches could not be more than 35 meshes deep. Fishers were required to have their names and addresses attached to gillnets and fish wheels (5 AAC 01.270).

Kuskokwim River chum salmon were listed by the BOF as a stock of yield concern in September 2000, but improved abundance led to the finding being discontinued in January 2007 and at present there are no stock of concern designations for the Kuskokwim Management Area. Historically, Kuskokwim River chum salmon, though an important subsistence species, have been primarily targeted for commercial use (Estensen, 2009). In January 2004, the BOF adopted regulations allowing ADF&G to specify closed periods around commercial fishing periods by emergency order in districts 1 and 2. Prior to this action, areas within commercial salmon fishing districts were closed to subsistence salmon net and fish wheel gear 16 hours before, during, and six hours after commercial fishing periods. Since 2004, areas within commercial salmon fishing districts have been closed to subsistence salmon net and fish wheel gear six hours before, during, and three hours after commercial fishing periods (Fall et al., 2009). Many of the fishermen who participate in the Kuskokwim commercial fisheries are area residents who also subsistence fish. The purpose of this regulatory change was to continue discouraging illegal fishing activities, such as the sale of subsistence-caught salmon into the commercial fishery, while also providing more subsistence harvest opportunity.

Subsistence Harvest Assessment Methods

There are 38 communities in the Kuskokwim Management Area. The Kuskokwim Subsistence Salmon Monitoring Program has estimated the harvest of subsistence salmon primarily through household surveys, and to a lesser extent, harvest calendars and post card surveys. The Division of Commercial Fisheries began conducting subsistence salmon harvest surveys among Kuskokwim River fishers in the Kuskokwim River drainage in 1960. During the 1980s, funding was insufficient to conduct surveys in all Kuskokwim Area communities; instead, subsets of villages sampled and then these data were expanded to produce an estimate of the salmon harvest by other communities. As such, while information from 1960 to 1988 is available, the data are not necessarily comparable from year to year because the statistical methods used to expand the harvest

data and produce total harvest estimates of Kuskokwim Area subsistence salmon were not fully documented (personal communication, Holly Carroll, 2010; see also Simon et al., 2007 and Walker and Coffing, 1993).

The Division of Subsistence assumed responsibility for the Kuskokwim Subsistence Salmon Monitoring Program in 1988 and collected and analyzed subsistence data until 2007. The division developed a stratified household survey program to estimate Kuskokwim subsistence salmon harvests by community. Subsistence salmon harvests were estimated based on the total number of households in a community, not just the number of fishing households as in the previous method. Not only were households that "usually fish" tracked on an annual basis, but households that "usually do not fish" were also tracked annually as well as sampled during postseason harvest monitoring activities. This stratified method of estimating total community harvest results in more complete data for all salmon species harvested for most communities in the Kuskokwim Area. When compared to the new method, the previous method significantly overestimated subsistence salmon harvests, due likely to the overemphasis on fishing households in the reporting of harvest information (personal communication, Holly Carroll, 2010; see also Simon et al., 2007 and Walker and Coffing, 1993).

In 2007, Subsistence Division ran an abbreviated version of the monitoring program with limited funding. In 2008, the Division of Commercial Fisheries re-established its supervision of the program in the Kuskokwim Area in order to continue the collection of this information that is important for managing the subsistence as well as the commercial and sport salmon fisheries in the Kuskokwim Area (personal communication, Holly Carroll, 2010). Given the history of differing methodologies used for estimating subsistence salmon harvest in the Kuskokwim Management Area, harvest numbers presented in this section are estimates only and cannot be compared to one another across the time series.[17]

As previously mentioned, subsistence salmon harvest calendars are mailed annually to all Kuskokwim Area households that "usually fish" and to those that fished the previous season. Harvest calendars are designed to record the daily harvest of each salmon species harvested for subsistence uses May–October. All Kuskokwim Area communities received the same style of calendar. Calendars are mailed to post office boxes when addresses are available; otherwise, calendars are sent via general delivery to the post office clerk for distribution. Each calendar is return-postage-paid and return-addressed to the Division of Subsistence office in Anchorage (Fall et al., 2009).

Survey efforts in Kuskokwim Area communities occur over a three month time span beginning in late September, after most residents have completed salmon fishing for the season and most subsistence users have returned from fall moose and caribou hunts. Communities where residents usually harvest salmon through October are surveyed in November. Prior to beginning community surveys, efforts are made to inform and prepare residents for the arrival of survey staff. This is done weeks or days in advance via letters to city, tribal, or traditional council offices, radio announcements, posters placed in public buildings, and telephone calls to community officials. Prior to traveling to each community, staff identifies households that have already mailed or otherwise returned their salmon harvest calendars. Time spent by survey staff on house-to-house interviews varies from one-half to two days per community, depending on community size. Upon arrival in a community, survey staff introduces themselves to area council officials and outline their task. Staff uses household checklists to identify residents they need to contact for household surveys. Each checklist contains a list of all known households in the community and identifies those households that are reported to have subsistence fished for salmon the previous year. Each checklist also indicates which households were mailed harvest calendars. Knowledgeable individuals in the community help staff update the community household list and identify which households "usually fish" and which households "usually do not fish." Attempts are made to contact all households that "usually fish" or that were known to have fished during the current year. If time

[17] ADF&G, Division of Commercial Fisheries staff are currently involved in a project designed to revise historical harvest estimates to align them with the current monitoring methodology used. Project efforts include the use of statistical modeling to integrate the various datasets in order to provide estimates of historical run abundance.

permits, households that are classified as "usually do not fish" are contacted about their subsistence fishing activities. Completed subsistence salmon harvest calendars that have not been returned to ADF&G are collected during the interview, if available (Fall et al., 2009).

Following door-to-door household surveys, post card harvest reports are mailed to selected households that were not contacted directly or from which harvest calendars were not received (Fall et al., 2009).

From an estimated 4,734 households located in the Kuskokwim Area, contact was made with 992 unique households by household surveys, returned calendars, or post card surveys. From this total, harvest data were obtained for 832 households; community harvest estimates were expanded from this data set, except in communities where fewer than 30 households or <50% of all households in a sample stratum were contacted. In this case, the reported harvest was used as the harvest for the community (no expansion to non-contacted households occurred). From the 1,356 households for which there was information, 785 (58% of households contacted and approximately 17% of the total area households) were identified as having subsistence fished for salmon in 2007 (although specific harvest numbers were not available for all fishing households) (Fall et al., 2009). Note that this information will be updated with the 2008 Alaska Subsistence Salmon Fisheries Annual Report when it is available.

The Kuskokwim River drainage represents 84% of the estimated total number of households in the entire Kuskokwim area and 91% of the identified subsistence fishing households. In the South Kuskokwim Bay region, 31% of households were estimated to have subsistence fished in 2007, with 71% of those having harvested salmon for subsistence uses. The only data collected from the Bering Sea coastal communities were from two surveys from members of the community contacted outside of their home community; therefore, no harvest data are available from this region, but harvest activity by households in the Bering Sea coastal communities is believed to be much greater than what the available data documents (Fall et al., 2009). Note that this information will be updated with the 2008 Alaska Subsistence Salmon Fisheries Annual Report when it is available; this report is expected in late January 2011.

Chum Salmon Subsistence Harvest

Chum salmon subsistence harvest estimates for 2008 were 58,332 fish out of an all salmon species[18] total of 251,301 fish (Table 13). Average annual subsistence harvest for the most recent five years is approximately 50,000 chum salmon and harvest has been within or above ANS every year since 1990. (Fall et al., 2009).

In 2008, estimates of subsistence salmon harvest for communities contacted in the Kuskokwim Area totaled 23%) of the total subsistence salmon harvested (Figure 23). These estimates fall above the most recent five year averages for all species of salmon, with the exception of pink salmon. Figure 24 and Table 13 below highlight historical subsistence chum salmon harvests for the Kuskokwim River. Lower Kuskokwim River communities accounted for 85% of the 2007 estimated subsistence salmon harvests in the Kuskokwim Area. Residents of Bethel accounted for 38% of the Kuskokwim Area subsistence salmon harvests (Fall et at., 2009). This information will be updated with the 2008 Alaska Subsistence Salmon Fisheries Annual Report when it is available; this report is expected in late January 2011.

[18] Pink salmon are not included in these data. ADF&G has only recently begun monitoring pink salmon in the Kuskokwim area; therefore, historical comparisons are not yet possible.

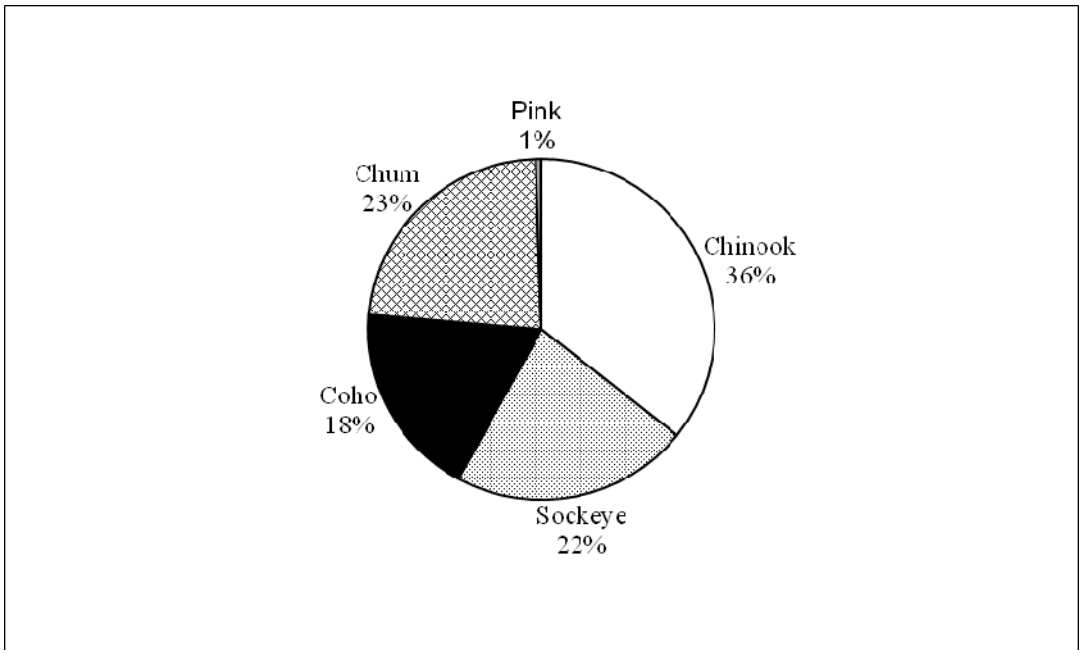


Figure 23 Kuskokwim Area subsistence salmon harvest composition, 2008

Source: Fall et al., 2009.

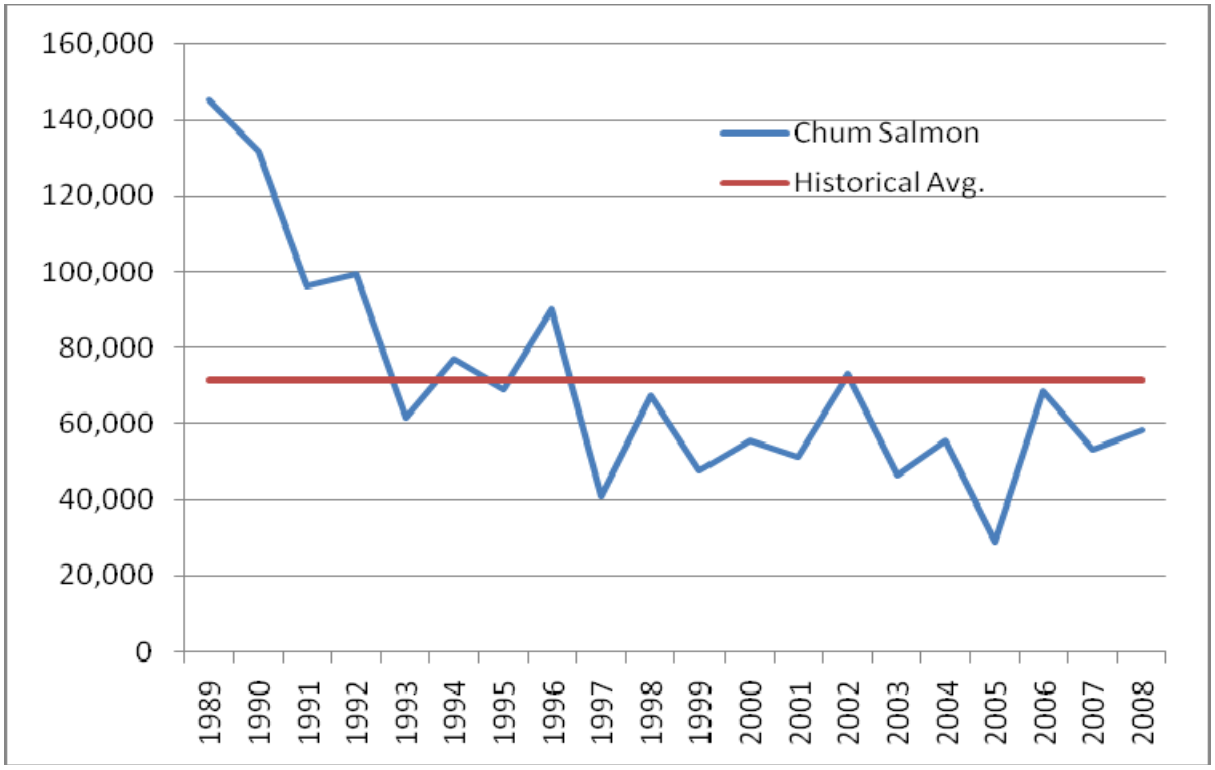


Figure 24 Estimated historical subsistence chum salmon harvests, Kuskokwim River, 1989-2008

Table 13 Estimated historical subsistence chum salmon harvest, Kuskokwim River, 1989-2008

	Households		Estimated Salmon Harvest				
Year	Total	Surveyed	Chinook	Sockeye	Coho	Chum	Total
1989	3,422	2,135	85,322	37,088	57,786	145,106	325,287
1990	3,317	1,830	92,675	39,659	50,708	131,470	314,513
1991	3,347	2,024	90,226	56,401	55,620	96,314	298,561
1992	3,314	1,724	68,685	34,158	44,494	99,576	246,914
1993	3,274	1,816	91,722	51,362	35,295	61,724	240,103
1994	3,179	1,821	98,378	39,280	36,504	76,949	251,111
1995	3,652	1,894	100,157	28,622	39,165	68,941	236,885
1996	3,643	1,837	81,597	35,037	34,699	90,239	241,572
1997	3,510	1,831	85,506	41,251	30,717	40,993	198,466
1998	3,495	1,849	86,113	37,579	27,240	67,664	218,595
1999	4,180	2,523	77,660	49,388	27,753	47,612	202,413
2000	4,441	2,750	68,841	44,832	35,670	55,371	204,714
2001	4,483	2,297	77,570	51,965	31,686	51,117	212,338
2002	4,339	2,798	70,219	27,733	34,413	73,234	205,599
2003	4,535	2,375	72,498	36,894	38,791	46,291	194,474
2004	4,670	2,432	85,086	34,892	39,406	55,575	214,959
2005	3,903	1,610	72,174	47,656	36,751	28,838	186,762
2006	4,657	1,514	68,041	34,849	32,809	68,812	204,510
2007	4,618	1,356	72,097	34,578	26,270	53,298	186,243
2008	4,734	992	90,179	56,268	46,522	58,332	251,301
5-year average (2003-2007)	4,477	1,857	73,979	37,774	34,805	50,563	197,121
10-year average (1998-2007)	4,332	2,150	75,030	40,037	33,079	54,781	202,926
15-year average (1993-2007)	4,039	2,047	80,511	39,728	33,811	59,110	213,160
Historical average (1989-2007)	3,894	2,022	81,293	40,170	37,672	71,533	230,668

Source: ADF&G Division of Subsistence CSIS; Fall et al., 2009.

During 2008, 438 households reported using drift gillnets for subsistence salmon harvests, 61 reported using setnets, and 70 reported using subsistence rod and reel gear. The most common gear type used in the Kuskokwim Area is the drift gillnet (76% of reporting households). Many households throughout the area also use rod and reel for subsistence fishing. Rod and reel is used by households that may not have access to other gear types, by fishers in areas where other gear types are not as effective or efficient, and to harvest fewer fish when less are sought (Fall et al., in prep).

In 2007, few households reported retaining commercially-caught salmon for subsistence uses. An estimated total of 702 salmon were retained from commercial catches, including 197 chum salmon (Fall et al., 2009).[19]

[19] This information will be updated with the 2008 Alaska Subsistence Salmon Fisheries Annual Report when it is available; this report is expected in late January 2011.

3.3.4 Yukon River

Description of Management Area

The Yukon Area includes all waters of Alaska within the Yukon River drainage and coastal waters from Point Romanof, northeast of Kotlik, to the Naskonat Peninsula. For management purposes, the Yukon Area is divided into seven districts and 10 subdistricts (Figure 25). Commercial fishing may be allowed along the entire 1,224 miles of the Yukon River in Alaska and along the lower 225 miles of the Tanana River. The Coastal District includes the majority of coastal marine waters within the Yukon Area and is only open to subsistence fishing. The Lower Yukon Area (Districts 1, 2, and 3) includes coastal waters of the Yukon River delta and that portion of the Yukon River drainage downstream of Old Paradise Village (river mile 301). The Upper Yukon Area (Districts 4, 5, and 6) is the Alaskan portion of the Yukon River drainage upstream of Old Paradise Village (Bergstrom et al., 2009).

While non-salmon fish species provide an important component of the overall fish harvest, salmon comprise the bulk of the fish harvested for subsistence in the Yukon Area. Chinook salmon, summer and fall chum salmon, and coho salmon comprise the majority of the salmon harvests in the Yukon River drainage. The number of salmon harvested for subsistence in this region is significant. Unlike many marine and coastal fisheries in which commercial harvests predominate, subsistence salmon harvests within the Yukon drainage often exceed commercial, sport, and personal use harvests combined (Fall et al., 2009).

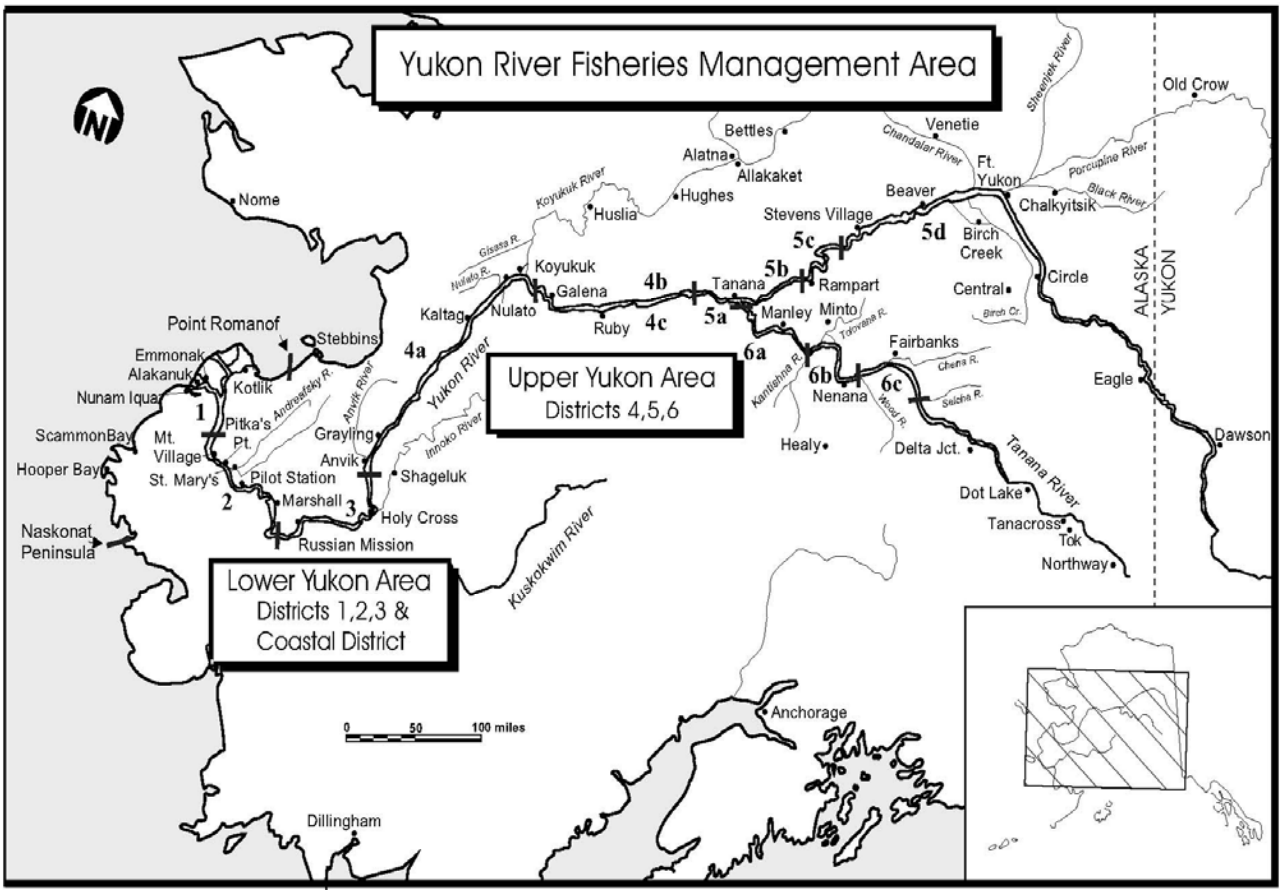


Figure 25 Yukon River Fisheries Management Area

Drift gillnets, set gillnets, and fish wheels are used by Yukon Area fishers to harvest the majority of salmon. According to regulation, salmon may be taken by gillnet, beach seine, a hook and line attached to a rod or pole, handline, or fish wheel (5AAC 01.220(a)). Set gillnets are utilized throughout the Yukon Area, often in the main rivers and coastal marine waters, while drift gillnets are used extensively in some parts of the river (i.e., by state regulation, that portion of the Yukon drainage from the mouth to a point 18 miles downstream of Galena) (5 AAC 01.220(e)). During subsistence fishing closures specified in 5 AAC 01.210(b), all salmon gillnets with a mesh size greater than four inches must be removed from the water and fish wheels may not be operated (5 AAC 01.220(f)(9)). Fish wheels are a legal subsistence or noncommercial gear type throughout the Yukon drainage, although due to river conditions and the availability of wood for building materials, they are used almost exclusively only on the middle and upper Yukon and Tanana rivers (Fall et al, 2009).

Depending on the area of the Yukon River drainage and salmon species' run timing, subsistence fishing occurs from late May through early October; fishing opportunity in the Lower Yukon Area in May and in the Upper Yukon Area in October is highly dependent upon river ice conditions. Chum salmon in the Yukon River consist of an earlier, and typically more abundant, summer chum salmon run and a later fall chum salmon run. Fishing activities are based either from fish camps or from the home villages; fishing patterns and preferred sites vary from community to community. Extended family groups, typically representing several households, often undertake subsistence salmon fishing together. Households and related individuals typically cooperate to harvest, process, preserve, and store salmon for subsistence uses (JTC, 2010).

Subsistence Regulations

Regulation and management of Yukon River drainage subsistence salmon fishing is guided by the *Yukon River Drainage Subsistence Salmon Fishery Management Protocol*, which provides a framework for coordinated subsistence fisheries management between ADF&G and the federal subsistence management programs in the Yukon River drainage. The protocol also directs state and federal managers to solicit input from the Yukon River Drainage Fisheries Association (YRDFA), the state and federal regularity bodies functioning through the Alaska Board of Fisheries and Federal Subsistence Board processes, and other stakeholders during the decision-making process (Fall et al, 2009).

Standard subsistence permit conditions include prohibition of fishing within 300 ft of a dam, fish ladder, weir, culvert, or other artificial obstruction. The majority of the United States' portion of the Yukon Area is open to subsistence fishing; however, the Joint Board has defined a portion of the Tanana River in the Yukon River drainage as lying within the Fairbanks Nonsubsistence Area (5 AAC 99.015). The harvest of fish for home uses in these nonsubsistence areas occurs under personal use and sport fishing regulations (see Section 3.5.3) (Fall et al., 2009).

At its September 2000 work session, the BOF classified the Yukon River summer chum salmon as a stock of management concern.[20] This determination of management concern was based on documented low escapements during 1998-2000 and an anticipated low run in 2001. The classification as a management concern was continued at the January 2004 BOF meeting due to established escapement goals not being achieved in East Fork Andreafsky River from 1998-2003 and in Anvik River from 1998-2001 and 2003 (Bergstrom et al., 2009). Given the collectively large spawning escapements of the Yukon River summer chum salmon stock over the three years preceding the January 2007 BOF meeting (2004-2006), including a near record run in 2006, the summer chum salmon stock no longer met stock of concern criteria and the classification was discontinued in February 2007 (Bergstrom et al., 2009).

[20] A stock of 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. Chronic inability is defined as the continuing or anticipated inability to meet escapement objectives over a four to five year period (5 AAC 39.222(f)(21)).

In addition to the above actions, in January 2010, the BOF modified The Yukon River Summer Chum Salmon Management Plan to allow, by emergency order, a commercial harvest up to 50,000 fish if the total run size is between 900,000 and 1,000,000 fish, distributed by district or subdistrict in proportion to the guideline harvest levels (Hayes and Norris, 2010).

Similar to that of summer chum salmon, Yukon River fall chum salmon was classified as a stock of yield concern[21] by the BOF at its September 2000 work session. Additionally, Toklat and Fishing Branch Rivers fall chum salmon were classified as stocks of management concern. The determination for the entire Yukon River fall chum salmon as a stock of yield concern was based on substantial decrease in yields and harvestable surpluses during the period 1998-2000, and the anticipated very low run expected in 2001. The 2000 fall chum salmon run was the worst on record. The determination for Toklat and Fishing Branch Rivers as stocks of management concern was based on escapements not meeting the OEG of 33,000 fish for Toklat River from 1996-2000, and not meeting the escapement objective of 50,000-120,000 fish for Fishing Branch River from 1997-2000 (Borba et al., 2009).

Classification as a stock of yield concern continued at the January 2004 BOF meeting because the combined commercial and subsistence harvests showed a substantial decrease in fall chum salmon yield from the 10-year period (1989-1998) to the more recent five year average (1999-2003). Toklat River stock was removed from management concern classification as a result of the BEG review presented at the BOF meeting; however, as a component of the Yukon River drainage, Toklat River fall chum salmon stock was included in the drainage-wide yield concern classification. Fishing Branch River stock was also removed from the management concern classification because management of the portion of the drainage is covered by an annex to the Pacific Salmon Treaty, which is governed under the authority of the Yukon River Panel (Borba et al., 2009).

In January 2007, the BOF determined that Yukon River fall chum salmon stock no longer met the criteria for a yield concern. Run strength was poor from 1998-2002; however, steady improvement had been observed since 2003. The 2005 run was the largest in 30 years and 2006 was above average for an even-numbered year run. The drainage-wide OEG of 300,000 fall chum salmon was exceeded in the preceding five years. The five year average (2002-2006) total reconstructed run of approximately 950,000 fish was greater than the 1989-1998 10-year average of approximately 818,000 fish, which indicated a return to historical run levels (Borba et al., 2009).

As with summer chum salmon, the BOF also modified the Yukon River Fall Chum Salmon Management Plan in January 2010. The BOF lowered the threshold required to allow a directed fall chum salmon commercial fishery from a run size of 600,000 fall chum salmon to 500,000 fall chum salmon. This modification also changed the threshold in the Yukon River Coho Salmon Management Plan from a run size of 550,000 fall chum salmon to 500,000 fall chum salmon in order to conduct a coho salmon directed commercial fishery (Hayes and Norris, 2010).

Since adopted by the BOF in 2001, the subsistence salmon fishery has been managed based on a schedule implemented chronologically consistent with migratory timing as the run progresses upstream. Subsistence fishing is open seven days per week until the schedule is established. The subsistence salmon fishing schedule is based on current or past fishing schedules and provides reasonable opportunity for subsistence during years of normal to below average runs. The objectives of the schedule are to 1) reduce harvest early in the run when there is a higher level of uncertainty, 2) spread the harvest throughout the run to reduce harvest impacts on any particular component of the run and 3) provide subsistence fishing opportunity among all users during years of low salmon runs (personal communication, J. Linderman, 2010). Table 14 below presents the 2010 subsistence fishing schedule as it was established prior to the start of the season. Once commercial fishing is opened,

[21] A stock of yield concern is defined as a concern arising from a chronic inability, despite use of specific management measures, to maintain expected yields, or harvestable surpluses, above a stock's escapement needs (5 AAC 39.222(f)(42)).

subsistence fishing is open seven days per week, 24 hours per day, with the exception of closed periods 18 hours before, during, and 12 hours after commercial openings.

Table 14 Yukon Area subsistence fishing schedule by Yukon River district, 2010

Geographic Area/District	Fishing Period	Schedule to Begin	Days of the Week
Coastal District	7 days/week	All season	M/T/W/Th/F/Sa/Su - 24 hours
District Y-1	Two 36-hour periods/week	7-Jun-10	Mon. 8 pm to Wed. 8 am/Thu. 8 pm to Sat. 8 am
District Y-2	Two 36-hour periods/week	9-Jun-10	Wed. 8 pm to Fri. 8 am/Sun. 8 pm to Tue. 8 am
District Y-3	Two 36-hour periods/week	13-Jun-10	Wed. 8 pm to Fri. 8 am/Sun. 8 pm to Tue. 8 am
Subdistrict Y-4-A	Two 48-hour periods/week	16-Jun-10	Sun. 6 pm to Tue. 6 pm/Wed. 6 pm to Fri. 6 pm
Subdistricts Y-4-B, C	Two 48-hour periods/week	23-Jun-10	Sun. 6 pm to Tue. 6 pm/Wed. 6 pm to Fri. 6 pm
Koyukuk and Innoko Rivers	7 days/week	All season	M/T/W/Th/F/Sa/Su - 24 hours
Subdistricts Y-5-A, B, C	Two 48-hour periods/week	29-Jun	Tue. 6 pm to Thu. 6 pm/Fri. 6 pm to Sun. 6 pm
Subdistricts Y-5-D	7 days/week	All season	M/T/W/Th/F/Sa/Su - 24 hours
District Y-6	Two 42-hour periods/week	All seaon	Mon. 6 pm to Wed. Noon/Fri. 6 pm to Sun. Noon
Old Minto Area	5 days/week	All season	Friday 6 pm to Wednesday 6 pm

Source: Hayes and Norris, 2010.

Subsistence Harvest Assessment Methods

Most Yukon Area communities have no regulatory requirements to report their subsistence salmon harvest. For these communities, ADF&G operates a voluntary survey program. Harvest information is collected through postseason household interviews, follow-up telephone interviews and postal questionnaires, and harvest calendars. In select areas, fishermen must document their harvest on a subsistence or personal use permit. Subsistence harvest information is necessary to determine if sufficient salmon are returning to the Yukon Area for escapement and subsistence requirements, and if adequate fishing opportunity is provided to meet subsistence uses. Subsistence harvest information is critical for run reconstruction analysis and forecasting (Bergstrom et al., 2009).

Harvest information is collected using a combination of subsistence harvest calendars mailed prior to fishing activities, postseason household interviews, postseason telephone interviews, and postseason post card reminders. In road-accessible portions of the Yukon area, including the majority of the Tanana River drainage (subdistricts 6A and 6B, and the Upper Tanana River drainage), the Yukon River drainage between Hess Creek and the Dall River (known as the Yukon River bridge area), the upper portion of Subdistrict 5D between the upstream mouth of Twenty-two Mile Slough and the U.S.–Canada border, and, as of 2004, the Rampart area (western end of Garnet Island to the mouth of Hess Creek), and the Middle and South Fork area of the Koyukuk River, subsistence fishers are required to obtain an annual household permit prior to fishing,

document their subsistence salmon harvest on the household permit, and return it to ADF&G at the end of the season (Fall et al., 2009).

Prior to salmon fishing activities, subsistence harvest calendars are mailed to all identified fishing households within the survey communities. The Lower Yukon Area calendars contain the months of May through September and the Upper Yukon Area calendars contain the months of June through October. Additional calendars are mailed to those households for which fishing activities are unknown and are also made available to households upon request from ADF&G offices in Emmonak and Fairbanks. The calendars provide space for fishers to record their daily subsistence harvest of salmon by species. Calendars are return-postage-paid and are mailed to ADF&G or given to ADF&G research staff during postseason trips to the villages, especially to conduct the postseason salmon survey. Posters sent to village post offices and announcements on area radio stations remind fishers to give their calendars to research staff (Fall et al., 2009).

In addition to the harvest calendars, ADF&G Division of Commercial Fisheries staff conducted postseason in-person interviews with a stratified random sample of all households within the Yukon River drainage. Survey questions focus on Chinook, summer chum, fall chum, and coho salmon, but households are also asked about other fish species as well. Some households that are not contacted in person by the surveyors are contacted by telephone. Those households not contacted by telephone are mailed a survey questionnaire and a postage-paid return envelope (Fall et al., 2009).

A subsistence permit is required in the road-accessible portions of the Yukon River drainage. Subsistence fishers record their daily salmon harvests on a household permit and return the permit within 10 days of the expiration date on the permit. Subsistence permit applications are mailed to all who returned the prior year's permit, along with instructions on how to apply by mail. In addition, ADF&G staff travel to select villages so that applicants can be issued permits in person. Permits are also issued in several ADF&G offices or by mail throughout the season. Those who do not return permits are sent up to two reminder letters. Telephone contacts with households that do not respond to the reminder letters are attempted as a final measure (Fall et al., 2009).

Subsistence salmon permit holders in a portion of Subdistrict 6B (the Tanana River drainage above a point three miles upstream of Totchaket Slough to the boundary with 6C) and personal use harvesters in Subdistrict 6C are required to report their harvests weekly for inseason management purposes. To maximize the return of permits, ADF&G sends reminder letters to these households. Most unreturned permits are considered unfished, as subsistence fishing households are not eligible to receive a permit the following year until the previous year's permit is returned (Fall et al., 2009).

Chum Salmon Subsistence Harvest

The species composition of the estimated 2008 subsistence–personal use salmon harvests for the entire Yukon Area included 86,652 summer chum salmon (35%) and 89,538 fall chum salmon (36%) out of a estimate of 247,936 total salmon (all species) (Figure 26). This is an estimated total based on household surveys and returned permits and calendars, and it includes subsistence harvests, personal use harvests, commercial harvests retained for home uses, and fish distributed from ADF&G test fisheries. The 2008 harvest estimates registered above the 5-year average for fall chum salmon and below the 5-year average for summer chum salmon. While low salmon abundance in 2001 closed commercial fishing in the Alaska portion of the Yukon River drainage, a small commercial fishery for Chinook and summer chum salmon has been offered in every year since, including 2007 (Fall et al., *in prep*).

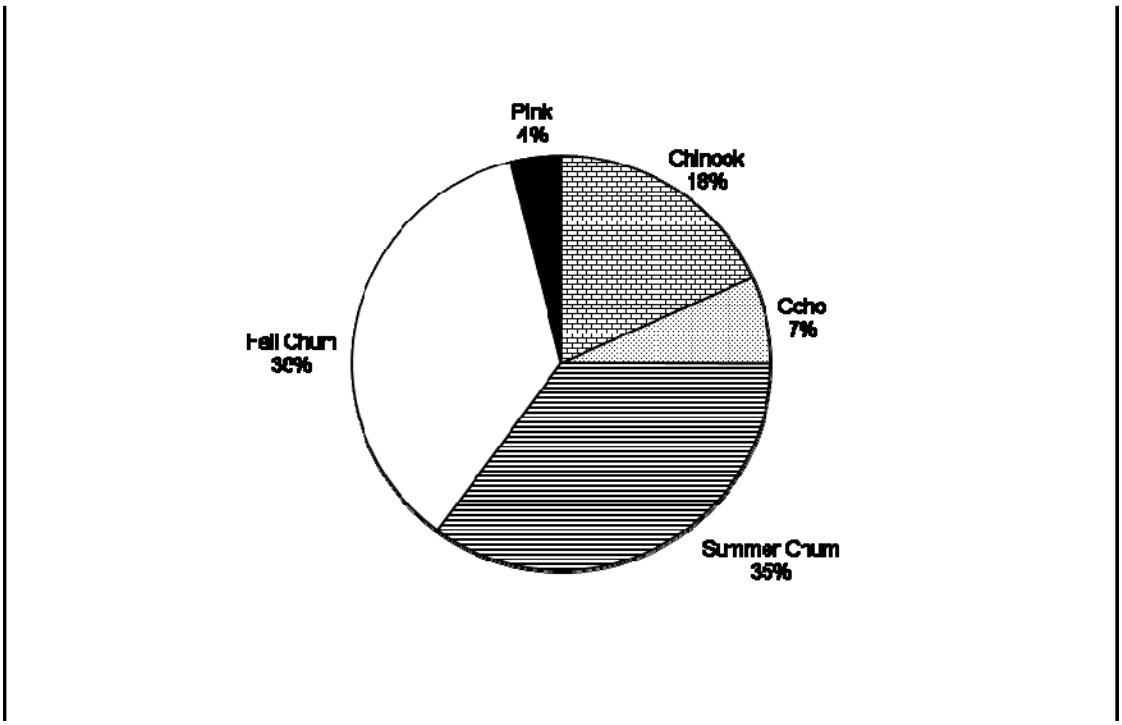


Figure 26 Yukon area estimated subsistence salmon harvests, 2008

Source: Fall et al., *in prep*.

The estimated 2008 subsistence harvest of 86,652 summer chum salmon was below both the five year and 10-year averages (93,011 and 86,947, respectively). While summer chum salmon harvests have been relatively stable since 1990, they mark a significant decrease from the 1980s when harvests were higher, likely due to the then-existing commercial roe fishery in the middle Yukon River. The fall chum salmon harvest of 89,538 is also an increase in harvest since 1997 and registers above both the 5-year average of 79,540 fall chum salmon and the 10-year average of 61,973 fall chum salmon, both of which reflect multiple years of poor runs and harvests (Figure 27 and Table 15). It should be noted that regulatory restrictions were implemented so as to protect fall chum salmon stocks due to these poor runs in 1998, and 2000 through 2003. While harvests of fall chum salmon have recently climbed from earlier years' estimates, comparison with average fall chum salmon harvests for 1976–2007 begins to show the true magnitude of the harvest decline in this fishery between 2000 and 2003; the historical average (1976–2007) harvest of fall chum salmon was 117,460 fish (Fall et al., *in prep*).

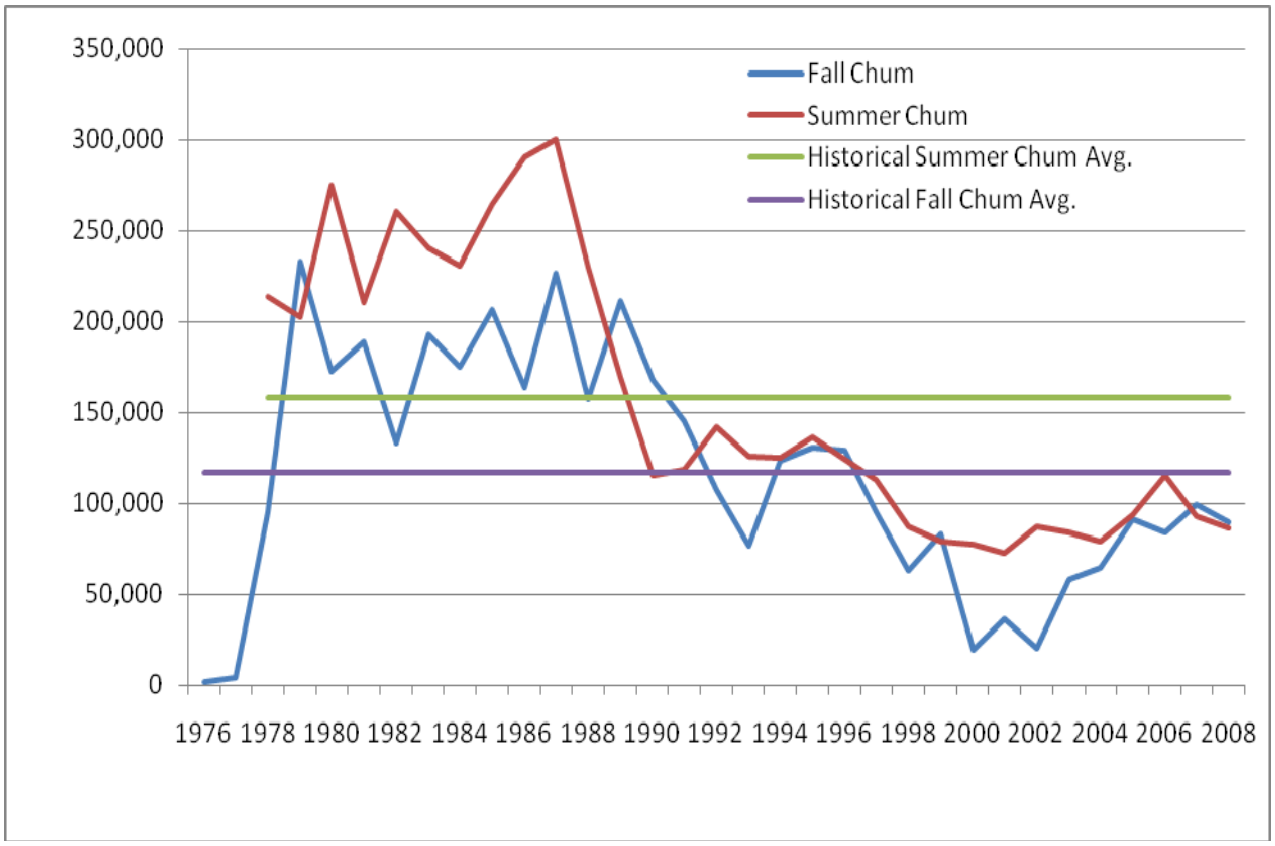


Figure 27 Estimated historical subsistence chum salmon harvest, Yukon River area, 1976 - 2008

Table 15 Estimated historical subsistence chum salmon harvest, Yukon River area, 1976-2008

	Households or Permits[a]		Estimated salmon harvest[a]					
Community	Total	Surveyed or Returned	Chinook	Coho	Summer Chum	Fall Chum	Pink	Total
1976			17,530	12,737		1,375		31,642
1977			16,007	16,333		4,099		36,439
1978			30,785	7,965	213,953	95,532		348,235
1979			31,005	9,794	202,772	233,347		476,918
1980			42,724	20,158	274,883	172,657		510,422
1981			29,690	21,228	210,785	188,525		450,228
1982			28,158	35,894	260,969	132,897		457,918
1983			49,478	23,905	240,386	192,928		506,697
1984			42,428	49,020	230,747	174,823		497,018
1985			39,771	32,264	264,828	206,472		543,335
1986			45,238	34,468	290,825	164,043		534,574
1987			55,039	46,213	300,042	226,990		628,284
1988	2,700	1,865	45,495	69,679	229,838	157,075		502,087
1989	2,211	983	48,462	40,924	169,496	211,303		470,185
1990	2,666	1,121	48,587	43,460	115,609	167,900		375,556
1991	2,521	1,261	46,773	37,388	118,540	145,524		348,225
1992	2,751	1,281	47,077	51,980	142,192	107,808		349,057
1993	3,028	1,397	63,915	15,812	125,574	76,882		282,183
1994	2,922	1,386	53,902	41,775	124,807	123,565		344,049
1995	2,832	1,391	50,620	28,377	136,083	130,860		345,940
1996	2,869	1,293	45,671	30,404	124,738	129,258		330,071
1997	2,825	1,309	57,117	23,945	112,820	95,141		289,023
1998	2,986	1,337	54,124	18,121	87,366	62,901		222,512
1999	2,888	1,377	50,515	19,984	79,250	83,420		233,169
2000	3,209	1,341	36,844	16,650	77,813	19,402	1,591	152,300
2001	3,072	1,355	56,103	23,236	72,392	36,164	403	188,298
2002	2,775	1,254	44,384	16,551	87,599	20,140	8,425	177,100
2003	2,850	1,377	56,872	24,866	83,802	58,030	2,167	225,737
2004	2,721	1,228	57,549	25,286	79,411	64,562	9,697	236,506
2005	2,662	1,406	53,547	27,357	93,411	91,667	3,132	269,114
2006	2,833	1,473	48,682	19,985	115,355	84,320	4,854	273,196
2007	2,819	1,495	55,292	22,013	93,075	99,120	2,118	271,618
2008	3,030	1,664	45,312	16,905	86,652	89,538	9,529	247,936
5-year average (2003-2007)	2,777	1,396	54,388	23,901	93,011	79,540	4,394	255,234
10-year average (1998-2007)	2,882	1,364	51,391	21,405	86,947	61,973	4,048	224,955
Historical average (1976-2007)	2,807	1,347	45,293	28,368	158,645	117,460	4,048	340,864

Source: ADF&G Division of Commercial Fisheries personal communication, preliminary report.

Tables 1, 3, 7, and 11. Preliminary results as of June 9, 2009.

[a]Estimates prior to 1988 are based on fish camp surveys and sampling information is unavailable.

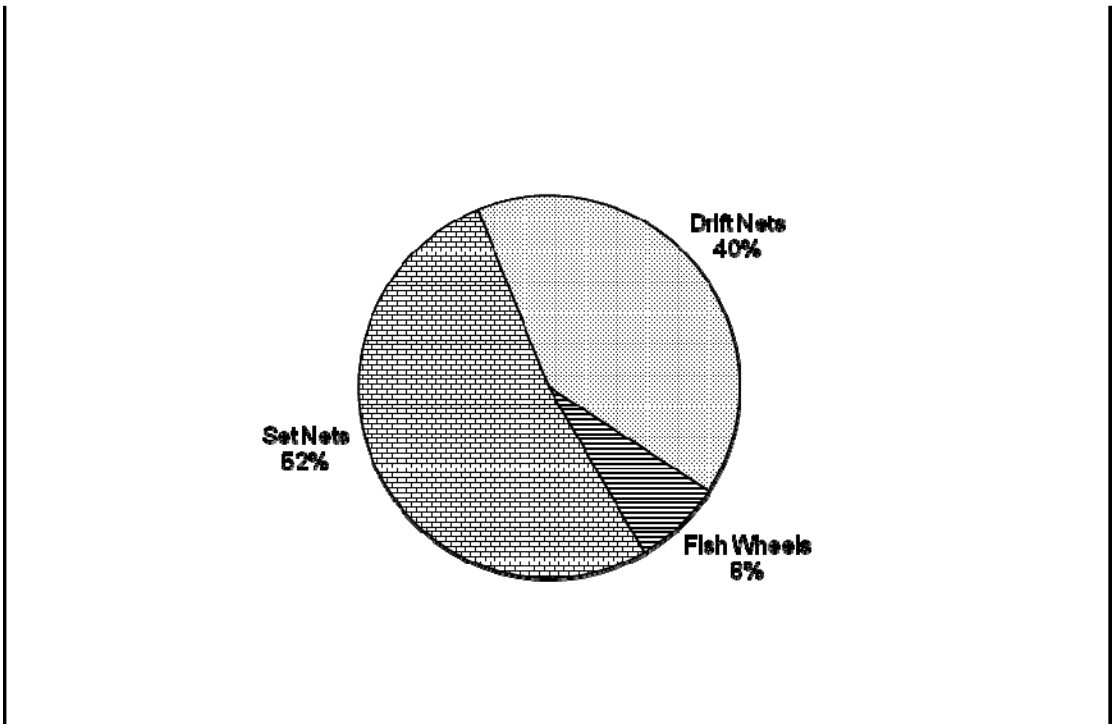


Figure 28 Primary gear type utilized for subsistence salmon fishing, Yukon area, 2008

Source: Fall et al., *in prep*.

Primary gear types used by fishing households in surveyed villages in 2007 included set gillnet (50%), drift gillnet (41%), and fish wheel (9%), largely the same as 2006 (Figure 28) (Fall et al., 2009).

Of the estimated 1,267 households (drainage-wide) owning dogs, about 11% (144 households) are estimated to have fed their dogs whole salmon in 2007. Of the 5,297 dogs owned by fishing households in 2008, about 66% (3,517 dogs) were owned by households in the Upper Yukon River, which includes districts 4, 5, and 6. In 2007, species-specific information on the number of salmon retained for dog food was collected from subsistence harvests in surveyed communities, but not in permit communities. In the Coastal District and in districts 1 through 5, an estimated 16,265 summer chum salmon and 28,717 fall chum salmon were retained for dog food from subsistence salmon harvests. An additional 33,836 whole salmon (species unknown) were fed to dogs by permit holders, including those users in District 6. From commercial harvests, 5,527 summer chum salmon and 80 fall chum salmon were retained and used as dog food in Districts 1–5 (Fall et al., 2009).[22]

[22] This information will be updated with the 2008 Alaska Subsistence Salmon Fisheries Annual Report when it is available; this report is expected in late January 2011.

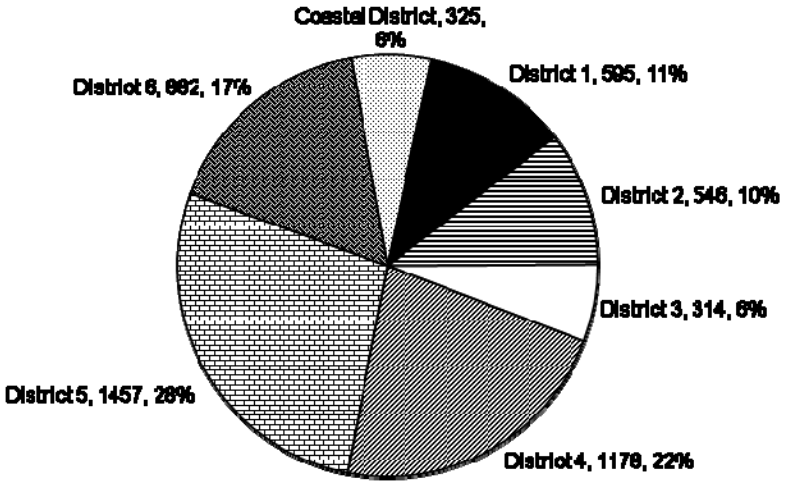


Figure 29 Estimated number of dogs by district, Yukon area, 2008

Source: Fall et al., *in prep*.

Since 1992, ADF&G has inquired as to whether surveyed households were meeting their subsistence salmon needs for that year. The disastrous fishing year in 2000 resulted in restrictions and closures in subsistence salmon fishing schedules and made it extremely difficult for fishing families to meet their needs (64% of surveyed households reported not meeting their needs in 2000). In 2003, ADF&G began asking this question in a species-specific manner, measuring responses by community and by species. Specifically, surveyed households were asked whether 100%, 75%, 50%, or <25% of their harvest needs were met for each species. Two checkboxes, "0%" and "no need," were added to the 2005 survey in order to distinguish those who had a need, but no success in harvesting a species, from those who had no need and therefore, did not harvest any fish. According to 2007 data, 48% reported meeting >75% of their needs for summer chum salmon and 29% reported meeting >75% of their needs for fall chum salmon and coho salmon. This represents a decrease in households reporting that the majority of their needs were met from 2005 and also a decrease in what residents reported in 2006. Forty-seven percent, 69%, and 68% of households reporting meeting less than one-half their needs for summer chum salmon, fall chum salmon, and coho salmon (Fall et al., 2009).[23]

In 1993, the BOF made a positive customary and traditional (C&T) use finding for all salmon in the Yukon–Northern Area. Since 1990, the overall total subsistence salmon harvest in the Yukon area has declined by approximately 30%. The ANS determination for summer chum salmon was established at 83,500-142,192 and at 89,500-167,900 for fall chum salmon. In 2001, the BOF determined species-specific amounts of salmon necessary for subsistence. All species were within ANS ranges in 2007; 2005 and 2007 mark the only times this has happened since 2001 (and 1998, if species-specific ANS estimates are projected back to 1998) (Table 8) (Fall et al., 2009).

[23] This information will be updated with the 2008 Alaska Subsistence Salmon Fisheries Annual Report when it is available; this report is expected in late January 2011.

Table 16 Comparison of amounts necessary for subsistence (ANS) and estimated subsistence chum salmon harvests, Yukon River area, 1998-2008

	Chinook	Coho	Summer Chum	Fall Chum
ANS Range	45,500-66,704	20,500-51,980	83,500-142,192	89,500-167,900
Year	Estimated Number of Subsistence Salmon Harvested			
1998	54,124	**18,121**	87,366	**62,901**
1999	53,305	20,885	83,784	89,940
2000	**36,404**	**14,939**	**78,072**	**19,395**
2001	55,819	22,122	**72,155**	**35,703**
2002	**43,742**	**15,489**	87,056	**19,674**
2003	56,959	23,872	**82,272**	**56,930**
2004	55,713	20,795	**77,934**	**62,526**
2005	53,409	27,250	93,259	91,534
2006	48,593	**19,706**	115,093	**83,987**
2007	55,156	21,878	92,891	98,947
2008	**45,186**	**16,855**	86,514	**89,357**

Source: ADF&G Division of Commercial Fisheries preliminary report; Appendices B1-B4. Preliminary results as of January 4, 2011.
Bold underlined cells indicate harvest amounts are below the minimum ANS. Totals include Coastal District, harvests from subsistence permits, and test fish. Totals do not include personal use salmon harvests.

In January 2001, the BOF used ADF&G's harvest data to adjust the amount necessary for subsistence, a measure which attempts to quantify the amount of salmon reasonably necessary for subsistence use in the Yukon area. Harvest estimates include personal use, test fish distributions, and commercial retained and these parameters were included in harvest estimates used to establish current ANS ranges[24]. The BOF established maximum and minimum ANS harvest ranges based on the total historic estimated harvest for each species by all districts combined for the years from 1990 to 1999, with exceptions for years when subsistence fishing was restricted to meet escapement requirements for fall chum salmon and coho salmon. The ANS levels represent the needs of all subsistence users drainagewide and do not necessarily reflect the needs of specific individuals, communities, or sections of the drainage.

3.3.5 Arctic Alaska

Arctic Alaska includes the Norton Sound, Port Clarence, and Kotzebue management districts. These three districts include all waters from Point Romanoff in southern Norton Sound to Point Hope, and St. Lawrence Island. These management districts encompass over 65,000 square miles and have a coastline exceeding that of California, Oregon, and Washington combined (Soong et al., 2008). There are approximately 17,000 people in the area, the majority of whom are Native Alaskans residing in more than 30 villages scattered along the coast and major river systems (Menard et al., *in prep*).

[24] It should be noted that harvest estimates derived from source data presented in Table 16 will differ when compared to harvest estimates (prior to 2005) presented in the 2008 Annual Subsistence Report (scheduled to be published in 2011). Subsistence harvest estimates presented in the 2008 Annual Subsistence Report have been adjusted and do not include personal use harvests, ADF&G test fishery distributions, or salmon retained from commercial harvests.

The five species of Pacific salmon are indigenous to the area; however, chum salmon, coho salmon, and pink salmon are the most abundant. Table 17 below provides a summary of subsistence salmon harvest for Arctic Alaska in 2008 (Fall et al., *in prep*). In summer, subsistence fishers harvest salmon with gillnets or seines in the main Seward Peninsula rivers and in the coastal marine waters. Beach seines are used near the spawning grounds to harvest schooling or spawning salmon and other species of fish. A major portion of fish taken during the summer months is air dried or smoked for later consumption by residents. Chum and pink salmon are the most abundant species throughout the area (Fall et al., 2009).

Two visits by ADF&G personnel are made to each village in the management area in order to issue Tier I subsistence fishing permits. Villagers can also call the Nome office toll free and a permit will be mailed or faxed when possible. Village residents are able to mail completed permits to the Nome office postage free. Attempts are made to contact all permit holders who did not return their household permit by phone or letter. Also, trips to villages are made postseason by ADF&G personnel to collect permits and discuss the fishing season (Menard et al., *in prep*).

In 2004, ADF&G's subsistence salmon harvest assessment program changed when household surveys were discontinued in most communities because the Tier 1 household subsistence permit system was expanded from Nome to include Port Clarence District and Norton Sound Subdistricts 2 and 3. Thereafter, subsistence salmon harvest for those communities is reported totals from subsistence permits, so household surveys have not been necessary (Menard et al., *in prep*).

In 2007, the BOF approved new regulations to allow for cash sales of up to $200 worth of subsistence-taken finfish per household, per year, harvested in Norton Sound-Port Clarence Area only. Persons intending to sell any subsistence-taken salmon (and other finfish) need to obtain a free customary trade permit from Nome ADF&G and record cash sales on the permit. Sales cannot be made to a fishery business or resold by the buyer (Menard et al., *in prep*).

Table 17 Subsistence salmon harvests by district, Arctic Alaska, 2008

		Estimated salmon harvest[a]					
District	Households surveyed or permits returned	Chinook	Sockeye	Coho	Chum	Pink	Total
Norton Sound District[b]	1,151	3,087	399	18,889	11,505	56,096	89,976
Port Clarence District[c]	399	125	5,144	562	2,499	7,627	15,957
Kotzebue Area[d]	ND	ND	ND	ND	ND	ND	ND
Total[e]	1,172	3,212	5,543	19,451	14,004	63,723	105,933

Source: ADF&G Division of Subsistence, ASFDB 2009 (ADF&G 2009) and Kawerak, Inc., household survey, 2009.

a. Harvests reported during household surveys are expanded into estimates to account for uncontacted households. Harvests reported on permits are not expanded.

b. Household surveys conducted in Unalakleet, Koyuk, Shaktoolik, St. Michael, and Stebbins. Permits issued for Cape Woolley, Nome Subdistrict (Tier I), Golovin Subdistrict, and Elim Subdistrict.

c. Permits issued for Port Clarence Subdistrict, Pilgrim River, and Salmon Lake.

d. Due to lack of funding, no collection of subsistence salmon harvest data took place in Kotzebue Sound communities for 2008. The average yearly subsistence harvest of salmon in the Kotzebue area between 1994 and 2004 was 59,650 fish. ND = No data.

e. Households surveyed or permits returned column does not add up to the total shown above due to individual households fishing in multiple districts.

3.3.5.1 Norton Sound

Description of Management Area

The Norton Sound District encompasses all waters from Point Romanof north to Cape Douglas. It is divided into six subddistricts: 1) Nome, 2) Golovin, 3) Moses Point, 4) Norton Bay, 5) Shaktoolik, and 6) Unalakleet. The subdistrict and statistical area boundaries were established to facilitate management of individual salmon stocks, and each subdistrict contains at least one major salmon-producing stream (Soong et al., 2008). In 2001, a regulatory change by the BOF made rod and reel a legal subsistence fishing gear type in the area from Cape Espenberg on northern Seward Peninsula to Bald Head, which is between Elim and Koyuk. This area includes subsistence fishing areas used by the residents of Nome, White Mountain, Golovin, Elim, Koyuk, Shaktoolik, and Unalakleet (Fall et al., 2009). Although a fishing pole can be used for subsistence fishing, sport fish methods and means requirements still apply to harvesting of fish.

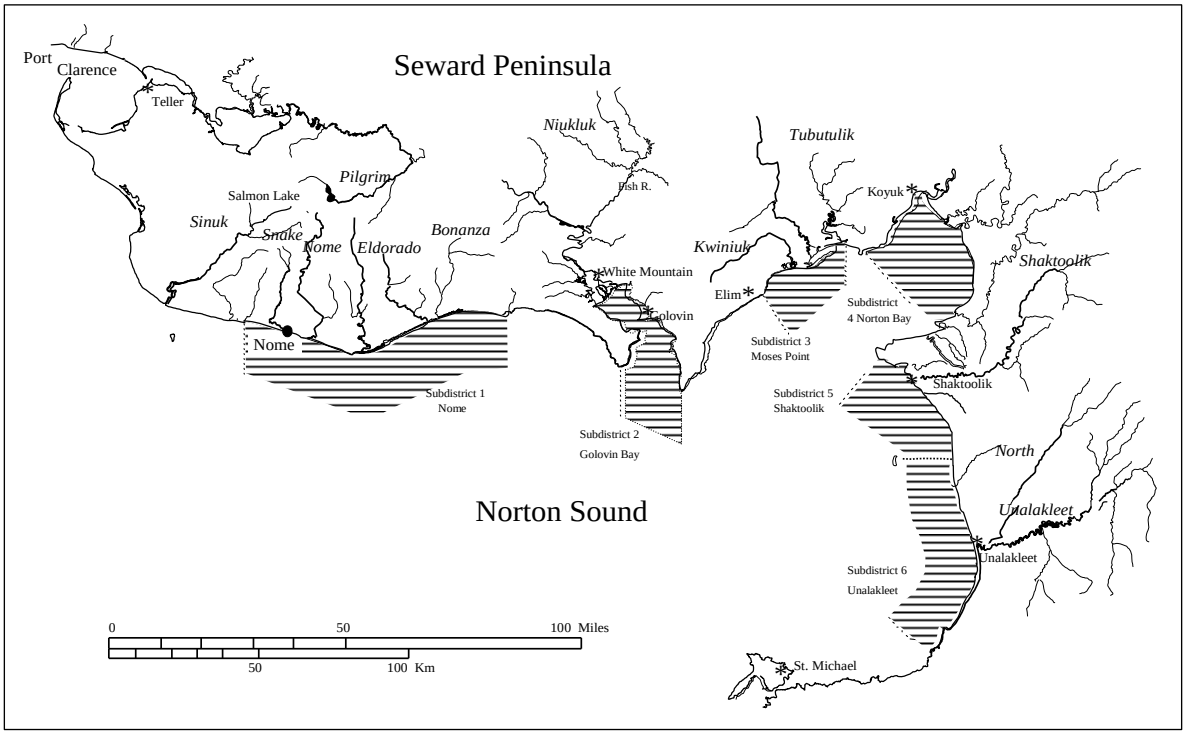


Figure 30 Norton Sound District

Salmon management in Norton Sound has changed significantly since the mid 1990s because of limited market conditions and marginal returns of many salmon stocks within the district. Except for the Nome Subdistrict, commercial fishing can occur if salmon runs are sufficient and a commercial market opens. The Nome Subdistrict is managed intensively for subsistence use: Tier II chum salmon subsistence permits, registration permits, closed waters, setting fishing period length, limiting gear, and harvest limits are all tools employed throughout the season to provide for escapement needs and to maximize subsistence opportunity (Menard et al., *in prep*).

Chum Salmon Subsistence Harvest

The estimated 2008 subsistence harvest of salmon by communities in the Norton Sound District was 89,976 fish (Table 18). Subsistence harvesters took 11,505 chum salmon runs (13%) in 2008, compared to just over

18,000 in 2007 and 10,000 in 2006 (Table 18; Figure 31). Very little of the documented subsistence salmon harvest was taken by residents from outside the district (Fall et al., *in prep*).

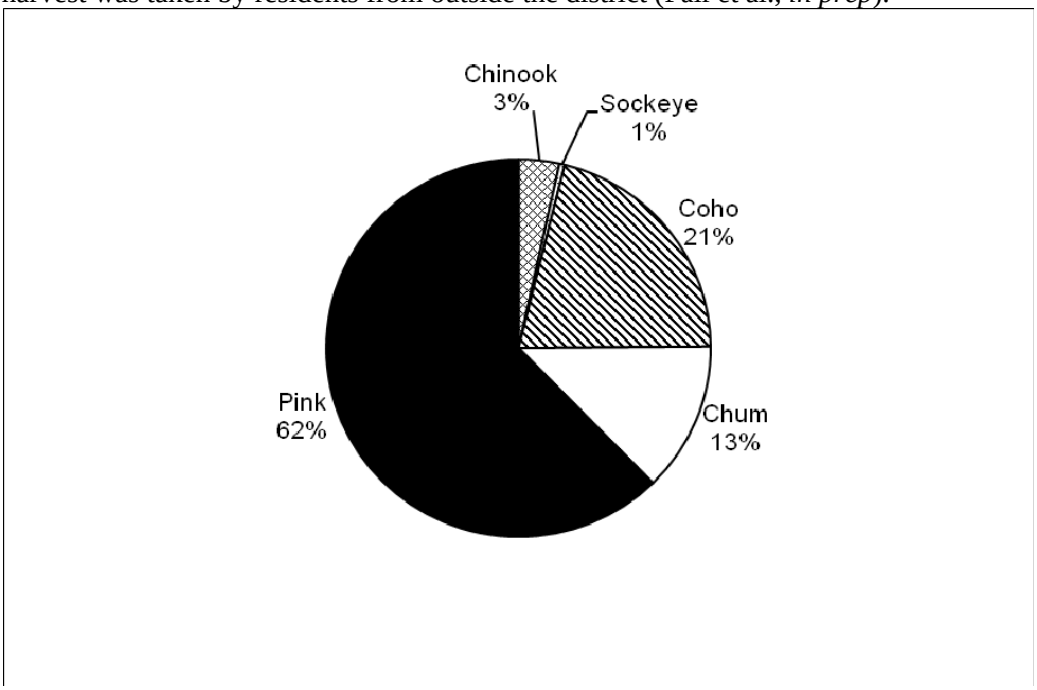


Figure 31 Species composition of estimated subsistence salmon harvests, Norton Sound District, 2008

Source: Fall et al., *in prep*.

Subdistrict 1 (Nome)

In Subdistrict 1 (Nome), subsistence harvests consist primarily of pink salmon, coho salmon, and chum salmon. Chum salmon runs have been depressed for over 20 years, leading to increasing restrictions on all types of harvest. Upstream portions of most rivers are closed to protect spawning salmon, and harvests are limited in all Subdistrict rivers. For 16 years, subsistence fishing has been prosecuted primarily by emergency order, with openings much less frequent than in regulation (Fall et al., 2009).

In September 2000, the BOF classified chum salmon in the Nome Subdistrict as a stock of management concern. The stock of concern determination was a result of persistent low chum salmon productivity since the mid-1980s. Commercial and sport fishing for chum salmon are closed in Subdistrict 1 and subsistence salmon management is among the most restrictive in Alaska with a Tier II[25] chum salmon fishery in effect from 1999 - 2005. In 1999, the chum salmon return was so poor that even Tier II fishing was closed; in 2000, only 10 permits were awarded. The classification as a management concern was continued at the January 2004 BOF meeting. In 2007, the BOF changed the status of Subdistrict 1 chum salmon from a stock of management concern to a stock of yield concern based on data showing that during the preceeding five years (2002-2006) a majority of chum salmon escapement goals had been achieved in Subdistrict 1. Since the 2006 fishing season, Subdistrict 1 has reverted back to Tier I[26] subsistence fishing regulations (including observance of the fishing schedule provided in regulation) because projected runs of chum salmon exceeded the amount necessary for

[25] A "Tier II" subsistence permit program is necessary when the number of participants in a subsistence fishery must be limited because the harvestable surplus of the fish stock is less than the amount necessary to provide for subsistence uses. Individuals are scored based on their history of uses of the particular resource and the ability to obtain food; those with the highest scores receive Tier II permits.
[26] In a Tier I subsistence fishery, all interested Alaska residents may participate. Other harvesters (commercial, sport, and personal use) are prohibited or restricted.

subsistence; however, at the October 2009 BOF work session, ADF&G recommended continuation of Norton Sound Subdistrict 1 chum salmon as a stock of yield concern based on low yields for the recent five year (2005-2009) period compared to historical yields in the 1980s. In 2009, ADF&G forecasted the chum salmon run to reach the lower end of the escapement goal range, but by mid-July the chum salmon run in Subdistrict 1 was projected to fall short of the escapement goal, and subsistence salmon gillnetting and subsistence chum salmon fishing was subsequently closed (Menard and Bergstrom, 2009).

Permits have been required for subsistence salmon fishing in Norton Sound Subdistrict 1 since 1974. By regulation, permits with catch calendars are issued to each requesting household listing all Nome Subdistrict fishing locations, catch limits, and gear restrictions. After the fishing season, households are required to return the completed permit to ADF&G regardless of whether or not they actually fished (Menard et al., *in prep*). Since 1998, the Nome permit data have not been expanded to account for households whose permits were not returned. This contrasts with earlier years when permit data were expanded by drainage, with expansion factors based upon the fraction of unreturned permits for that drainage. ADF&G staff believed that expansion of the permit data led to an overestimation of the salmon harvest because the unreturned permits were most likely from households that did not fish (Fall et al., 2009). Beginning in 2004, stricter enforcement of regulations including fines for failure to return a permit has resulted in nearly all permits issued being returned (Menard et al., *in prep*). In 2008, the Nome ADF&G office issued 455 subsistence (Tier I) salmon permits; 448 were returned.

Subdistricts 2 (Moses Point), 3 (Golovin), and 4 (Norton Bay)

At its September 2000 work session, the BOF classified Norton Sound Subdistricts 2 and 3 chum salmon as a stock of yield concern. This determination was based on low harvest levels for the previous five year (1995-1999) period. The classification was continued at the January 2004 BOF meeting and at the January 2007 BOF meeting. At the October 2009 BOF work session, ADF&G recommended continuation of the Norton Sound Subdistrict 2 and Subdistrict 3 chum salmon as a stock of yield concern. Based on data from 2005-2009, low yields of chum salmon continue in Subdistricts 2 and 3; yields have been inconsistent, but often low. Subsistence chum salmon harvests averaged 1,767 and 1,216 fish in Subdistricts 2 and 3, respectively, from 2005-2009. From 2004-2009, the SEG in Subdistrict 2 was achieved only in 2007 (Menard and Bergstrom, 2009).

Subsistence permits were required for salmon fishing in Golovin and Moses Point for the fourth year as of 2007. In 2007, 153 permits were issued for subdistrict 2; fewer than in 2004 (199) and 2005 (174). Of the permits issued in subdistrict 2, 152 were returned. The number of Subdistrict 2 permits issued to Nome residents dropped by 25% from 2004 to 2007. Fishery managers attribute the decline to easing of fishing restrictions in the Nome subdistrict. In 2007, ADF&G issued 64 permits for Subdistrict 3, which was fewer than 2005 (70) but more than in 2004 (58) and 2006 (63). All permits were returned. No subsistence harvest information was obtained for Norton Bay in 2007 (Fall et al., 2009).[27]

Subdistricts 5 (Shaktoolik) and 6 (Unalakleet)

The Shaktoolik and Unalakleet subdistricts are typically managed together because actions in one subdistrict are believed to affect the movement of fish in the other. Restrictions were placed upon subsistence and sport fisheries in 2003, 2004, and 2006. Under the Chinook salmon management plan adopted by the BOF in February 2007 (5 AAC 04.395), subsistence gillnet salmon fishing (all species) in 2007 was limited to two 48-hour fishing periods per week from mid June to mid July. On the Unalakleet River, subsistence fishing was limited to two 36-hour fishing periods per week. Fishing time could be increased only if ADF&G were to

[27] This information will be updated with the 2008 Alaska Subsistence Salmon Fisheries Annual Report when it is available; this report is expected in late January 2011.

project that the lower end of the SEG range would be reached. By the first week of July 2007, it was believed that the Chinook salmon run would not meet the lower end of the SEG range. Marine waters in these subdistricts were closed to subsistence gillnet fishing by emergency order on July 4th. Sport fishing was closed on July 5th. Later, when it became clear that escapement goals would be met, subsistence gillnet fishing reopened on the lower Unalakleet and in the marine waters, but with mesh size restrictions in place to protect larger, predominately female fish entering rivers (Fall et al., 2009).[28]

ADF&G personnel conduct household surveys in Shaktoolik and Unalakleet. Researchers attempt to contact all of the households in each of the surveyed communities. For 2007, actual sample rates ranged from 93% in Unalakleet, where 201 of the 217 households were surveyed, to 89% in Shaktoolik, where 51 of the 57 households were surveyed. The salmon survey data were expanded by community to account for the households not contacted (Fall et al., *in prep*).

Shaktoolik and Unalakleet continue to be surveyed postseason, by household. Additionally, daily surveys of Unalakleet River and ocean subsistence fishermen have been conducted annually during the Chinook salmon run since 1985. Although total harvests by subsistence fishermen are not documented, effort and catch information are used to judge timing and magnitude of the Chinook salmon return. The commercial fishery in these areas is delayed until it becomes apparent subsistence needs are being met and Chinook salmon are beginning their upstream migration as indicated by ADF&G test net in the lower Unalakleet River (Menard et al., *in prep*).

[28] This information will be updated with the 2008 Alaska Subsistence Salmon Fisheries Annual Report when it is available; this report is expected in late January 2011.

Table 18 Subsistence chum salmon harvest by subdistrict in Norton Sound, 1998 - 2008

	Subsistence Chum Salmon					
Year	Nome	Golovin	Moses Point	Norton Bay	Shaktoolik	Unalakleet
1998	964	1,893	1,376	6,192	1,034	3,038
1999	337	3,656	744	4,153	467	3,692
2000	535	1,155	1,173	4,714	2,412	3,000
2001	858	3,291	898	4,445	1,553	2,918
2002	1,114	1,882	1,451	3,971	800	3,877
2003	565	1,477	1,687	3,397	587	1,785
2004	685	880	683	ND	139	2,154
2005	803	1,852	598	ND	202	2,660
2006	940	722	1,267	ND	351	2,712
2007	2,938	4,217	2,334	ND	465	2,057
2008	739	350	1,284	3,330	201	960

Note: ND = no data. Source: Menard et al., *in prep*.

3.3.5.2 Port Clarence

Description of Management Area

The Port Clarence District includes all waters from Cape Douglas north to Cape Prince of Wales, including Salmon Lake and the Pilgrim River drainage. In most of the district, subsistence salmon fishing has few restrictions other than the general statewide provisions. Standard permit conditions include prohibition of fishing within 300 ft of a dam, fish ladder, weir, culvert, or other artificial obstruction. Salmon may be taken in most areas at any time, with no harvest limits. Since 2004, subsistence salmon permits have been required in all Port Clarence waters. In addition, in the Pilgrim River drainage, including Salmon Lake and the Kuzitrin drainage, harvests are limited, and specified areas are closed to subsistence salmon fishing. For Salmon Lake, 2007 was the third year salmon fishing was opened in a portion of that body of water since its closure in 1972 (Fall et al., *in prep*).

In 2008, 399 Port Clarence Pilgrim River permits were issued, compared to 363 in 2007, 345 in 2006, and 330 in 2005. Of the permits issued in 2007, 201 were to fish the Pilgrim River only; 161 were for other waters in the district. The number of permits for the Pilgrim River has grown substantially, perhaps corresponding to several consecutive years of record sockeye salmon runs. All Pilgrim River permits were returned and all permits issued for Port Clarence were also returned. ADF&G issued 1 permit for Salmon Lake in 2007 (Fall et al., *in prep*).

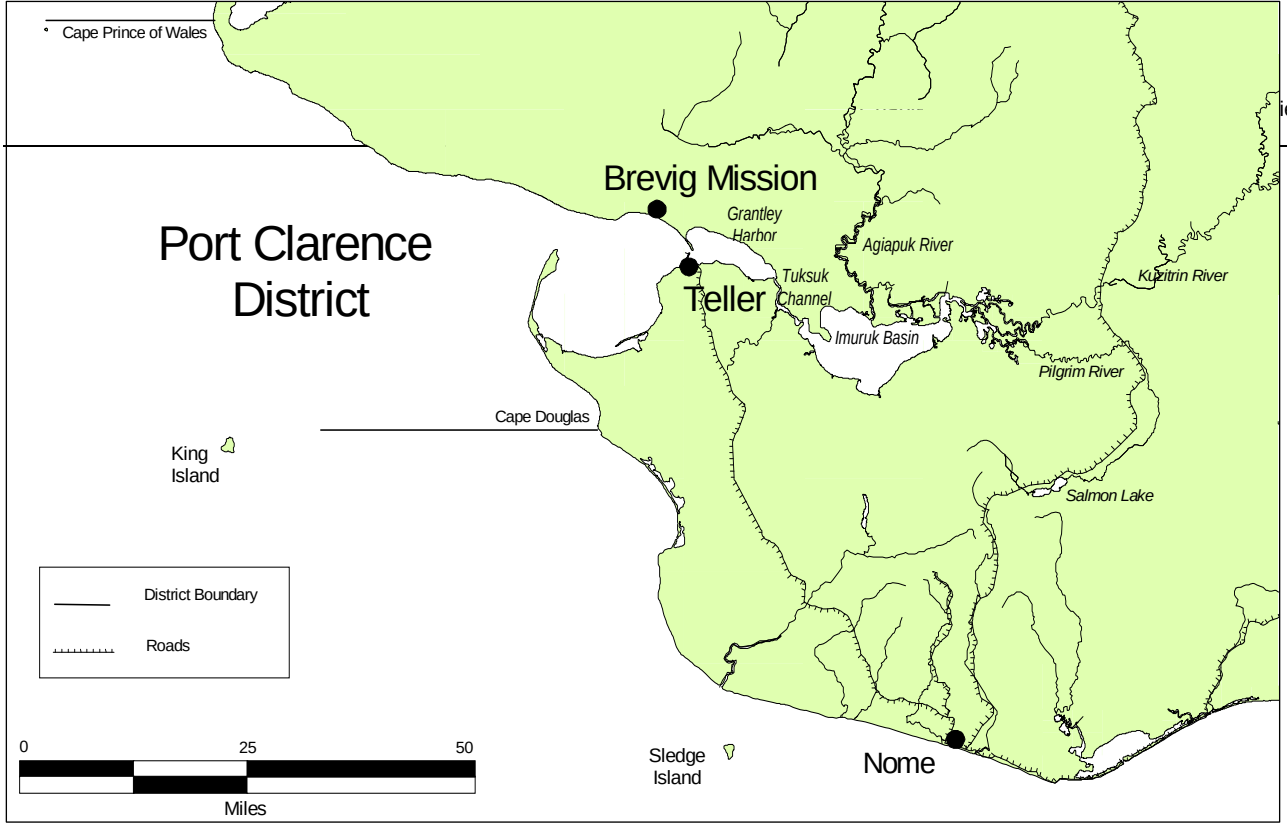


Figure 32 Port Clarence District

Chum Salmon Subsistence Harvest

The estimated 2008 subsistence harvest of salmon in the Port Clarence District was 15,957 fish (Table 18). This was lower than the previous four years. Of the total salmon harvest, 28% (2,499 fish) were chum salmon (Figure 33) (Fall et al., 2009).

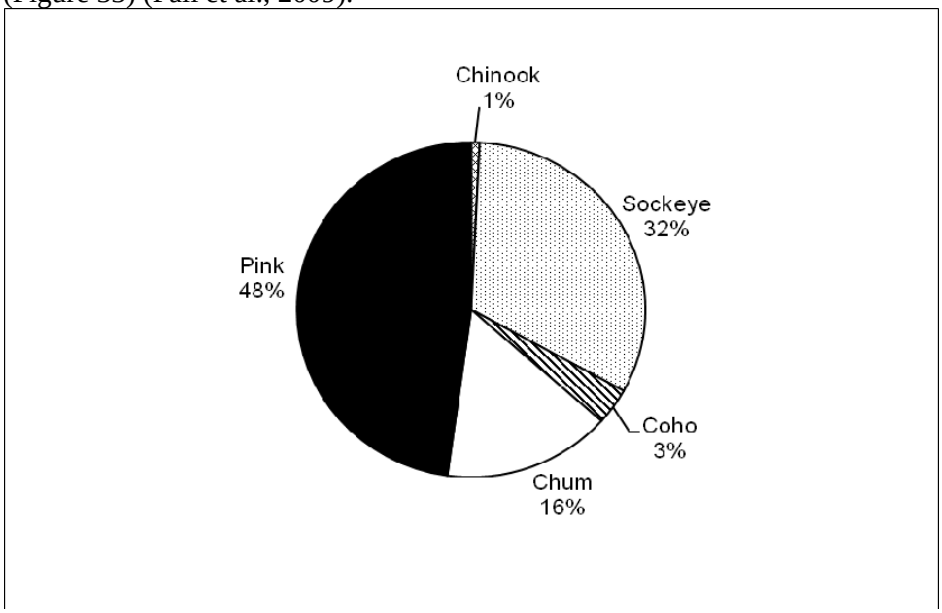


Figure 33 Species composition of estimated subsistence salmon harvests, Port Clarence District, 2008

Source: Fall et al., *in prep*.

3.3.5.3 Kotzebue

The Kotzebue area encompasses all waters from Point Hope to Cape Prince of Wales, including those waters draining into the Chukchi Sea. Along the Noatak and Kobuk rivers, where runs of chum salmon are strong, household subsistence activities in mid and late summer revolve around the harvesting, drying, and storing of salmon for uses during the winter. In southern Kotzebue Sound, fewer salmon are taken for subsistence because of low availability. Chum salmon predominate in the district, but small numbers of other salmon species are present in the district (Menard et al., *in prep*).

In the Kotzebue area, subsistence salmon fishing has few restrictions, other than the general statewide provisions. Standard conditions include prohibition of fishing within 300 ft of a dam, fish ladder, weir, culvert, or other artificial obstruction. Salmon may be taken in the district at any time with no harvest limits and no required permits. Commercial fishermen, however, are not allowed to subsistence fish for salmon during the commercial season (Fall et al., 2009).

From 1994 through 2004, with funding from the Division of Commercial Fisheries, the Division of Subsistence conducted household surveys in selected Kotzebue Sound communities to collect subsistence salmon harvest data. Since funding for that effort has not been available since 2004, no surveys have been conducted; therefore, no subsistence salmon harvest estimates are available since that time. The average yearly subsistence harvest between 1994 and 2004 was 59,650 salmon, the majority of which were chum salmon (Table 19). This average may be low due to incomplete datasets resulting in low harvest totals for several years during that period. Harvest estimates for 1994, 2002, 2003, and 2004 do not include the city of Kotzebue. Because Kotzebue is the largest community in the region, residents typically harvest as much salmon as residents from all other communities in the region combined. No harvest information is available for Ambler, a Kobuk River village, for 2001. Data for 2002 include only harvest information from Noatak and Noorvik (Fall et al., 2009).

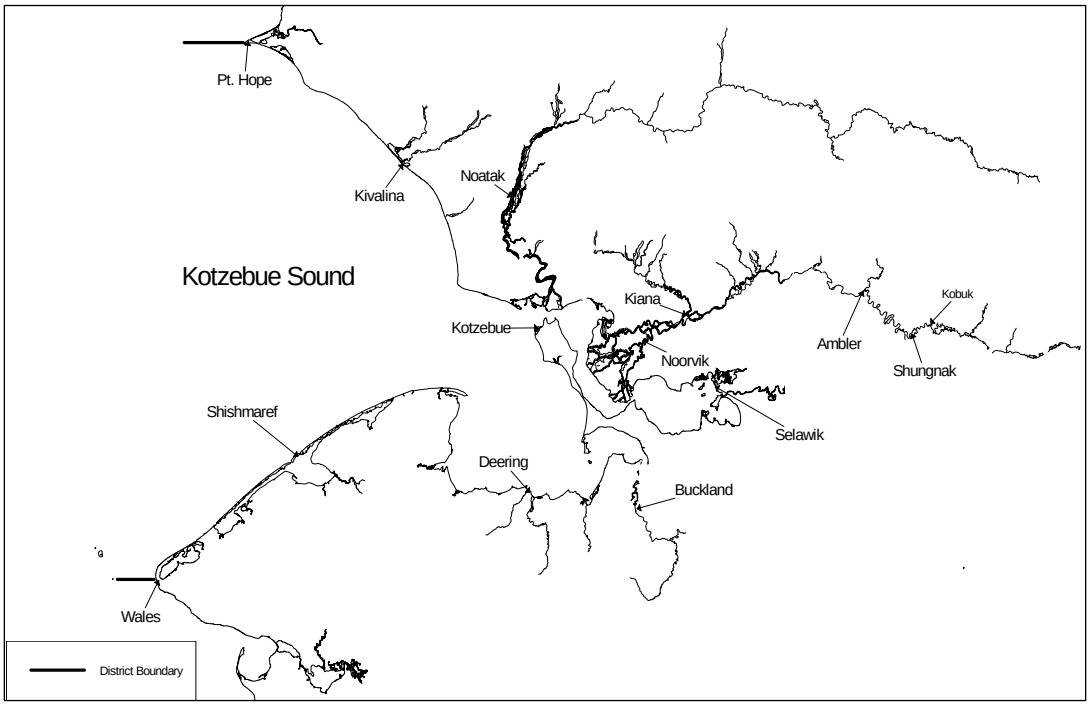


Figure 34 Kotzebue Sound area

Historical subsistence surveys for the Kotzebue Area have been less complete than for Norton Sound and Port Clarence Districts. Expanded surveys from 1995 to 2004 result in an estimated total subsistence harvest for Kotzebue to be 57,977 annually, the majority of which are chum salmon (Menard et al., *in prep*).

Table 19 Estimated historical subsistence chum salmon harvests by district, Arctic Alaska, 1994 - 2008

	Norton Sound District						
Year	Number of households	Chinook	Sockeye	Coho	Chum	Pink	Total
1994	839	7,212	1,161	22,108	24,776	70,821	126,077
1995	851	7,766	1,222	23,015	43,014	38,594	113,612
1996	858	7,255	1,182	26,304	34,585	64,724	134,050
1997[a]	1,113	8,998	1,892	16,476	26,803	27,200	81,370
1998[a]	1,184	8,295	1,214	19,007	20,032	51,933	100,480
1999	898	6,144	1,177	14,342	19,398	20,017	61,078
2000	860	4,149	682	17,062	17,283	38,308	77,485
2001	878	5,576	767	14,550	20,213	30,261	71,367
2002	935	5,469	763	15,086	17,817	64,354	103,490
2003	940	5,290	801	14,105	13,913	49,674	83,782
2004	1,003	3,169	363	8,225	3,200	61,813	76,770
2005	1,061	4,087	774	13,896	12,008	53,236	84,000
2006	1,066	3,298	901	19,476	10,306	48,764	82,745
2007	1,041	3,744	923	13,564	18,170	21,714	58,116
2008	1,151	3,087	399	18,889	11,505	56,096	89,976

	Port Clarence District						
Year	Number of households	Chinook	Sockeye	Coho	Chum	Pink	Total
1994	151	203	2,220	1,892	2,294	4,309	10,918
1995	151	76	4,481	1,739	6,011	3,293	15,600
1996	132	194	2,634	1,258	4,707	2,236	11,029
1997	163	158	3,177	829	2,099	755	7,019
1998	157	289	1,696	1,759	2,621	7,815	14,179
1999	177	89	2,392	1,030	1,936	786	6,233
2000	163	72	2,851	935	1,275	1,387	6,521
2001	160	84	3,692	1,299	1,910	1,183	8,167
2002	176	133	3,732	2,194	2,699	3,394	12,152
2003	242	176	4,436	1,434	2,425	4,108	12,578
2004	371	278	8,688	1,131	2,505	5,918	18,520
2005	329	152	8,532	726	2,478	6,593	18,481
2006	345	133	9,862	1,057	3,967	4,925	19,944
2007	362	85	9,484	705	4,454	1,468	16,196
2008	399	125	5,144	562	2,499	7,627	15,957

	Kotzebue Area[b]						
Year	Number of households	Chinook	Sockeye	Coho	Chum	Pink	Total
1994[c]	557	135	33	478	48,175	3,579	52,400
1995[d]	1,327	228	935	2,560	102,880	2,059	108,662
1996	1,187	550	471	317	99,740	951	102,029
1997	1,122	464	528	848	57,906	1,181	60,925
1998	1,279	383	392	461	48,979	2,116	52,330
1999	1,277	9	478	1,334	94,342	841	97,004
2000	1,227	211	75	2,557	65,975	75	68,893
2001[e]	1,149	11	14	768	49,014	36	49,844
2002[f]	216	3	9	56	16,880	8	16,955
2003[g]	488	40	53	1,042	19,201	583	20,918
2004[g]	440	54	18	1,502	23,348	1,259	26,181
2005[h]	ND	ND	ND	ND	ND	ND	ND
2006[h]	ND	ND	ND	ND	ND	ND	ND
2007[h]	ND	ND	ND	ND	ND	ND	ND
2008[h]	ND	ND	ND	ND	ND	ND	ND

Source: ADF&G Division of Subsistence, ASFDB 2009 (ADF&G 2009) and Kawerak, Inc., household survey, 2009.

[a] Includes Gambell and Savoonga.

[b] Normally includes Ambler, Kiana, Kobuk, Kotzebue, Noatak, Noorvik, and Shungnak.

[c] Includes Deering and Wales; does not include Kotzebue.

[d] Includes Shishmaref.

[e] Does not include Ambler.

[f] Includes only Noatak and Noorvik.

[g] Does not include Kotzebue.

[h] Due to lack of funding, no collection of subsistence salmon harvest data took place in Kotzebue area communities from 2005-2008. The average yearly subsistence harvest of salmon in the Kotzebue area between 1994 and 2004 was 59,650 fish. ND = No Data.

Table 20 Historic subsistence salmon harvests, Arctic Alaska, 1975-2008

	Households or permits		Estimated salmon harvest[a]					
Year	Total	Surveyed or returned	Chinook	Sockeye	Coho	Chum	Pink	Total
1975	117	79	3	225	102	3,698	7,298	11,326
1976	138	104	6	0	275	1,856	5,472	7,609
1977	195	181	35	64	623	12,222	2,839	15,783
1978	168	126	31	0	242	4,035	10,697	15,005
1979	138	119	519	0	1,007	3,419	5,842	10,787
1980	232	161	135	0	2,075	5,839	21,728	29,777
1981	236	169	47	88	1,844	9,251	6,100	17,330
1982	230	182	33	6	2,093	5,719	20,480	28,331
1983	243	189	74	40	1,950	7,013	8,499	17,576
1984	240	189	85	0	1,890	4,945	18,067	24,987
1985	215	198	56	114	1,054	5,717	2,117	9,058
1986	279	240	157	127	788	8,494	9,011	18,577
1987	235	173	97	102	812	7,265	705	8,981
1988	192	166	67	171	1,089	6,379	2,543	10,249
1989	173	130	24	131	549	3,456	924	5,084
1990	188	165	60	234	542	4,525	2,413	7,774
1991	155	128	83	166	1,279	3,715	194	5,437
1992	163	132	152	163	1,720	2,030	7,746	11,811
1993	142	104	51	74	1,780	1,578	758	4,241
1994	1,547	1,169	7,713	3,414	24,494	75,489	78,954	190,063
1995[b]	2,329	1,445	8,070	6,639	27,314	151,905	43,947	237,874
1996	2,177	1,454	7,999	4,287	27,879	139,032	67,911	247,108
1997[c]	2,398	1,645	9,620	5,597	18,153	86,808	29,135	149,314
1998[c]	2,620	1,730	8,967	3,301	21,226	71,632	61,863	166,989
1999	2,351	1,300	6,242	4,046	16,706	115,676	21,644	164,315
2000	2,247	1,336	4,399	3,612	20,654	84,196	40,499	153,360
2001[d]	2,192	1,259	5,671	4,473	16,617	71,138	31,480	129,378
2002[e]	1,327	1,204	5,624	4,504	17,838	37,396	67,756	133,119
2003[f]	1,670	1,488	5,505	5,289	16,580	35,540	54,365	117,279
2004[g]	1,915	1,814	3,534	9,159	11,585	31,386	70,841	126,506
2005[g,h]	1,129	1,104	4,239	9,306	14,622	14,486	59,829	102,481
2006[g,h]	1,125	1,099	3,431	10,763	20,533	14,273	53,689	102,689
2007[g,h]	1,122	1,073	3,829	10,407	14,269	22,624	23,182	74,312
2008[h]	1,247	1,172	3,212	5,543	19,451	14,004	63,723	105,933
5-year average (2003-2007)	1,392	1,316	4,108	8,985	15,518	23,662	52,381	104,653
10-year average (1998-2007)	1,770	1,341	5,144	6,486	17,063	49,835	48,515	127,043
Historical average (1975-2007)	904	668	2,623	2,621	8,793	31,901	25,410	71,349

Source: ADF&G Division of Subsistence, ASFDB 2009 (ADF&G 2009) and Kawerak, Inc., household survey, 2009.

Note: Since 1994, ADF&G has conducted an annual subsistence salmon harvest assessment effort in Northwest. Alaska that provides more extensive and reliable estimates. Harvest estimates prior to 1994 cannot be directly compared.

[a.] Includes selected communities in the Norton Sound District, Port Clarence District, and Kotzebue Area.

[b.] Includes Shishmaref.

[c.] Includes Gambell and Savoonga.

[d.] Does not include Ambler.

[e.] For the Kotzebue Area, includes only Noatak and Noorvik.

[f.] Does not include Kotzebue.

[g.] Does not include Koyuk.

[h.] Does not include Kotzebue Area.

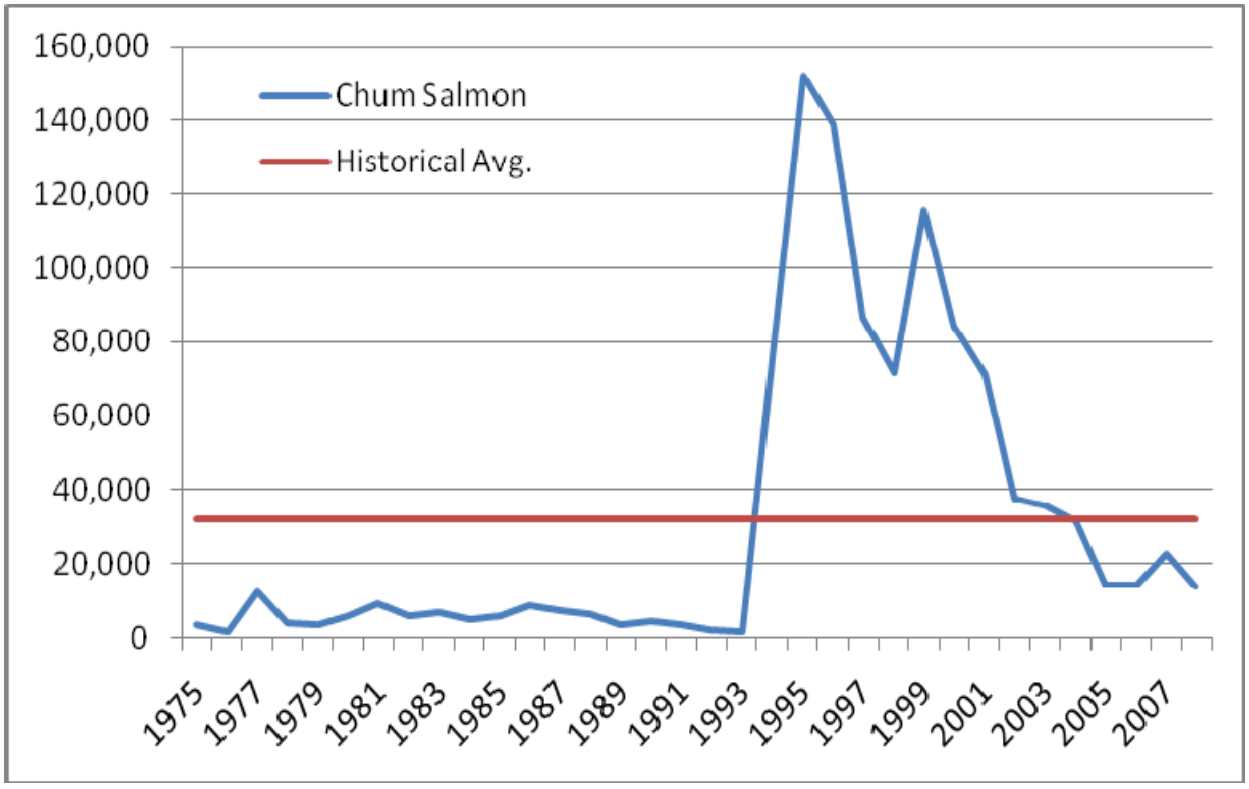


Figure 35 Total estimated historical subsistence chum salmon harvest, Arctic Alaska, 1975-2008

Note: Data incomplete for years 1990-1993 and 2005-2008. Source: Menard et al., *in prep*.

3.3.6 Alaska Peninsula/Area M

Description of Management Area

The Alaska Peninsula area includes all Pacific Ocean waters of Alaska between a line extending southeast from the tip of Kupreanof Point and the longitude of the tip of Cape Sarichef, and all Bering Sea waters of Alaska east of the longitude of the tip of Cape Sarichef and south of the latitude of the tip of Cape Menshikof. The communities of the Alaska Peninsula area are Port Heiden (estimated population 83 in 2009), Nelson Lagoon (population 60 in 2009), False Pass (population 41 in 2009), Cold Bay (population 84 in 2009), King Cove (population 744 in 2009), and Sand Point (population 1,001 in 2009) (http://laborstats.alaska.gov). Port Heiden is in the Lake and Peninsula Borough; the other communities are in the Aleutians East Borough (which also includes Akutan in the Aleutian Islands area) (Fall et al., 2009).

The Alaska Peninsula Management Area is further divided into the North Peninsula portion and the South Peninsula portion. The North Alaska Peninsula includes those waters from Cape Sarichef to Cape Menshikof and consists of two districts: The Northwestern District (includes all waters between Cape Sarichef and Moffet Point) and the Northern District (includes all water between Moffet Point and Cape Menshikof) (Hartill and Murphy, 2010). The South Peninsula portion is divided into four management districts: 1) Southeastern District, consisting of waters between Kupreanof Point and McGinty Point; 2) South Central District, consisting of waters between McGinty Point and Arch Point Light; 3) Southwestern District, consisting of waters between Arch Point Light, False Pass, and Cape Pankof Light; and 4) Unimak District, consisting of waters between Cape Pankof Light and Scotch Cap, including Sanak Island (Poetter et al., 2009). It should be noted that the Alaska Peninsula Area (Area M) and Bristol Bay Are (Area T) overlap consists of the Cinder River Section, Inner Port Heiden Section, and Ilnik Lagoon .

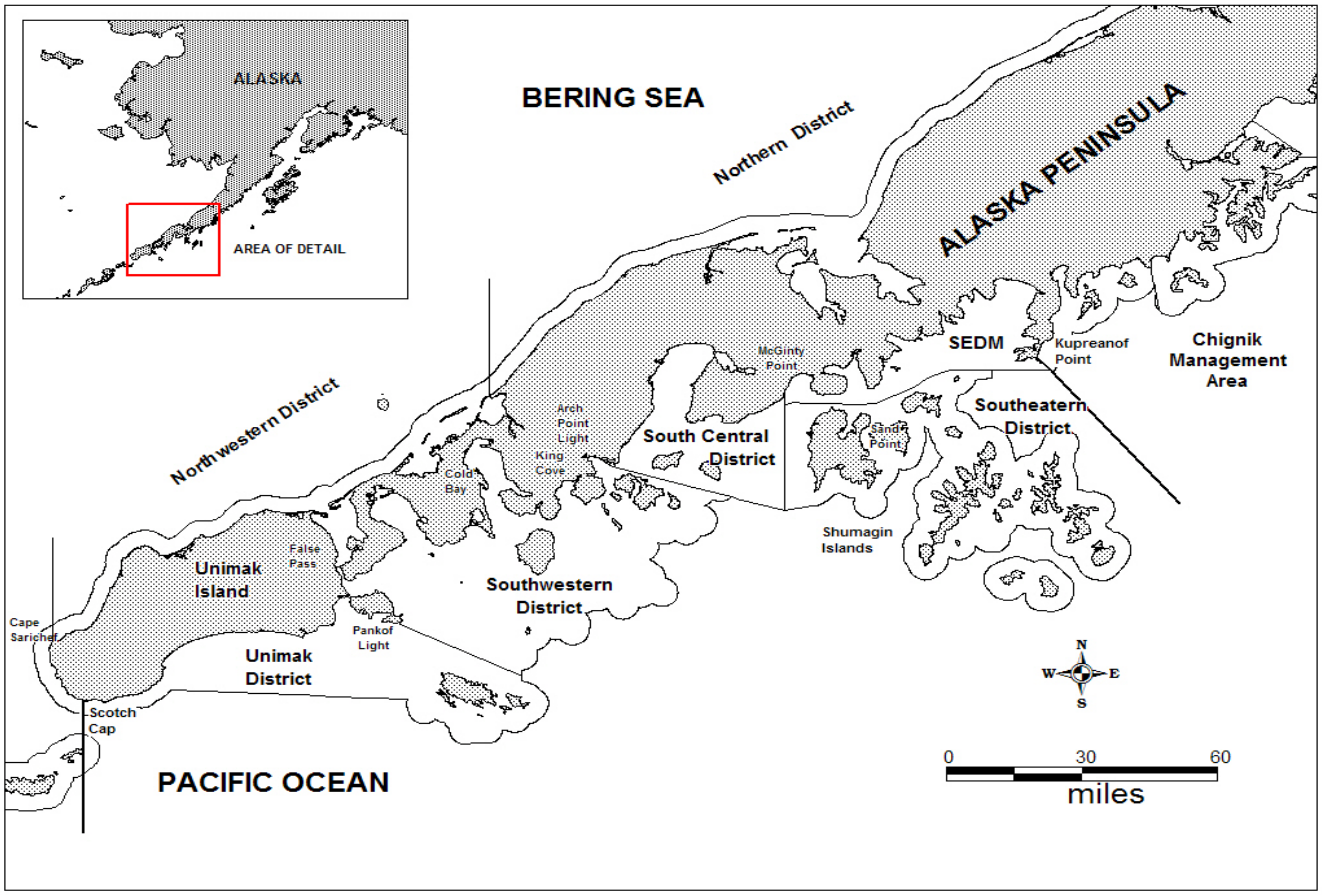


Figure 36 Alaska Peninsula area

Subsistence Regulations

A subsistence permit, which must be used to record daily harvests, is required for subsistence fishing in the Alaska Peninsula Management Area. There is an annual limit of 250 salmon per household. Legal gear includes seines and gillnets. In waters open to commercial fishing, set and drift gillnets may not exceed 50 fathoms in length. In most other areas, set gillnets may not exceed 100 fathoms and drift gillnets may not exceed 200 fathoms. Purse seines may not exceed 250 fathoms in length. Other standard permit conditions include prohibition of fishing within 300 feet of a dam, fish ladder, weir, culvert, or other artificial obstruction. Salmon may be taken at any time except in those districts and sections open to commercial salmon fishing;

salmon may not be taken during the 24 hours before and 12 hours following a commercial salmon fishing period. A few small areas closed to subsistence salmon fishing are listed in 5 AAC 01.425 (Fall et al., 2009).

Federal regulations governing subsistence salmon fishing in waters under the jurisdiction of the FSB are generally identical to the state regulations summarized above, with the exception that rod and reel, in addition to gillnet and seine, is legal subsistence gear under federal rules. There is no separate federal subsistence permit; a state permit is required for subsistence fishing under the federal regulations (Fall et al., 2009).

Subsistence Harvest Assessment Methods

Subsistence permits for the Alaska Peninsula area have been issued since 1979. Except for residents of Sand Point and Cold Bay, permits are mailed each year to fishers who returned their permits at the end of the previous fishing season. Sand Point and Cold Bay residents are issued permits upon request at the ADF&G offices in Sand Point and Cold Bay. Permits are also issued upon request at other ADF&G offices and by mail to people who telephone to request them. Regulations require that permits be returned to ADF&G by October 31. Reminder letters are sent around November 1 to people who have not yet returned their permits. If a person does not return the permit, his or her name is removed from the mailing list. Data from returned permits are tabulated by species and fishing area. Harvest data from returned permits are expanded by community of residence to estimate the harvest by all permit holders (Fall et al, 2009).

From 1985 through 2008, the number of subsistence salmon permits issued for the Alaska Peninsula Management Area has averaged 195 per year. The recent five-year average (2004–2008) was 161 permits. In 2009, 134 subsistence salmon fishing permits were issued for the Alaska Peninsula area, down from 199 issued in 2008. The response rate was 88% in 2009 (118 of 134 permits were returned). Of all permits issued, 122 (91%) were issued to residents of Alaska Peninsula area communities, and 12 (9%) were issued to residents of other Alaska communities. Most nonlocal residents fish at Mortensen's Lagoon on the Cold Bay road system (Hartill and Keyse, 2010).

Chum Salmon Subsistence Harvest

The estimated subsistence salmon harvest in the Alaska Peninsula Management Area in 2009 was 435 fish. The estimated subsistence harvest for all salmon species in 2009 was 9,973 fish. This is a decrease from the year before (15,306 salmon) and lower than the historical average (1985–2008; 18,255 salmon), the recent 10-year average (16,310 salmon), and the recent five year average (2004-2008; 13,843 salmon) (Figure 37, Table 21). The 2009 subsistence harvest was made up of 61% sockeye salmon, 25% coho salmon, 7% pink salmon, 6% chum salmon (Figure 38), and 1% Chinook salmon. Of the total salmon harvest, residents of Cold Bay harvested 6%, Sand Point residents 22%, Port Moller and Nelson Lagoon residents 7%, King Cove residents 41%, and False Pass residents 4%. Other Alaska residents harvested 6% (Figure 39) (Hartill and Keyse, 2010).

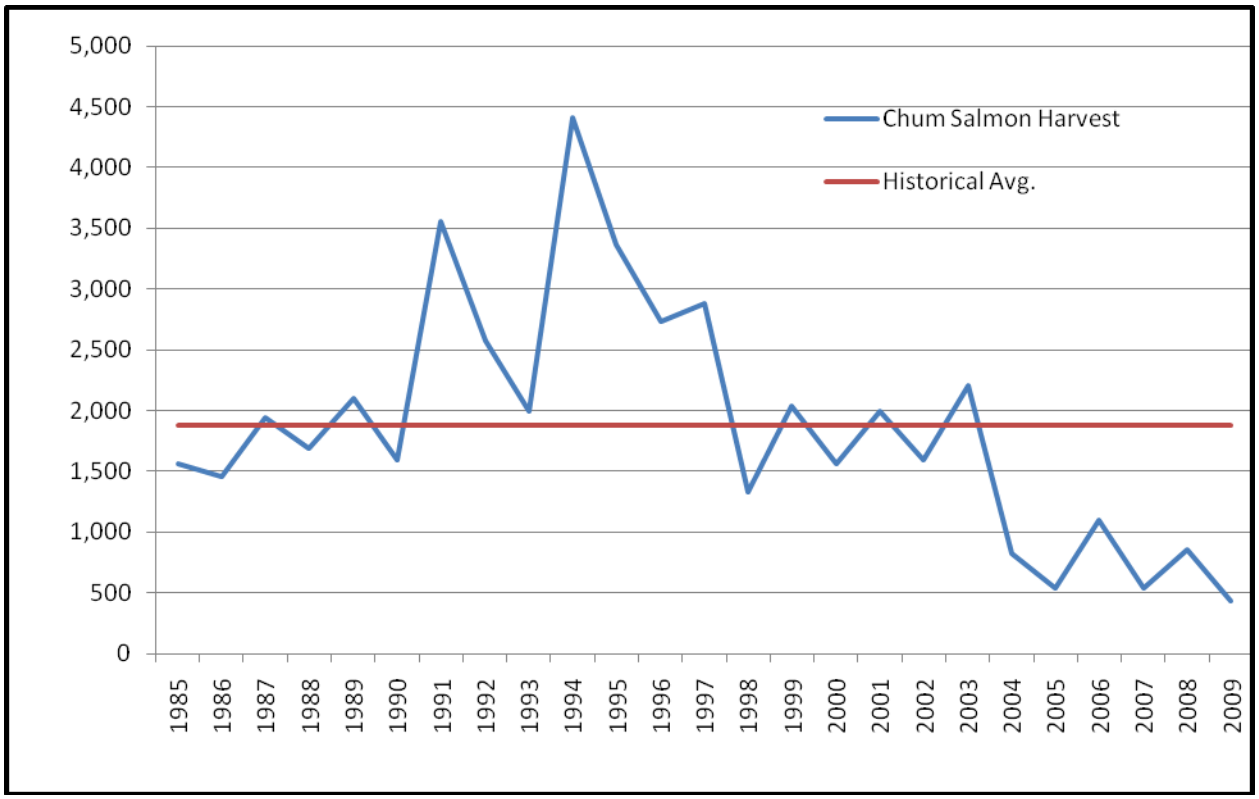


Figure 37 Estimated historical subsistence chum salmon harvest, Alaska Peninsula, 1985-2009

Table 21 Estimated historical subsistence salmon harvest, Alaska Peninsula, Area M, 1985-2009

Year	Permits Issued	Chum Salmon	Total
1985	161	1,566	13,755
1986	147	1,455	11,727
1987	191	1,943	13,719
1988	183	1,692	14,762
1989	188	2,104	17,314
1990	201	1,589	15,188
1991	249	3,551	22,783
1992	229	2,574	19,805
1993	262	1,997	22,032
1994	256	4,406	25,256
1995	260	3,369	24,251
1996	234	2,728	25,578
1997	217	2,885	26,096
1998	233	1,326	22,759
1999	186	2,035	22,789
2000	178	1,558	18,132
2001	185	1,996	19,514
2002	156	1,593	15,335
2003	165	2,203	18,117
2004	146	820	14,240
2005	159	534	16,109
2006	153	1,097	13,382
2007	150	538	10,180
2008	199	857	15,306
2009	134	435	9,973
2004-2008 Average	161	769	13,843

Source: Personal communication, Jeff Wadle, 2010.

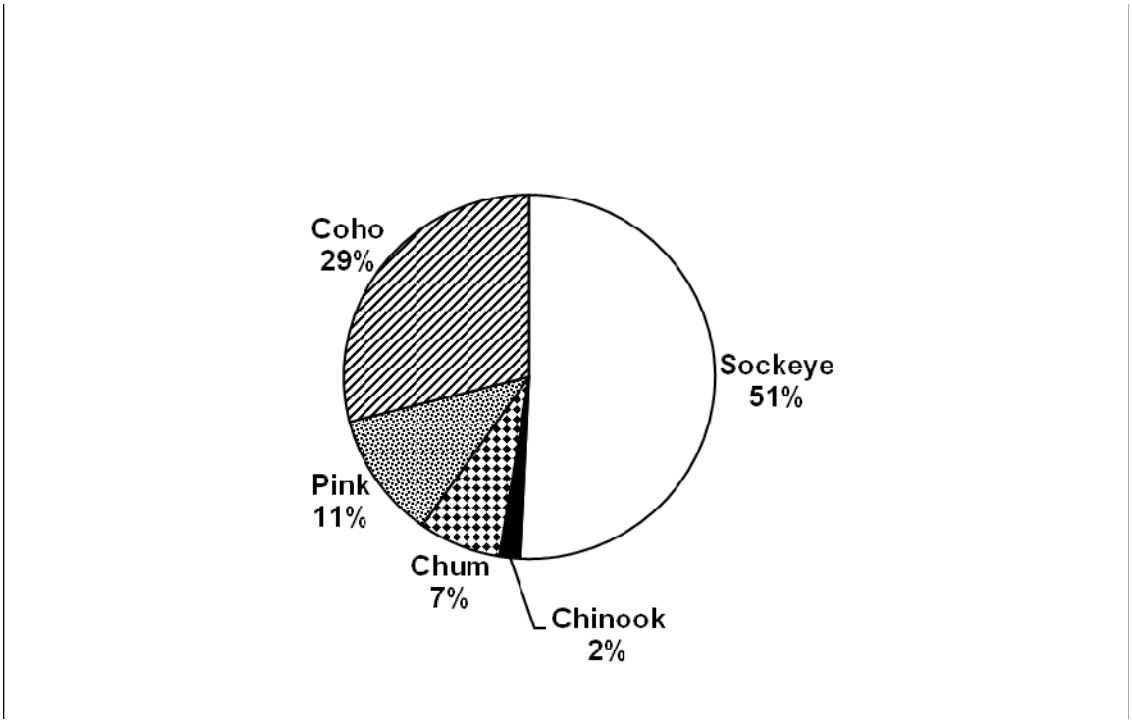


Figure 38 Composition of Alaska Peninsula area subsistence salmon harvest by species, 2008

Source: Fall et al., *in prep.*

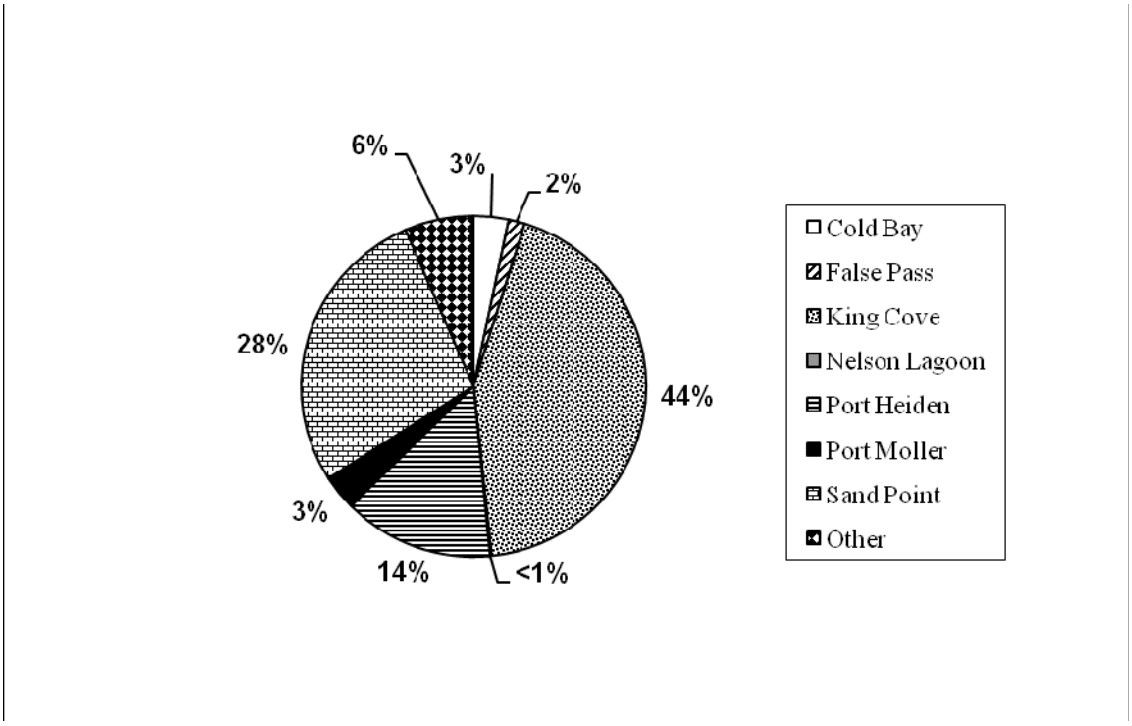


Figure 39 Subsistence salmon harvests by community, Alaska Peninsula area, 2008

Source: Fall et al., *in prep*.

In interviews with Division of Subsistence staff, fishery managers expressed the view that the subsistence permit program did not completely document all subsistence salmon harvesting activities because some subsistence users did not obtain permits. A comparison of permit and household interview data for 1992 for King Cove found that about 31% of interviewed households that reported subsistence fishing did not have permits. The estimated total subsistence salmon harvest for the community based on the interviews was 7,036 (±1,773), compared to 5,856 based on permit returns. At Sand Point in the same year, 41% of interviewed households reported that they harvested salmon for subsistence but did not have permits. The estimated total subsistence salmon harvest for Sand Point based on the household interviews was 11,338 (±2,551), compared to 7,833 based on estimates using permit return information (Fall et al., 2009).

The subsistence permit program for the Alaska Peninsula area does not account for salmon withheld from commercial catches for home uses. However, commercial fishermen are required to report the retention of fish taken in a commercial fishery on commercial harvest fish tickets. Fishery managers believe that this number is substantial, especially in years when commercial salmon prices are low. For 1992, it was estimated that 51% of the salmon harvested for home uses at King Cove, and 45% at Sand Point, were removed from commercial harvests (Fall et al., 2009).

3.4 Sport and personal use fisheries by region in western Alaska

Alaskan sport fishing effort and harvest are monitored annually through a statewide sport fishery postal survey. Harvest estimates are typically not available until approximately one calendar year after the fishing season; therefore, 2010 harvest estimates are not available for this document.

3.4.1 Bristol Bay

Sport Fisheries

While the majority of sport fishing effort in the Bristol Bay area targets Chinook, coho, sockeye salmon and rainbow trout, several drainages, including the Togiak, Nushagak, and Alagnak, support directed chum salmon sport fisheries. The 2009 sport catch/harvest of chum salmon was estimated as follows: Togiak: 3,014/88; Nushagak: 10,009/1,239; Alagnak: 12,630/50; and Bristol Bay wide: 30,766/1,443. The recent five year (2004-2008) average sport catch/harvest was estimated as follows: Togiak: 3,938/79; Nushagak: 7,519/1,112; Alagnak: 13,321/321; and Bristol Bay wide: 26,898/1,760. The 2009 sport fishing effort (angler-days) was estimated as: Togiak: 3,638; Nushagak: 18,064; Alagnak: 9,995; and Bristol Bay wide: 76,848. The recent five year (2004-2008) average sport fishing effort (angler-days) was estimated as: Togiak: 5,426; Nushagak: 23,328; Alagnak: 9,907; and Bristol Bay wide: 98,249.

The majority of sport fishing effort (>90%) targets species other than chum salmon. In terms of effort, catch, and harvest, the directed chum salmon sport fisheries in Bristol Bay would be characterized as minor in relation to other sport fisheries in the area. Additionally, a significant proportion of the sport catch of chum salmon occurs incidentally in directed king salmon sport fisheries. After a relatively steady increase from the 1970s through 2000, total sportfishing effort in the Bristol Bay Area declined during 2002 and 2003, followed by increasing effort through 2007 and another decline during 2008 and 2009 (Figure 40). Catch and harvest of chum salmon in Bristol Bay sport fisheries have remained stable or declined slightly during the last 10 years (personal communication, Jason Dye, 2010).

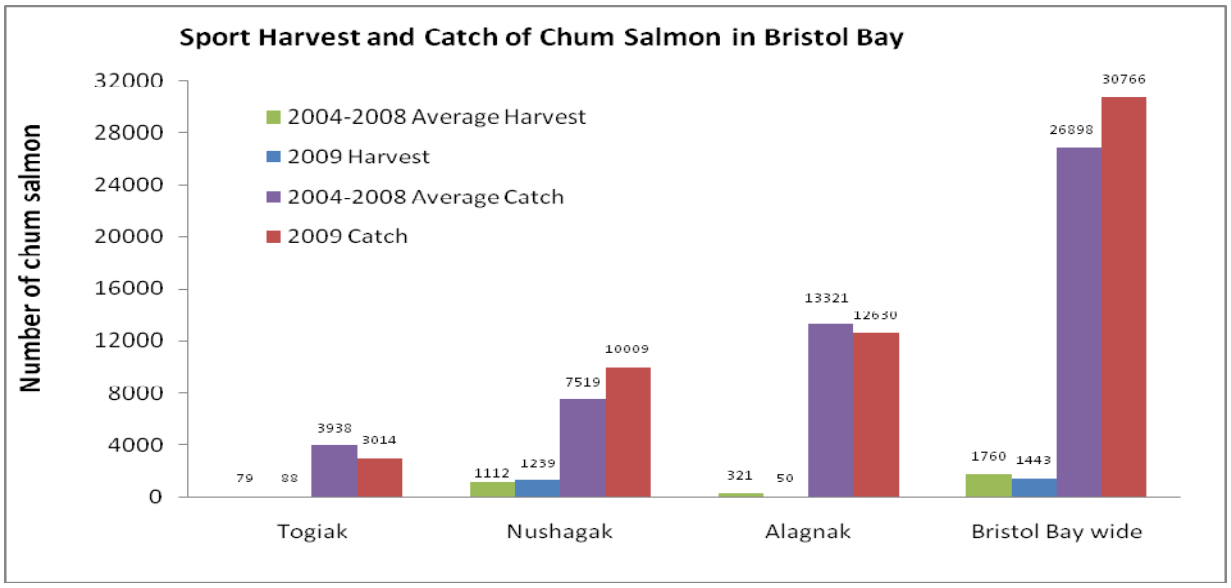


Figure 40 Sport Harvest and Catch of Chum Salmon in Bristol Bay

Personal Use Fisheries

Due to subsistence fishing opportunities in Bristol Bay and the limits on personal use fisheries, personal use fishing rarely occurs in the Bristol Bay area and no recent personal use chum salmon harvest has been documented (personal communication, Jason Dye, 2010).

3.4.2 Kuskokwim Area

Sport Fisheries

Most of the Kuskokwim River and Kuskokwim Bay sport fishing effort occurs in the Lower Rivers of the Kuskokwim drainage and in the Goodnews and Kanektok Rivers of Kuskokwim Bay. Most effort is directed at Chinook and coho salmon and rainbow trout. Little sport fishing effort is directed at chum salmon, but there is a small yearly harvest. The amount of effort toward chum salmon catch and harvest is expected to remain similar in subsequent years.

As the Kuskokwim River and Kuskokwim Bay fisheries are not in the same drainage, they are calculated separately. From 2004-2008, the average Kuskokwim River chum salmon harvest in the sport fishery was 286 fish. For same time period 2004-2008, the average Kuskokwim Bay chum salmon harvest in the sport fishery was 88 fish. The total 2008 sport harvest of summer chum salmon in the Kuskokwim River drainage (not including Kuskokwim Bay) was estimated at 121 fish. The 2008 sport fish harvest of chum salmon in Kuskokwim Bay was 141 fish.

Personal Use Fisheries

Currently there are no personal use salmon fishing regulations in effect for the Kuskokwim Management Area.

3.4.3 Yukon River

Sport Fisheries

Most of the Yukon River drainage's sport fishing effort occurs in the Tanana River drainage along the road system and most effort is directed primarily at Chinook and coho salmon. Little sport fishing effort is directed at chum salmon, but all chum salmon harvested in the sport fishery are categorized as summer chum salmon. Although a portion of the genetically distinct fall chum salmon stock may be taken by sport fishers, most of the sport chum salmon harvest is thought to be made up of summer chum salmon because: 1) the run is much more abundant in tributaries where most sport fishing occurs; and 2) the chum salmon harvest is typically incidental to efforts directed at Chinook salmon, which overlap in run timing with summer chum salmon (JTC, 2010).

From 2004-2008, the Tanana River on average made up 36% of the total Yukon River drainage summer chum salmon harvest. On September 1, 2009 two Emergency Orders were issued to close all waters of the Yukon and Tanana River drainages to the retention of chum salmon. These actions remained in effect throughout the remainder of the 2009 salmon season. The total 2008 sport harvest of summer chum salmon in the Alaskan portion of the Yukon River drainage (including the Tanana River) was estimated at 371 fish. The recent five year (2004-2008) average for sport harvest of summer chum salmon was estimated at 367 fish (JTC, 2010).

Personal Use Fisheries

The Fairbanks Nonsubsistence Area, located in the middle portion of the Tanana River, contains the only personal use fishery within the Yukon River drainage. The management area known as Subdistrict 6-C is completely within the Fairbanks Nonsubsistence Area. Personal use salmon and a valid resident sport fishing license are required to fish within the Fairbanks Nonsubsistence Area. The harvest limit for a personal use salmon household permit is 10 Chinook, 75 summer chum salmon, and 75 fall chum salmon and coho salmon combined. The personal use salmon fishery in Subdistrict 6-C has a harvest limit of 750 Chinook, 5,000 summer chum salmon, and 5,200 fall chum salmon and coho salmon combined (JTC, 2010).

In 2009, the personal use salmon fishery followed the regulatory fishing time of two 42-hour periods per week except during the time period September 3-17 when it was closed to conserve fall chum salmon with precedence for subsistence fisheries and escapement requirements. The 2009 preliminary harvest (as of February 2010) based on permits returned for Subdistrict 6-C included 308 summer chum salmon and 78 fall chum salmon. The recent five year (2004-2008) average personal use harvest was estimated at 193 summer chum salmon and 210 fall chum salmon in the Yukon River drainage (JTC, 2010).

3.4.4 Arctic Alaska

Personal Use Fisheries

Currently there are no personal use salmon fishing regulations in effect for the Arctic Alaska Management Area.

3.4.4.1 Norton Sound

Sport Fisheries

In Norton Sound, most of the sport fishing effort occurs along the Nome road system, and to the south in the Unalakleet River drainage, where king and coho salmon fishing is popular and two large sport guiding operations are located. Pink salmon fishing is also popular, but sockeye fishing is nearly nonexistent. Chum salmon stocks have steadily declined in many places on the Seward Peninsula since the early 1980s. This has led to increasingly restrictive sport and commercial management, and the initiation of Tier II subsistence in the Nome Subdistrict (as previously discussed in Section 3.3.5.1.1). All rivers in northern Norton Sound from the Sinuk River in the west to Topkok in the east have been closed to sportfishing for chum salmon since 1992. It

is anticipated that until chum salmon populations recover, there will be a need to continue with very restrictive measures to protect local stocks. In the Golovin, Elim, Norton Bay, Shaktoolik, and Unalakleet subdistricts, sport fishing for chum remains open, with recent ten-year average catches of 3,892 and harvests of 616 fish per year, with an average annual fishing effort of 17,027 angler days. In 2009, catches of chum salmon in Norton Sound was 2,113 and harvest was 412 fish (personal communication, Brendan Scanlon, 2010).

3.4.4.2 Kotzebue

Sport Fisheries

Chum salmon are far and away the most abundant of the five Pacific salmon in the Kotzebue area, therefore, virtually all of the salmon sport fishing effort directed at chum salmon. However, while some salmon fishing effort occurs in association with wilderness float trips in Kotzebue Sound drainages, the amount of sport fishing effort expended toward salmon in the northern part of the management area is very light and harvests are very small, with sheefish and Dolly Varden being the principle target species. The recent 10-year average chum salmon harvest for the entire Kotzebue Area was 978 fish, the average catch was 2,903 fish, and the average of annual sport fishing effort was 5,779 angler-days. In 2009, catches of chum salmon in the Kotzebue area was 3,232 and harvest was 229 fish (personal communication, Brendan Scanlon, 2010).

3.4.5 Alaska Peninsula/Area M

Sport Fisheries

A significant percentage of the Alaska Peninsula/Aleutian Islands Regulatory Area sport fishing effort occurs in the Chignik River drainage and is directed at Chinook and coho salmon. Relatively little sport fishing effort is directed at chum salmon, and few are harvested annually. The annual chum salmon harvest typically represents around 1% of the total salmon harvest within the regulatory area. Most chum salmon sport fishing effort normally occurs in freshwaters of the Russel Creek drainage near Cold Bay (personal communication, 2010). From 2000-2009, Alaska Peninsula chum salmon sport harvests averaged 303 fish, although the median harvest during this period equaled 173. Total chum catch (including harvests) averaged just below 3,700. With the exception of 2009, when the chum salmon harvest appeared to increase substantially from historic levels, the most recent 10-year trend shows relatively little change in sport fishing activity targeting this species (personal communication, Donn Tracy, 2010).

Table 22 Alaska Peninsula/Aleutian Islands chum salmon catch and harvest, 2000 - 2009

Alaska Peninsula/Aleutian Islands Chum Salmon Catch and Harvest

Year	Catch*	Harvest
2000	7,217	213
2001	784	174
2002	1,734	107
2003	5,631	179
2004	3,024	435
2005	2,648	64
2006	1,856	109
2007	2,382	171
2008	3,443	62
2009	8,194	1,519
Avg.	3,691	303
Median	2,836	173

*Includes harvest.

Regarding the table above, the terms catch and harvest are often used interchangeably in commercial and subsistence fisheries; however there is a distinction between catch and harvest in the sport fisheries. When reporting or speaking of harvest, it is simply the number of fish that are caught and taken (killed) by an angler of a particular species for a certain fishery or location. Catch, however, are the numbers of fish of a particular species that are caught but not retained or harvested. In sport fishery terms, catch is the total number of fish that were caught including those fish that were released, while harvest is the number of fish caught that were kept. As such, harvest is a subset of catch when reviewing statewide harvest survey numbers (personal communication, Charlie Swanton and Tom Taube, 2010).

It should be noted, however, that when evaluating or reporting catch, there is often confusion regarding the distinction between catch and harvest so that catch statistics may (and often times do) include fish that have been harvested. In a strict interpretation, it cannot be emphatically stated that all fish reported as caught are released which is why both catch and harvest are reported (personal communication, Charlie Swanton and Tom Taube, 2010).

Personal Use Fisheries

Currently there are no personal use salmon fishing regulations in effect for the Alaska Peninsula/Aleutian Islands Regulatory Area.

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3.5 Commercial Chum Salmon Fisheries by Region

This section provides extensive background information on the commercial Chum salmon fisheries in western Alaska river systems likely most affected by Chum salmon bycatch. The information is presented by ADF&G management region and is focused on the regions that contribute to the Western Alaska stock of Chum salmon.

3.5.1 Kotzebue Sound

The Kotzebue Sound District includes all waters from Cape Prince of Wales to Point Hope. The Kotzebue District is divided into three subdistricts. Subdistrict 1 has six statistical areas open to commercial salmon fishing. Within the Kotzebue District chum salmon are the most abundant anadromous fish. Other salmon species (Chinook, pink, coho, and sockeye) occur in lesser numbers, as do Arctic char and sheefish. (This section was developed from ADF&G 2007a, Menard 2007a, ADF&G 2009b, ADF&G 2010 b and c, and data supplied by ADF&G in ADF&G 2010 and 2007).

Recent Management Actions

Primary commercial fishery management objectives are to provide adequate chum salmon escapement through the commercial fishery to: 1) ensure sustained runs by allowing adequate escapement, and 2) meet subsistence harvest needs. During the last five years, the commercial fishing schedule has been set by the buyer. ADF&G opens the commercial fishery to the hours requested by the buyer in order to allow the buyer flexibility. If poor run strength necessitates fishing restrictions, ADF&G will establish periodic closures of the fishery. Only in 2006 has the department restricted fishing time to allow for more salmon passage through the commercial fishing district (Menard, 2010).

Fishery and Reporting Requirements

In the Kotzebue fishery, gear is limited to set nets with an aggregate of no more than 150 fathoms per permit holder. There has been limited buyer capacity in the Kotzebue fishery in the 2000s. In 2002 and 2003 there was no buyer in Kotzebue and only one buyer has been in Kotzebue since 2004.
The buyer has until 10 a.m. to report catches from the preceding day by phone or fax. However, the buyer has always reported catches within a few hours of the fishery closure and makes a request for fishing time the following day based on their capacity and cargo plane schedules. Commercial fish tickets are turned in the following day although they have up to three days to submit the tickets. Commercial fishing periods ranged from four to eight hours in 2010.

All salmon caught by CFEC permit holders during commercial periods must be reported on fish tickets. Regulations also require commercial fishermen to report, on each fish ticket, the number of salmon harvested but not sold during commercial fishing periods. Buyers are required to ensure this information is reported on fish tickets even though a portion of the commercial harvest may have been used for subsistence (ADF&G, 2010).

Status of Runs and Conservation Concerns

The Kotzebue fishery is primarily a chum salmon fishery, with some Chinook, sockeye, and Dolly Varden taken incidentally. The overall chum salmon run to Kotzebue Sound in 2010 was estimated to be above average, based on the commercial harvest rates, subsistence participants reporting average to above average catches, and the Kobuk test fish index being the fifth best in the 18 year project history. No stocks in the Kotzebue area are presently identified as being of management or yield concern and the commercial fishery is allowed to remain open continuously with harvest activity regulated by buyer interest.

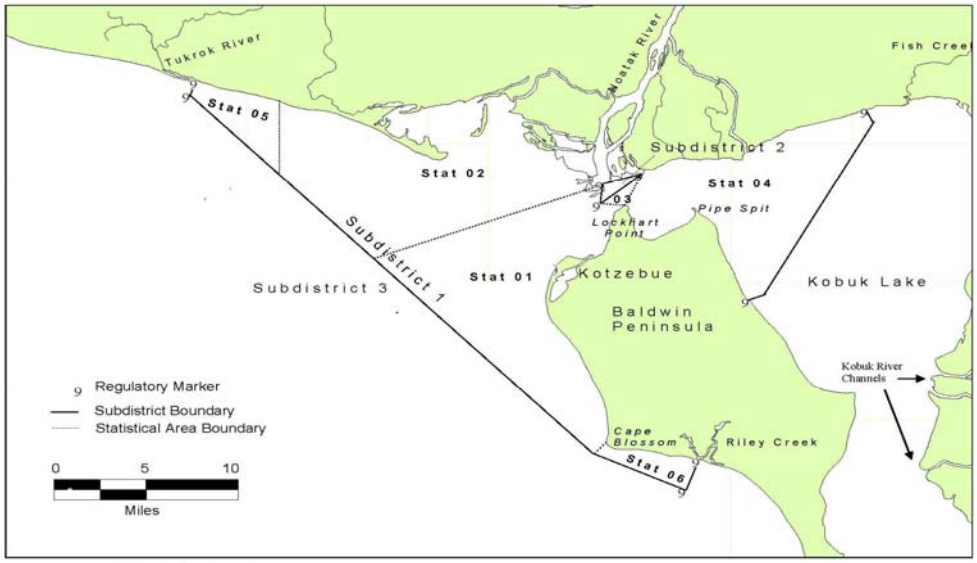

Fig. 3-41 Kotzebue Fishery Management Area

Commercial Fishery Situation and Outlook

The historical commercial chum salmon harvests are listed in Table 3-23. Commercial chum salmon harvests during the 20 years when there was a major buyer (1982-2001) ranged from 55,907 to 521,406 fish, the 20-year average being 220,720. The 5-year (1997-2001) average catch was 141,741. This significant decrease reflects the lack of demand for salmon on the open market that began in the mid-1990s as buyers began to purchase less salmon. Fishing effort during 1982–2001 ranged from 45 to 199 fishermen. The 20-year average was 129 fishermen; the 5-year average from 1997–2001 was 61 fishermen. The decrease in participation was likely due to substantial price declines and lack of market.

In 2002, the last significant buyer in the commercial fishery decided to not purchase fish in Kotzebue. Because there was no major buyer only 3 permit holders fished in 2002. Likewise, in 2003 there were only 4 permit holders. In both 2002 and 2003, one permit holder became a licensed agent for a buyer outside of Kotzebue, and worked with other permit holders to provide product for that market.

Beginning in 2004 one buyer provided a limited market for permit holders. The fishing effort (permits fished) over the last 5 years has one-quarter the fishing effort of 20 years ago. From 2004–2008 there were less than 50 permit holders participating in the commercial fishery each year with the average being 44 permit holders. In 2009 there was an increase to 62 permit holders participating in the fishery. The 2010 harvest of 270,343 chum salmon was the highest since 1995. Also, harvested for personal se in 2009 were 13 Chinook salmon, 6 sockeye salmon, 557 pink salmon, 7 coho salmon, 1,323 Dolly Varden and 3,021 sheefish. A total of 2,160,264 pounds of chum salmon were sold with a total ex-vessel value of $860,125. The 2010 average value per permit holder was $12,837 and was the highest value since 1988 (Table 3-23). Historic catches and values, compared to average catch and value, are depicted in Fig. 3-42 and Fig. 3-43.

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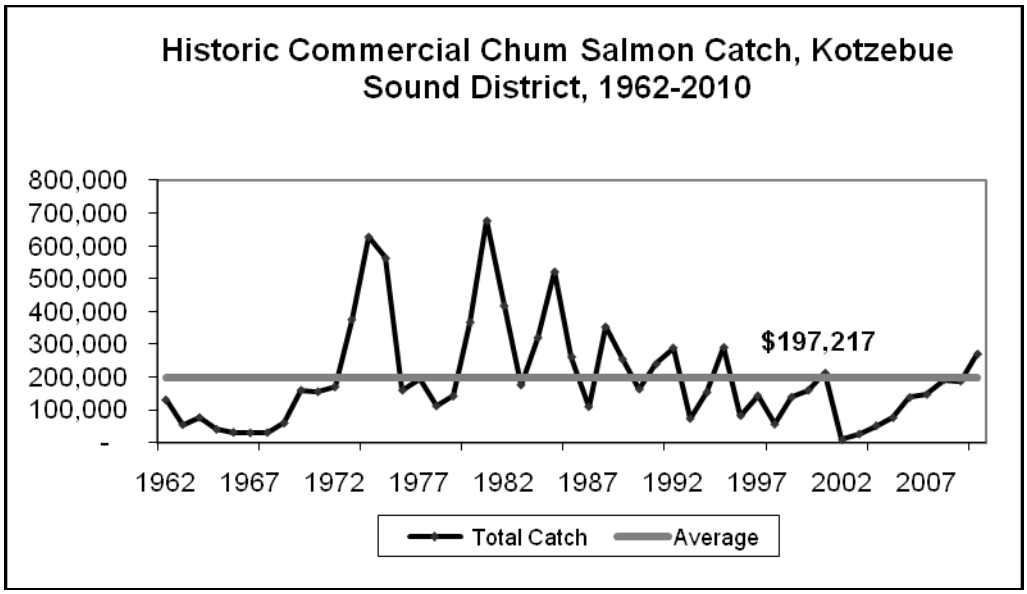


Fig. 3-42 Kotzebue Sound commercial Chum salmon catch, 1962-2010
Source: Data provided to NMFS by ADF&G, in 2010, in response to a special data request.

Table 3-23 Kotzebue district chum salmon catch and dollar value 1963-2010.

Year	Total Catch	Number of Permits [a]	Season Catch per Permit Holder	Gross Value of Catch to Permit Holders [b]	Real Value of Catch to Permit Holders [b]
1962	129,948	84	1,547	$4,500	$25,877.01
1963	54,445	61	893	$9,140	$52,005.25
1964	76,449	52	1,470	$34,660	$194,206.20
1965	40,025	45	889	$18,000	$99,054.67
1966	30,764	44	699	$25,000	$133,781.24
1967	29,400	30	980	$28,700	$148,991.26
1968	30,212	59	512	$46,000	$229,070.05
1969	59,335	52	1,141	$71,000	$336,926.49
1970	159,664	82	1,947	$186,000	$838,441.83
1971	154,956	91	1,703	$200,000	$858,614.34
1972	169,664	104	1,631	$260,000	$1,070,057.07
1973	375,432	148	2,537	$925,000	$3,606,782.69
1974	627,912	185	3,394	$1,822,784	$6,515,929.69
1975	563,345	267	2,110	$1,365,648	$4,460,134.84
1976	159,796	220	726	$580,375	$1,792,606.32
1977	195,895	224	875	$1,033,950	$3,002,209.99
1978	111,494	208	536	$575,260	$1,560,819.92
1979	141,623	181	782	$990,263	$2,480,466.14
1980	367,284	176	2,087	$1,446,633	$3,320,824.20
1981	677,239	187	3,622	$3,246,793	$6,814,690.56
1982	417,790	199	2,099	$1,961,518	$3,880,238.86
1983	175,762	189	930	$420,736	$800,634.98
1984	320,206	181	1,769	$1,148,884	$2,107,133.15
1985	521,406	189	2,759	$2,137,368	$3,804,852.43
1986	261,436	187	1,398	$931,241	$1,621,907.34
1987	109,467	160	684	$515,000	$871,652.85
1988	352,915	193	1,829	$2,581,333	$4,223,932.90
1989	254,617	165	1,543	$613,823	$967,867.43
1990	163,263	153	1,067	$438,044	$665,035.01
1991	239,923	142	1,690	$437,948	$642,130.42
1992	289,184	149	1,941	$533,731	$764,440.48
1993	73,071	114	641	$235,061	$329,390.10
1994	153,452	109	1,408	$233,512	$320,467.97
1995	290,730	92	3,160	$316,031	$424,864.33
1996	82,110	55	1,493	$56,310	$74,287.75
1997	142,720	68	2,099	$187,978	$243,690.01
1998	55,907	45	1,242	$70,587	$90,484.20
1999	138,605	60	2,310	$179,781	$227,119.38
2000	159,802	64	2,497	$246,786	$305,159.20
2001	211,672	66	3,207	$322,650	$390,152.01
2002	8,390	3	2,797	$7,572	$9,010.23
2003	25,763	4	6,441	$26,377	$30,725.98
2004	51,077	43	1,188	$64,420	$72,970.94
2005	75,971	41	1,853	$124,820	$136,821.44
2006	137,961	42	3,285	$216,654	$229,994.37
2007	147,087	46	3,198	$243,149	$250,741.12
2008	190,550	48	3,970	$385,270	$388,802.80
2009	187,562	62	3,025	$585,240	$585,240.00
2010	270,343	67	4,035	$860,125	$860,125
Average	197,217	111	1,952	$590,850	$1,282,885

[a] During 1962-1966 and 1968-1971 figures represent the number of vessels licensed to fish in the Kotzebue District, not the number of fishers.

[b] Some estimates between 1962 and 1981include only chum value which in figures represent over 99% of the total value. Figures after 1981 represent the chum value as well as incidental species such as Dolly Varden, whitefish and other salmon.

[c] Includes 2,000 chum salmon and $3,648 from the Sikusuilaq springs Hatchery terminal fishery.

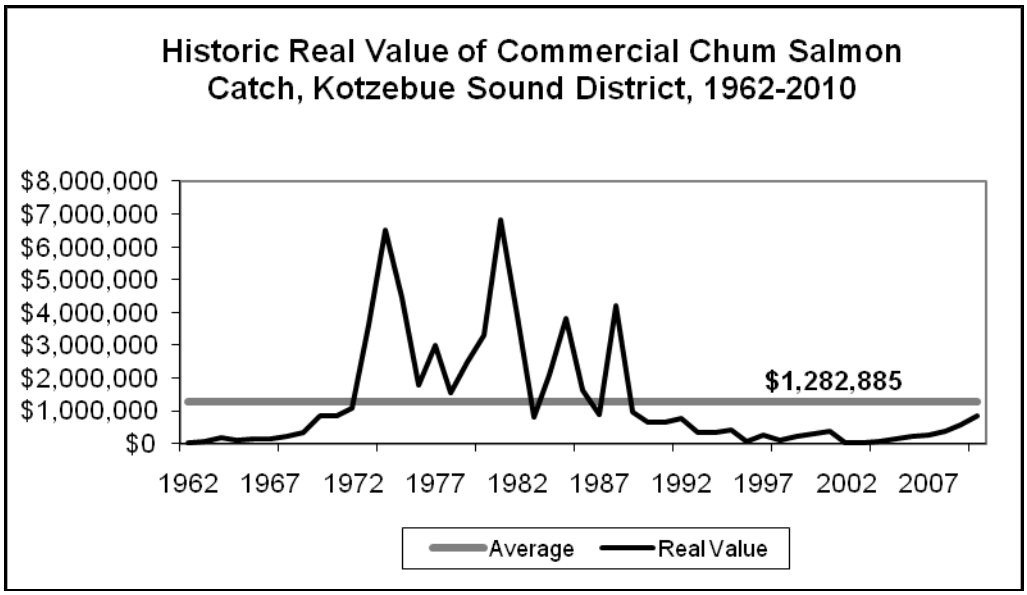


Fig. 3-43 Kotzebue Sound real value of commercial Chum salmon catch, 1962-2010
Source: Data provided to NMFS by ADF&G, in 2010, in response to a special data request.

3.5.2 Norton Sound

Norton Sound is comprised of two fishing districts, the Norton Sound District and the Port Clarence District. The Norton Sound District extends from Cape Douglas south to Point Romanof and includes over 500 miles of coastline. The area open to commercial salmon fishing is divided into six Subdistricts. Each Subdistrict contains at least one major spawning stream with commercial fishing effort located in the ocean near stream mouths. The Port Clarence District encompasses all waters from Cape Douglas north to Cape Prince of Wales. The area open to commercial salmon fishing is adjacent to the communities of Brevig Mission and Teller. (This section was developed from ADF&G 2007d, Menard 2007b, ADF&G 2009b, ADF&G 2010e and f, and ADF&G supplied data in ADF&G 2010 and 2007).

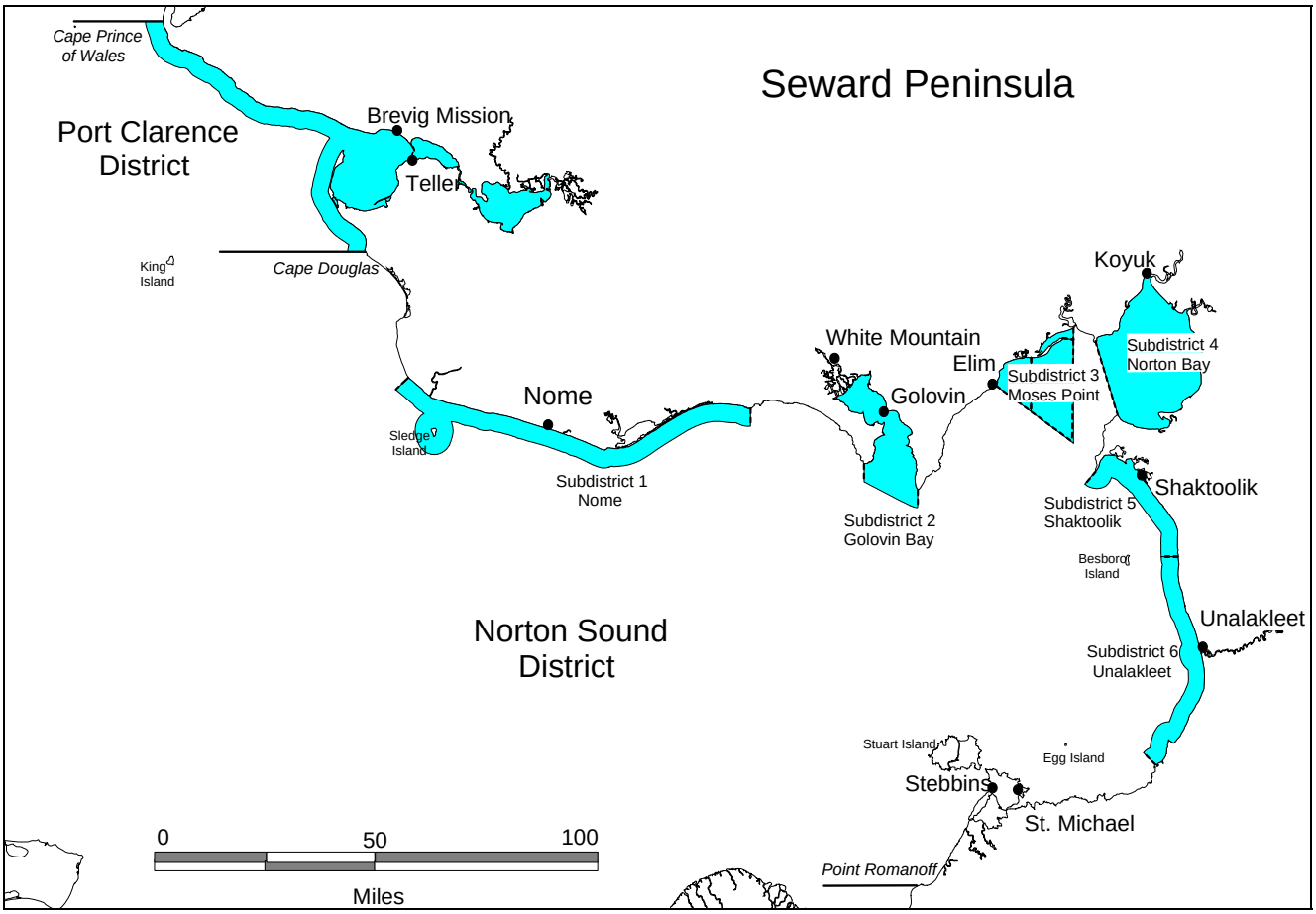


Fig. 3-44 Norton Sound fishing district map

Recent Management Actions

In response to guidelines established in the SSFP (5 AAC 39.222(f)(21)), the BOF classified Subdistrict 1 chum salmon stock as a management concern in 2000. The classification was upheld at the 2004 BOF meeting (Menard and Bergstrom, 2003a). In 2007, based on definitions provided in SSFP (5 AAC 39.222(f)(21) and (42)), only the most recent 5-year yield and escapement information (2002–2006), and the historical level of yield or harvestable surpluses were considered. Accordingly, ADF&G recommended a change in status of the Subdistrict 1 chum salmon stock from a management concern to a yield concern at the October 2006 BOF work session because in the preceding 5 years (2002–2006) a majority of chum salmon escapement goals had been achieved in Subdistrict 1. The BOF accepted ADF&G's recommendation and the Subdistrict 1 chum salmon stock was reclassified at its 2007 meeting (Menard and Bergstrom, 2006a). At the 2009 BOF meeting, ADF&G recommended continuation of Norton Sound Subdistrict 1 chum salmon as a stock of yield concern (Menard and Bergstrom, 2009). During the most recent 5 years (2005–2009), a majority of chum salmon escapement goals had been achieved in Subdistrict 1. ADF&G's recommendation to continue classification of this stock as a yield concern was based on low yields for the recent 5-year period (2005–2009) compared to historical yields in the 1980s.

In response to the guidelines established in the SSFP (5 AAC 39.222(f)(42)), the BOF classified Norton Sound Subdistricts 2 and 3 chum salmon as a stock of yield concern at its September 2000 work session. This determination as a yield concern was based on low harvest levels for the previous 5-year period (1995–1999). An action plan was subsequently developed by ADF&G and acted upon by the BOF in January 2001. The

classification as a yield concern was continued at the January 2004 BOF meeting (Menard and Bergstrom, 2003b) and at the January 2007 BOF meeting (Menard and Bergstrom, 2006b). ADF&G recommended continuation of the Norton Sound Subdistrict 2 and Subdistrict 3 chum salmon as a stock of yield concern at the 2009 BOF meeting (Menard and Bergstrom, 2009b). From 2005 to 2009, low yields of chum salmon have continued in Norton Sound Subdistrict 2 and in Subdistrict 3; yields have been inconsistent, but often low.

The 2009 Salmon Management Plan for the Golovin Subdistrict limits commercial harvest to a maximum of 15,000 chum salmon before mid-July in an attempt to protect chum salmon stocks and allow for some harvest while flesh quality is at its best. By that date, the chum salmon run usually can be assessed and fishing time adjusted accordingly. Previous to 2008 there had been no commercial chum salmon fishing in Subdistrict 2 since 2001, largely because escapements had fallen short of the SEG of 30,000 at the Niukluk River. Consequently, ADF&G has implemented a conservative approach with respect to determining when commercial fishing may occur. In 2009, the poor chum counts at Kwiniuk River tower in the adjacent subdistrict indicated a possible near-record low chum salmon run to northern Norton Sound and ADF&G did not open the Golovin Subdistrict to commercial salmon fishing until the coho salmon season. In the Moses Point Subdistrict 3, chum salmon fishing did not occur in 2009 because of a poor chum salmon run.

The Norton Bay Subdistrict typically has difficulty attracting a buyer due to its remoteness and reputation for watermarked fish. Because of lack of timely salmon escapement information, Norton Bay Subdistrict is typically managed similar to the Shaktoolik and Unalaklett Subdistricts. Both Shaktoolik and Unalakleet Subdistricts consistently attract commercial markets due to larger volumes of fish and better transportation services. In 2009, ADF&G delayed the onset of the chum salmon fishery until they could project that Chinook salmon escapement goals would be reached. When the escapement goal was projected to be reached, a 24-hour commercial chum salmon opening was permitted in Subdistricts 5 and 6 to evaluate chum salmon run strength and evaluate Chinook salmon incidental catches. Subdistricts 5 and 6 Chinook salmon were designated a stock of yield concern in 2004 and the BOF continued the designation in February 2007. To increase Chinook salmon escapements, the BOF also adopted a more conservative Subdistricts 5 and 6 King Salmon Management Plan (5 AAC 04.395) that was first implemented during the 2007 season (ADF&G, 2009).

The BOF met in Fairbanks in January 2010. At the meeting the department presented reports for Stock of Concern status for chum salmon in Subdistricts 1 (Nome), 2 (Golovin), and 3 (Moses Point) and king salmon in Subdistricts 5 (Shaktoolik) and 6 (Unalakleet). At this time ADF&G recommended continuation of a yield concern for those stocks.

Fishery and Reporting Requirements

All buyers, catcher/sellers and processors are required to register with the ADF&G office in Nome. In the last several years a buyer has returned to the northern subdistricts of Norton Sound to purchase salmon. Beginning in 2002 there was a five-year period where there was not a buyer in northern Norton Sound and only Subdistricts 5 and 6 had commercial salmon fishing periods. Although there were strengthening chum salmon runs beginning in the mid-2000s there was little buyer interest. The sole buyer for Norton Sound salmon is based out of Unalakleet in southern Norton Sound. The buyer is required to give a verbal report by phone or fax of catches from the preceding day by 10 a.m.

Because of distances involved in getting tenders to and from northern Norton Sound and Unalakleet the department staggers the commercial openings based on buyer capacity. Commercial fishermen are allowed to fish 100 fathoms of set nets, but two commercial permit holders may fish together and fish 200 fathoms of gear out of one boat. The buyer has up to one week to submit fish tickets. Most commercial fishing periods for chum salmon are 48 hours in length, but ranged from 24 hours to 54 hours in 2010.

All salmon caught by CFEC permit holders during commercial periods must be reported on fish tickets. Regulations also require commercial fishermen to report, on each fish ticket, the number of salmon harvested but not sold during commercial fishing periods. Buyers are required to ensure this information is reported on fish tickets even though a portion of the commercial harvest may have been used for subsistence (ADF&G, 2010).

Status of Runs and Conservation Concerns

The BOF made several changes to regulations at meetings in February and March 2007, for the management of Norton Sound salmon. The BOF changed the stock of concern classification for Subdistrict 1 (Nome) chum salmon from a management concern to a yield concern. Subdistricts 2 and 3 (Golovin and Moses Point) chum salmon stocks and Subdistricts 5 and 6 (Shaktoolik and Unalakleet) Chinook salmon stocks were continued as stocks of yield concern.

A commercial fishery for sockeye salmon is authorized in the Port Clarence District from July 1 through July 31, with openings established by emergency order. A guideline harvest level (GHL) was established allowing a harvest range from 0 to 10,000 sockeye salmon, dependent on a 30,000 sockeye salmon in-river goal for Pilgrim River. Also, the BOF closed the southwestern half of Salmon Lake to all subsistence salmon fishing to protect the majority of the sockeye salmon spawning grounds and the northeastern half of Salmon Lake may now only be opened by emergency order.

Commercial Fishery Situation and Outlook

Table 3-24 provides historic Chum salmon catches in the Norton Sound District from 1961 through 2010. The catch data document a long term decline in commercial harvest of chum salmon. From peak numbers of more than 300,000 in the 1980's, commercial harvest of chum salmon declined to a period low of just 600 fish in 2002. The 2004 commercial chum harvest was 6,296; however, since then the commercial chum harvest has improved considerably and the 2010 harvest of 117,743 chum salmon is the largest since 1986. This trend in Norton Sound commercial Chum harvests is depicted graphically in Fig. 3-45. In addition, Table 3-25 provides historic data on the numbers of permits fishing in the Norton Sound area. This data shows a similar decline in permits fished as harvest of Chinook and chum salmon declined. However, the 2010 total of 115 permits fished is nearly triple the five year average and more than double the ten year average. The outlook for the 2011 season is not yet available; however, will be provided in the initial review draft of this document.

Table 3-24 Commercial salmon catch by species, Norton Sound District, 1961-2010.

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1961	5,300	35	13,807	34,327	48,332	101,801
1962	7,286	18	9,156	33,187	182,784	232,431
1963	6,613	71	16,765	55,625	154,789	233,863
1964	2,018	126	98	13,567	148,862	164,671
1965	1,449	30	2,030	220	36,795	40,524
1966	1,553	14	5,755	12,778	80,245	100,345
1967	1,804	-	2,379	28,879	41,756	74,818
1968	1,045	-	6,885	71,179	45,300	124,409
1969	2,392	-	6,836	86,949	82,795	178,972
1970	1,853	-	4,423	64,908	107,034	178,218
1971	2,593	-	3,127	4,895	131,362	141,977
1972	2,938	-	454	45,182	100,920	149,494
1973	1,918	-	9,282	46,499	119,098	176,797
1974	2,951	-	2,092	148,519	162,267	315,829
1975	2,393	2	4,593	32,388	212,485	251,861
1976	2,243	11	6,934	87,916	95,956	193,060
1977	4,500	5	3,690	48,675	200,455	257,325
1978	9,819	12	7,335	325,503	189,279	531,948
1979	10,706	57	31,438	167,411	140,789	350,401
1980	6,311	40	29,842	227,352	180,792	444,337
1981	7,929	56	31,562	232,479	169,708	441,734
1982	5,892	10	91,690	230,281	183,335	511,208
1983	10,308	27	49,735	76,913	319,437	456,420
1984	8,455	6	67,875	119,381	146,442	342,159
1985	19,491	166	21,968	3,647	134,928	180,200
1986	6,395	233	35,600	41,260	146,912	230,400
1987	7,080	207	24,279	2,260	102,457	136,283
1988	4,096	1,252	37,214	74,604	107,966	225,132
1989	5,707	265	44,091	123	42,625	92,811
1990	8,895	434	56,712	501	65,123	131,665
1991	6,068	203	63,647	0	86,871	156,789
1992	4,541	296	105,418	6,284	83,394	199,933
1993	8,972	279	43,283	157,574	53,562	263,670
1994	5,285	80	102,140	982,389	18,290	1,108,184
1995	8,860	128	47,862	81,644	42,898	181,392
1996	4,984	1	68,206	487,441	10,609	571,241
1997	12,573	161	32,284	20	34,103	79,141
1998	7,429	7	29,623	588,013	16,324	641,396
1999	2,508	0	12,662	0	7,881	23,051
2000	752	14	44,409	166,548	6,150	217,873
2001	213	44	19,492	0	11,100	30,849
2002	5	1	1,759	0	600	2,365
2003	12	16	17,058	0	3,560	20,646
2004	0	40	42,016	0	6,296	48,352
2005	151	280	85,255	0	3,983	89,669
2006	12	3	130,808	0	10,042	140,865
2007	19	2	126,115	3,769	22,431	152,336
2008	83	60	120,293	75,384	25,124	220,944

2009	84	126	87,041	17,364	34,122	138,737
2010	140	103	62,079	31,557	117,743	211,622
Average 2005-2009	70	94	109,902	19,303	19,140	148,510
Average 2000--2009	133	59	67,425	26,307	12,341	106,264

Source: Data provided to NMFS by ADF&G in response to a special data request and Norton Sound Annual Management Report data courtesy of Jim Menard, ADF&G.

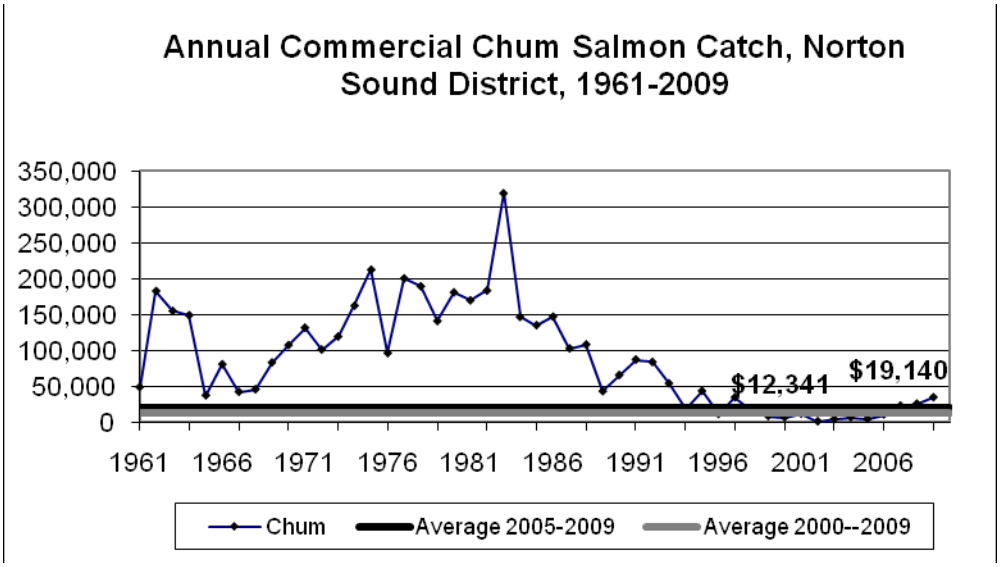


Fig. 3-45 Norton Sound commercial Chum salmon catch, 1961-2010
Source: Data provided to NMFS by ADF&G, in 2010, in response to a special data request.

Table 3-25 Number of commercial salmon permits fished, Norton Sound, 1970–2007

	SUBDISTRICT						District
Year	1	2	3	4	5	6	Total [a]
1970	6	33	21	0	12	45	[b]
1971	7	22	45	6	19	72	[b]
1972	20	20	48	32	20	71	[b]
1973	21	34	57	30	27	94	[b]
1974	25	25	60	8	23	53	[b]
1975	24	42	67	42	39	61	[b]
1976	21	22	54	27	37	60	[b]
1977	14	25	52	24	30	45	164
1978	16	24	44	26	26	51	176
1979	15	21	41	22	29	63	175
1980	14	17	26	13	26	66	159
1981	15	19	33	10	26	73	167
1982	18	17	28	10	32	68	164
1983	19	21	39	15	34	72	170
1984	8	22	25	8	24	74	141
1985	9	21	34	12	21	64	155
1986	13	24	34	9	30	73	163
1987	10	21	34	12	39	65	164
1988	5	21	36	13	21	69	152
1989	2	0	13	0	26	73	110
1990	0	15	23	0	28	73	128
1991	0	16	24	0	25	75	126
1992	2	1	21	9	25	71	110
1993	1	8	26	15	37	66	153
1994	1	5	21	0	39	71	119
1995	2	7	12	0	26	58	105
1996	1	4	12	0	20	54	86
1997	0	11	21	9	19	57	102
1998	0	16	23	0	28	52	82
1999	0	0	0	0	15	45	60
2000	0	12	13	0	26	49	79
2001	0	5	5	0	13	29	51
2002	0	0	0	0	7	5	12
2003	0	0	0	0	10	20	30
2004	0	0	0	0	11	25	36
2005	0	0	0	0	12	28	40
2006	0	0	0	0	22	40	61
2007	0	0	11	0	15	47	71
2008	0	4	12	4	23	58	91
2009	0	5	17	7	21	49	88
2010	0	10	19	5	35	49	115
Average 2005-2009	[b]	2	13	[b]	19	44	36
Average 2000-2009	0	3	6	1	16	35	56

Source: Data provided to NMFS by ADF&G in response to a special data request

[a] District total is the number of fishermen that actually fished in Norton Sound; some fishermen may have fished more than one subdistrict.

[b] Data not available.

Table 3-26 provides the real (inflation adjusted) value of commercial Chum salmon harvest compared to total real value of Norton Sound commercial salmon harvest from 1967 through 2010. The decline in catch of both chum and Chinook salmon, combined with declining salmon prices since the late 1970s, have depressed overall fishery value, from a peak of nearly $2.5 million in the late 1970s to a period low of just $3,500 in 2002. Over this time, Chum real value peaked in 1979 at $1.253 million. Chum real value has fluctuated since the 1980s; however, has had a generally downward trend to the period low of $379 in 2002. Since 2002, chum harvest and value have trended upwards and the 2010 harvest value of nearly half a million dollars is the highest real value recorded since 1985.

Table 3-26 Real historical value of commercial Chum catch, Norton Sound, 1967-2010 (inflation adjusted to 2009 value using the GDP deflator)

Year	Reported Total Value	Chum Value	Chum Value % of Total
1967	$228,616	$135,248	59.16%
1968	$317,212	$152,815	48.17%
1969	$452,227	$276,260	61.09%
1970	$446,353	$275,238	61.66%
1971	$433,600	$367,922	84.85%
1972	$420,718	$321,815	76.49%
1973	$1,203,847	$1,055,094	87.64%
1974	$1,562,604	$1,238,366	79.25%
1975	$1,349,669	$1,033,172	76.55%
1976	$881,155	$620,577	70.43%
1977	$1,585,412	$1,233,446	77.80%
1978	$2,461,806	$1,131,264	45.95%
1979	$2,201,247	$1,028,581	46.73%
1980	$1,313,344	$687,265	52.33%
1981	$1,598,643	$700,802	43.84%
1982	$2,116,106	$847,477	40.05%
1983	$1,800,622	$1,253,255	69.60%
1984	$1,353,661	$449,260	33.19%
1985	$1,457,018	$518,675	35.60%
1986	$951,735	$475,809	49.99%
1987	$876,551	$408,622	46.62%
1988	$1,244,666	$489,585	39.33%
1989	$503,766	$84,339	16.74%
1990	$719,720	$168,328	23.39%
1991	$606,253	$236,449	39.00%
1992	$642,217	$187,591	29.21%
1993	$451,381	$116,724	25.86%
1994	$1,184,449	$48,770	4.12%
1995	$478,818	$70,284	14.68%
1996	$449,008	$8,902	1.98%
1997	$471,761	$36,079	7.65%
1998	$460,173	$12,308	2.67%

1999	$97,098	$8,012	8.25%
2000	$185,365	$7,474	4.03%
2001	$68,830	$18,278	26.56%
2002	$3,500	$379	10.84%
2003	$75,103	$3,863	5.14%
2004	$138,767	$6,722	4.84%
2005	$324,629	$4,523	1.39%
2006	$413,703	$10,180	2.46%
2007	$590,061	$37,467	6.35%
2008	$766,415	$27,635	3.61%
2009	$722,167	$79,366	10.99%
2010	$1,220,487	$495,721	40.62%

Source: Calculated from data provided to NMFS by ADF&G in response to a special data request

Real historic chum salmon value, real total value, and the percentage of real chum value in real total value are displayed in Fig. 3-46. Both chum value and total value are displayed with respect to the left vertical axis and chum percent of total value is displayed on the right vertical axis. From this figure it is easy to see the divergence of chum and total value during the 2000s as commercial chum harvests in Norton Sound have been in decline. Also evident is the sharp increase in value of chum harvest in 2010 and that chum harvests accounted for just over 40 percent of the total value of all salmon harvested in Norton Sound. Historically, chum value was as much as 87 percent of total value in the early 1970s and trended downward in importance to the regions total fishery value through the early 2000s. In 2005, for example, chum accounted for only about 1.4 percent of the total commercial harvest value in Norton Sound. This decline was coincident with similar declines in Chinook salmon harvest and value leaving coho, pink, and sockeye as the primary sources of commercial salmon income in the region.

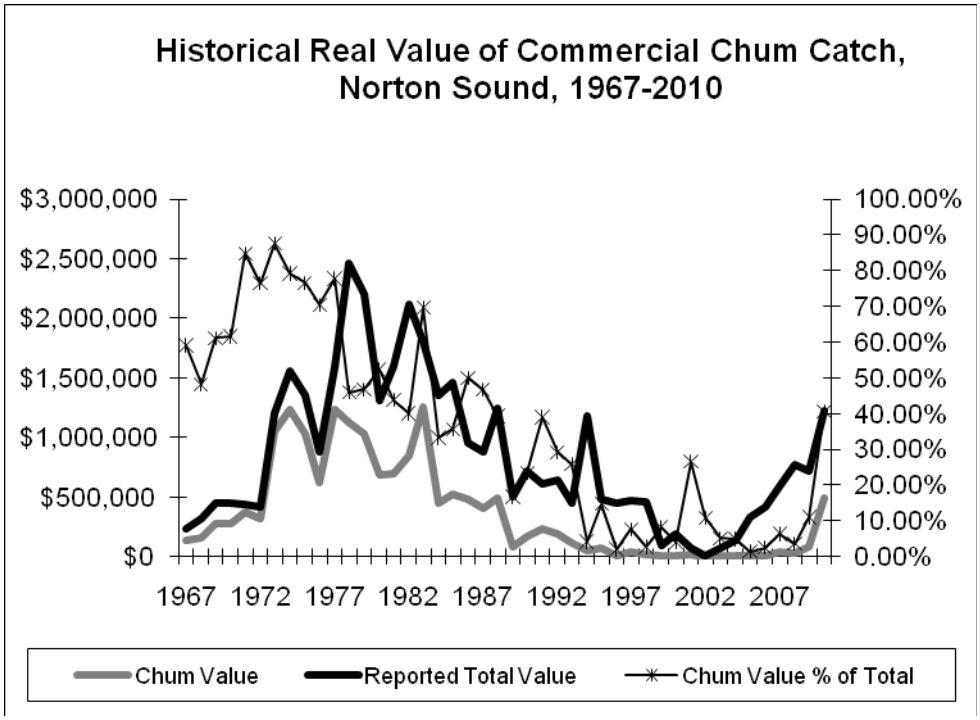


Fig. 3-46 Norton Sound commercial real Chum value, total value, and percent Chum value in total value, 1967-2010 (values are inflation adjusted to 2009 values using the GDP deflator)
Source: Derived from data provided to NMFS by ADF&G in response to a special data request

3.5.3 Kuskokwim River, Kuskokwim Bay

The Kuskokwim Area includes the Kuskokwim River drainage, all waters of Alaska that flow into the Bering Sea between Cape Newenham and the Naskonat Peninsula, and Nunivak and St. Matthew Islands (Fig. 3-47). The 2007 Kuskokwim River salmon fisheries were managed according to the Kuskokwim River Salmon Management Plan (5 AAC 07.365). Kuskokwim Bay salmon fisheries were managed according to the District 4 Salmon Management Plan (5 AAC 07.367) and their associated regulations. (This section was developed from ADF&G 2007b,c, ADF&G 2009a,ADF&G 2010d and data supplied in ADF&G 2010 and 2007)

The Kuskokwim River Salmon Management Working Group (Working Group) was formed in 1988 by the BOF in response to requests from stakeholders in the Kuskokwim River drainage seeking a more active role in the management of salmon fishery resources. Since then, the Working Group has become increasingly active in the preseason, inseason, and postseason management of the Kuskokwim River drainage subsistence, commercial, and sport salmon fisheries. In 2001, the Working Group modified its charter in order to more effectively address the needs of the Federal Subsistence Management Program by including members of the Coordinating Fisheries Committee of the Yukon-Kuskokwim Delta and Western Interior Regional Advisory Councils. The Working Group now serves as a public forum for Federal and State fisheries managers to meet with local users of the salmon resource to review run assessment information and reach a consensus on how to proceed with management of Kuskokwim River salmon fisheries. Working Group meetings provide the forum for area fishermen, user representatives, community representatives, Regional Advisory Council representatives, Fish and Game Advisory Committee members, and State and Federal managers to come together to discuss issues relevant to sustained yield fishery management and providing for the subsistence use priority.

Improvements have been made toward strengthening the cooperative management process of the Kuskokwim River Salmon Management Working Group through funding provided by the Office of Surface Mining, Reclamation and Enforcement, Department of the Interior (OSM) in support of project Fisheries Information Services (FIS) 01-116. The funding provided by OSM allowed ADF&G staff and Working Group members to more effectively keep area fishermen informed of run abundance, fishery status, and management strategies through discussion, news releases, newspaper articles and radio talk shows. The funding allowed dedicated staff to more effectively prepare for meetings by providing complete and frequent distribution of updated fishery status information in a standardized format. The funding also allowed travel for Working Group members to participate in fishery meetings located outside the drainage. Although progress has been made toward strengthening cooperative management, it is an ongoing process that will require the continued participation by area fishermen and basic funding for material preparation, communication and travel to maintain the interaction of Working Group members with fishery managers, fishery project leaders, research planners, and policy makers.

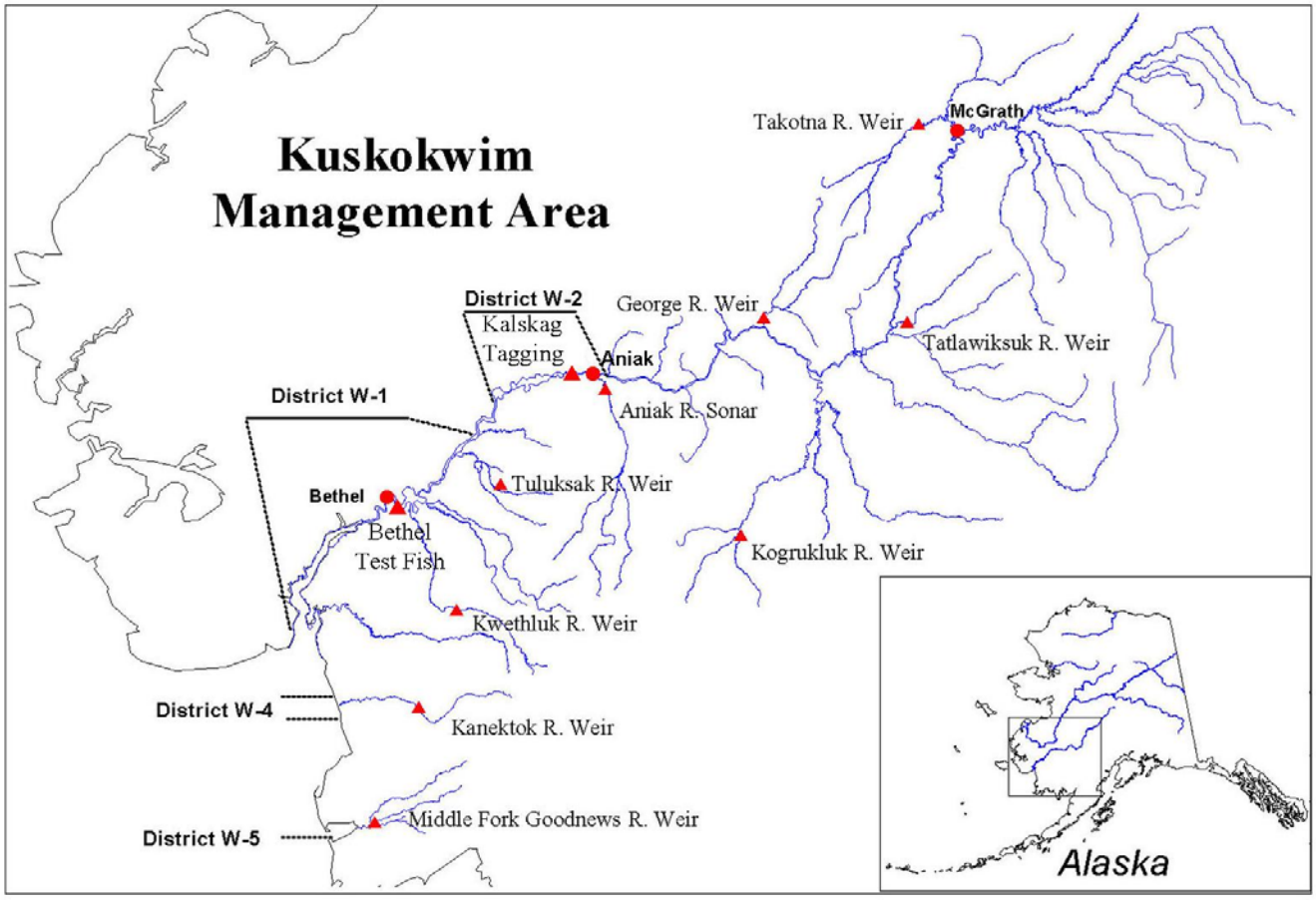


Fig. 3-47 Kuskokwim Management Area and salmon run assessment projects

Recent Management Actions

The District 4 commercial fishery is managed in accordance with the District 4 Salmon Management Plan 5 ACC 07.367. By regulation, the first commercial fishing period in District 4 is to occur prior to June 16. Additional commercial fishing periods are scheduled if salmon abundance warrants. In District 5, the commercial fishery will open during the fourth week of June given adequate run abundance and processor capacity. The commercial fishing schedule is anticipated to align with the District 4 commercial schedule from late June through July given adequate run abundance, market interest, and processor capacity. Fishing time may be reduced if such action is necessary to achieve salmon escapement objectives (ADF&G, 2010).

Low chum salmon abundance from 1997 through 2000 prompted the Alaska Board of Fisheries to declare Kuskokwim River chum salmon as a stock of yield concern in September 2000. The chum salmon runs to the Kuskokwim River improved throughout 2000s, with near record runs from 2005 through 2007, which led to the stock of concern finding being lifted in January 2007. Near record runs occurred from 2005 through 2007; thereafter, abundance has been near average (Estensen et al., 2009).

As directed by the Kuskokwim River Salmon Management Plan (5 AAC 07.365), a commercial fishery is allowed to be prosecuted in June and July if salmon abundance is above the amounts necessary to meet escapement goals and subsistence use. Improved chum salmon markets and increased processing capacity at the Platinum processing plant should result in commercial openings occurring from mid-to late June through July, provided salmon abundance in adequate and subsistence needs are being met. However, processing capacity may limit commercial openings in District 1 to Subdistrict 1-B (Bethel) only. Commercial openings

may be announced when no large scale buyers are available in order to provide opportunity for all permit holders operating as catcher/sellers or catcher/processors (ADF&G, 2010).

Although the use of gillnets with up to 8-inch mesh is allowed by regulation, commercial fishing periods are almost always limited to gillnets with 6-inch mesh or less. This allows for the commercial harvest of sockeye and chum salmon while limiting impacts to Chinook salmon (ADF&G, 2010).

Fishery and Reporting Requirements

All processors, buyers, and catcher/sellers of salmon are required to register with ADF&G before operating in the Kuskokwim Area. Processors, buyers, and catcher/sellers in Districts 1, 4, and 5 must register with the ADF&G office in Bethel. Registered salmon buyers are required to provide a verbal report of their salmon purchases within 24 hours following the closure of a commercial fishing period. Buyers are also required to mail fish tickets to ADF&G within 24 hours or deliver fish tickets within 72 hours following the closure of each commercial fishing period in the Kuskokwim Area. If there is incomplete reporting, ADF&G may delay additional commercial fishing periods until the needed harvest reports are received. In addition, it is very important for buyers to accurately report on each fish ticket the statistical area where salmon were harvested (maps of statistical areas are available upon request and are noted in regulation) (Estensen et al., 2009).

All salmon caught by CFEC permit holders during commercial periods must be reported on fish tickets. Regulations also require commercial fishermen to report, on each fish ticket, the number of salmon harvested but not sold during commercial fishing periods. Buyers are required to ensure this information is reported on fish tickets even though a portion of the commercial harvest may have been used for subsistence (ADF&G, 2010).

Status of Runs and Conservation Concerns

The BOF met in Anchorage from January 31 to February 5, 2007, to review regulatory fisheries proposals concerning the AYK area. The BOF discontinued the stock of yield concern designations for the Kuskokwim River Chinook and chum stocks based on Chinook and chum salmon runs being at or above the historical average each year since 2002. The Kuskokwim Area has no formal forecast for salmon returns, but broad expectations are developed based on parent-year escapements and recent year trends.

Commercial Fishery Situation and Outlook

There are 4 commercial salmon fishing districts: 1, 2, 4, and 5 (5AAC 07.200). District 1 (District W-1), the Lower Kuskokwim River, consists of the Kuskokwim River from a line between Apokak Slough and the southernmost tip of Eek Island and Popokamiut upstream to a line between ADF&G regulatory markers located at Bogus Creek, about 9 miles above the Tuluksak River (Fig. 2; Appendix A2). The downstream boundary has been in effect since 1986, and the upstream boundary was established in 1994 (Appendix A3). District 1 was divided into 2 subdistricts in 2000. Subdistrict 1A consists of that portion of District 1 upstream from a line between regulatory markers located at the downstream end of Steamboat Slough. Subdistrict 1B consists of that portion of District 1 downstream from the Steamboat Slough regulatory markers. Subdistrict registration requirements are in effect in District 1 (5 AAC 07.370).

District 2, the Middle Kuskokwim River, consists of the Kuskokwim River from ADF&G regulatory markers located at the upstream entrance to the second slough on the west bank downstream from Kalskag to the regulatory markers at Chuathbaluk. The downstream boundary of District 2 was used for the first time in 1990.

The District 4 commercial salmon fishery was established in 1960. The boundaries of District 4 extend from the northern-most edge of the mouth of Oyak Creek to the southern-most tip of the south mouth of the Arolik

River, and expand 3 mi from the coast into Kuskokwim Bay. Prior to 2001, the northern most boundary of the district was the northern most edge of Weelung Creek. The northern boundary was moved by regulation to minimize the number of Kuskokwim River bound Chinook and chum salmon harvested in the District 4 commercial fishery. The Kanektok and Arolik Rivers are the main spawning streams in the district. The village of Quinhagak is located at the mouth of the Kanektok River.

The District 5 commercial salmon fishery was established in 1968. The boundaries of District 5 extend from the southern most tip of the north spit to the northern most tip of the south spit at the entrance of Goodnews Bay, expanding east to a line between the mouth of Ukfigag Creek to the mouth of the Tunulik River. The Goodnews River drainage is the main spawning drainage in the district. The Goodnews and Middle Fork Goodnews Rivers are the primary spawning rivers within the drainage.

Kuskokwim River

Throughout the Kuskokwim Area, in 2010, chum and sockeye salmon abundance was very good while coho salmon abundance was below average and Chinook salmon abundance was poor. Kuskokwim River Chinook salmon run timing was normal, while sockeye, chum, and coho salmon runs were later than historical average. Kuskokwim Bay run timing was late for Chinook and coho salmon with normal run timing for both sockeye and chum salmon.

There were two registered buyers in the Kuskokwim Area in 2010 and processing capacity was adequate to purchase harvested fish with participation ranging from 49 to 226 permit holders. On average, 123 permit holders participated in each of 16 commercial fishing periods from 25 June through 12 August 2010. Chinook salmon catch rates from late June through mid-July were below average. Catch rates for Sockeye, and chum salmon, were average to above average from late June through late July. Coho salmon catch rates from late July through 12 August were primarily below average.

A total of 433 individual permit holders recorded landings in District 1 of the Kuskokwim River during the 2010 season. This level of fishing effort was 12 percent above the recent 10-year average of 387 fishermen. District 1 commercial harvest in 2010 was 2,731 Chinook; 22,428 sockeye, 58,031 coho; and 93,148 chum salmon. Chinook, sockeye, and chum salmon harvests were above the recent 10-year average, while coho salmon harvest was below the recent 10-year average. The chum salmon harvest was the highest since 1998. Total ex-vessel value of the fishery was $765,606; approximately 160 percent above the recent 10-year value.

Table 3-27 Chum salmon harvests, Kuskokwim River Area, 1960–2009

Year	Commercial Harvest[a]	Subsistence Harvest[b]	Test-Fish Harvest	Sport Fish Harvest	Total Harvest
1960	0	301,753 [c]			301,753
1961	0	179,529 [c]			179,529
1962	0	161,849 [c]			161,849
1963	0	137,649 [c]			137,649
1964	0	190,191 [c]			190,191
1965	0	250,878 [c]			250,878
1966	0	175,735 [c]	502 [d]		176,237
1967	148	208,445 [c]	338		208,931
1968	187	275,008 [c]	562		275,757
1969	7,165	204,105 [c]	384		211,654

1970	1,664	246,810	c	1,139	d		249,613
1971	68,914	116,391	c	254			185,559
1972	78,619	120,316	c	486			199,421
1973	148,746	179,259	c	675			328,680
1974	171,887	277,170	c	2,021			451,078
1975	184,171	176,389	c	1,062			361,622
1976	177,864	223,792	c	2,101			403,757
1977	248,721	198,355	c	576		129	447,781
1978	248,656	118,809	c	2,153		555	370,173
1979	261,874	161,239	c	412		259	423,784
1980	483,751	165,172	c	2,058		324	651,305
1981	418,677	157,306	c	1,793		598	578,374
1982	278,306	190,011	c	504		1125	469,946
1983	276,698	146,876	c	1,069		922	425,565
1984	423,718	142,542	c	1,186		520	567,966
1985	199,478	94,750		616		150	294,994
1986	309,213	141,931	c	1,693		245	453,082
1987	574,336	70,709		2,302		566	647,913
1988	1,381,674	151,967	e	4,379		764	1,538,784
1989	749,182	139,672		2,082		2,023	892,959
1990	461,624	126,509		2,107		533	590,773
1991	431,802	93,077		931		378	526,188
1992	344,603	96,491		15,330		608	457,032
1993	43,337	59,394		8,451		359	111,541
1994	271,115	72,022		11,998		1,280	356,415
1995	605,918	67,861		17,473		226	691,478
1996	207,877	88,966		2,864		280	299,987
1997	17,026	39,987		790		86	57,889
1998	207,809	63,537		1,140		291	272,777
1999	23,006	43,601		562		180	67,349
2000	11,570	51,696		1,038		26	64,330
2001	1,272	49,874		1,743		112	53,001
2002	1,900	69,019		2,666		53	73,638
2003	2,764	43,320		1,713		67	47,864
2004	20,429	52,374		1,810		117	74,730
2005	69,139	46,036		4,459		608	120,242
2006[f]	44,070	57,024		3,547		144	104,784
2007	10,783	51,308		3,237		424	65,752
2008	30,798	50,012	f	2,473		272	f 83,555
2009	76,790	50,012	f	2,741		272	f 129,815
5-yr avg ('05-'09)	46,316	50,878		3,291		344	100,830
10-yr avg ('00-'09)	26,952	52,067		2,543		209	81,771

[a] Districts 1 and 2 only; no chum harvests were reported in District 3.

[b] Estimated subsistence harvest expanded from villages surveyed.

[c] Includes small numbers of small Chinook, sockeye, and coho salmon.

[d] Includes small numbers of sockeye.

[e] Beginning in 1988, estimates based on a new formula. Data since 1988 is not comparable with previous years.

[f] 2008 and 2009 subsistence and sport harvest based on most recent 5-year average (2003–2007).

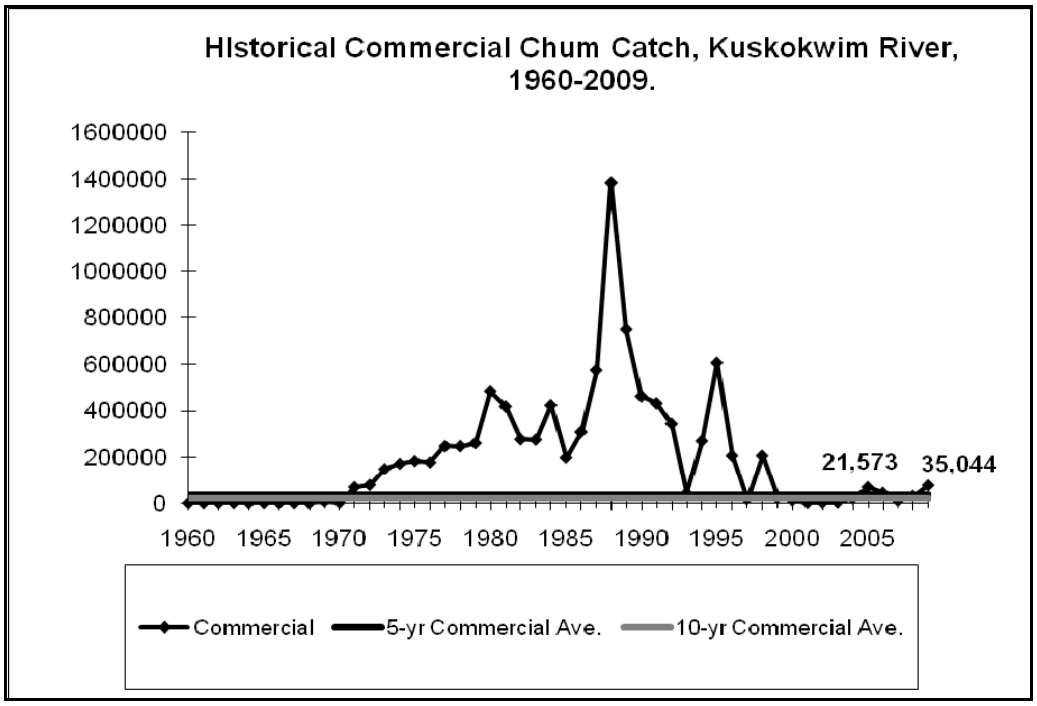


Fig. 3-48 Kuskokwim River commercial chum salmon catch, 1960-2010
Source: Data provided to NMFS by ADF&G, in 2010, in response to a special data request.

Table 3-28 provides the real (inflation adjusted) value of commercial Chinook salmon harvest compared to total value of Kuskokwim Area commercial salmon harvest from 1989 through 2007. Over this time, real Chinook value peaked in 1989 at $538,052, when it represented 10 percent of the overall real value. The decline in catch, combined with declining salmon prices since the early 1980s, have depressed overall fishery value below $1,000 in 2001, 2002, 2003 and 2007. The low of the period was $350 in 2002. Fig. 3-49, below, provides a graphical representation of this declining trend.

Table 3-28 Salmon harvests and real (inflation adjusted) value by species, Kuskokwim River, 1993–2009.

	Chinook		Sockeye		Chum		Coho		Total	
Year	Number	Value	Number	Value	Number	Value	Number	Value	Number	Value
1993	8,735	$101,817	27,008	$196,181	43,337	$158,005	610,739	$3,552,736	689,883	$4,008,821
1994	16,211	$174,144	49,365	$258,956	271,115	$523,755	724,689	$3,946,704	1,092,310	$4,915,866
1995	30,846	$376,811	92,500	$602,993	605,918	$973,695	471,461	$1,766,163	1,201,060	$3,719,728
1996	7,419	$31,220	33,878	$128,201	207,877	$225,564	937,299	$2,407,238	1,188,094	$2,793,205
1997	10,441	$47,762	21,989	$84,163	17,026	$25,291	130,803	$2,809,881	180,261	$2,967,099
1998	17,359	$95,355	60,906	$269,016	207,809	$234,978	210,481	$661,482	496,647	$1,260,901
1999	4,705	$28,129	16,976	$109,203	23,006	$20,754	23,593	$56,385	68,282	$214,471
2000	444	$3,764	4,130	$17,648	11,570	$9,851	261,379	$605,461	277,530	$636,728
2001	90	$646	84	$320	1,272	$1,000	192,998	$510,980	194,444	$512,946
2002	72	$252	84	$233	1,900	$1,416	83,463	$148,461	85,519	$150,362
2003	158	$985	282	$935	2,764	$1,266	284,064	$524,720	287,268	$527,907
2004	2,300	$11,118	9,748	$22,144	20,429	$7,489	433,807	$1,028,289	466,284	$1,069,039
2005	4,784	$31,832	27,645	$119,549	69,139	$25,338	142,319	$315,291	243,887	$492,010
2006	2,777	$17,189	12,618	$44,470	44,070	$15,911	185,598	$401,613	245,064	$479,184
2007	179	$1,657	703	$2,486	10,763	$3,128	141,049	$385,460	152,694	$392,731
2008	8,865	$71,639	15,601	$60,325	30,156	$11,315	142,877	$399,963	197,859	$543,246
2009	6,664	$61,452	25,673	$101,445	76,790	$76,494	104,546	$263,457	213,675	$502,848
5-yr avg ('04-'08)	3,781	26,687	13,263	49,795	34,911	12,636	209,130	506,123	261,158	595,242
10-yr avg ('99-'08)	2,437	16,721	8,787	37,732	21,507	9,747	189,115	437,662	221,883	501,863

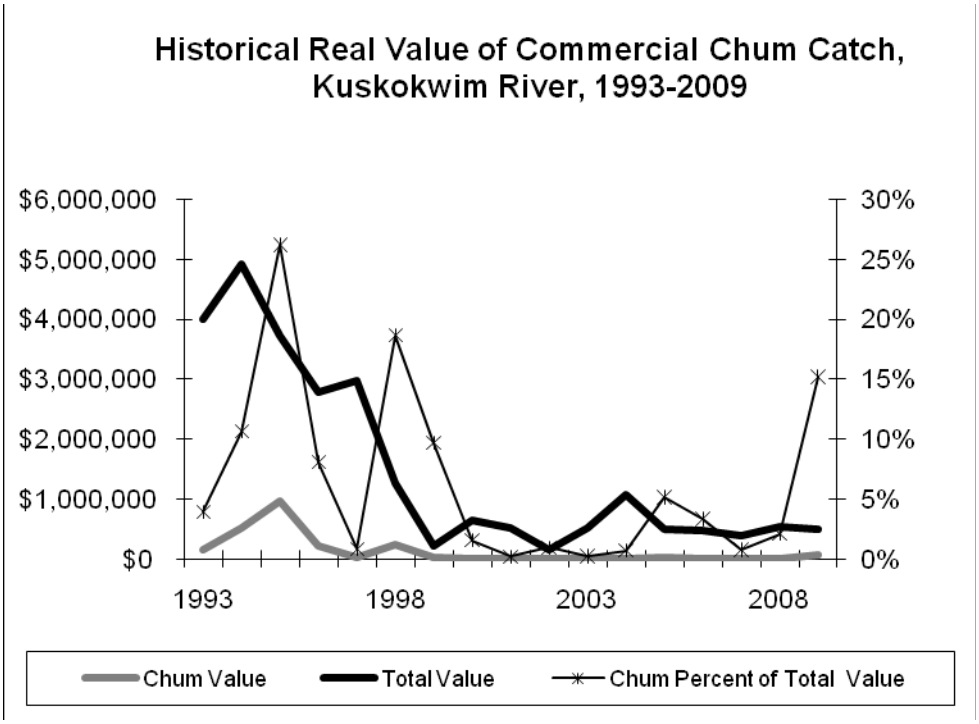


Fig. 3-49 Real Kuskokwim River Chum commercial value relative to total value, 1993-2009.
Source: Derived from data provided to NMFS by ADF&G in response to a special data request

Kuskokwim Bay

In 2010, the District 4 commercial salmon fishing season opened June 15, with management directed towards Chinook salmon harvest, and the District 5 season opened on June 28. Each district was initially placed on a 1 or 2 day per week commercial fishing schedule to allow for Chinook escapement. A schedule of three 12 hour commercial openings per week was initiated in Districts 4 and 5 on July 5 when management transitioned to sockeye salmon directed harvest. Chinook salmon harvest and catch rates per period were below. Sockeye anc chum salmon harvest and catch rates per period were above average in both districts.

A total of 241 individual permit holders recorded landings in District 4 during the 2010 season. This level of fishing effort was 65 percent above the recent 10-year average of 146 fishermen. The 2010 District 4 commercial harvest was 14,230 Chinook, 138,362 sockeye, 106,610 chum, and 13,690 coho salmon from 23 periods. District 4 chum and sockeye salmon harvest were the highest on record, while Chinook and coho salmon harvests were below the 10-year average. The total ex-vessel value of the District 4 fishery was $1,655,321, approximately 40 percent above the recent 10-year average value.

A total of 48 individual permit holders recorded landings in District 5 during the 2010 season. This level of fishing effort was an increase compared to 2009, and was 51 percent above the recent 10-year average of 32 fishermen. The 2010 District 5 commercial harvest was 1,752 Chinook, 41,074 sockeye, 26,914 chum, and 4,900 coho salmon from 22 periods. District 5 Chinook salmon harvest was below average. However, sockeye salmon harvest was approximately 49 percent above the recent 10-year average while chum salmon harvest was approximately 356 percent above the recent 10-year average. Coho salmon harvest was approximately 63 percent below the recent 10-year average. The total ex-vessel value of the District 5 fishery was $43,661; and was the second highest fishery value since 1988.

Table 3-29 Commercial salmon harvests, Kuskokwim Bay: Areas 4 and 5: 1990–2009

	District 4 (Quinhagak)					
Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1990	$253,562	$542,485	$123,936	$4,146	$89,343	$1,013,472
1991	$94,950	$246,734	$144,379	$52	$106,321	$592,436
1992	$166,471	$368,310	$303,740	$15,875	$139,268	$993,664
1993	$143,506	$402,763	$246,746	$4	$105,236	$898,255
1994	$67,584	$253,922	$420,802	$10,454	$84,395	$837,157
1995	$418,067	$323,104	$201,413	$81	$104,523	$1,047,188
1996	$61,004	$165,100	$246,930	$6	$61,686	$534,726
1997	$171,688	$204,190	$91,584	$0	$29,609	$497,071
1998	$82,168	$150,631	$197,676	$871	$36,497	$467,843
1999	$94,880	$140,846	$14,997	$0	$28,368	$279,091
2000	$131,351	$249,382	$31,898	$1	$23,929	$436,561
2001	$93,697	$89,334	$32,577	$0	$13,007	$228,615
2002	$56,356	$40,368	$47,651	$0	$23,374	$167,749
2003	$69,201	$107,287	$108,804	$0	$19,261	$304,553
2004	$107,700	$77,394	$201,879	$0	$18,372	$405,345
2005	$221,854	$241,478	$101,776	$4	$6,853	$571,965
2006	$147,802	$327,917	$61,433	$0	$14,030	$551,182
2007	$163,248	$374,004	$102,569	$0	$21,044	$660,865
2008	$140,580	$272,427	$317,143	$0	$20,581	$750,731
2009	$130,561	$384,209	$136,562	$0	$95,993	$747,325
5-yr avg ('05-'09)	$160,809	$320,007	$143,897	$1	$31,700	$656,414
10-yr avg ('00-'09)	$126,235	$216,380	$114,229	$1	$25,644	$482,489

	District 5 (Goodnews Bay)					
Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1990	$32,135	$263,598	$38,910	$254	$25,767	$360,664
1991	$8,370	$187,622	$47,519	$14	$31,394	$274,919
1992	$30,688	$257,457	$75,278	$2,913	$39,111	$405,447
1993	$21,351	$296,437	$95,043	$0	$28,304	$441,135
1994	$21,732	$309,577	$271,687	$5,442	$41,309	$649,747
1995	$31,339	$175,552	$58,061	$19	$21,427	$286,398
1996	$5,952	$87,427	$120,191	$4	$9,015	$222,589
1997	$10,867	$93,146	$9,497	$0	$9,358	$122,868
1998	$13,685	$100,171	$59,102	$174	$11,133	$184,265

1999	$9,020	$78,800	$7,515	$0	$8,327	$103,662
2000	$25,614	$146,708	$34,689	$2	$6,001	$213,014
2001	$10,496	$68,678	$17,089	$0	$2,586	$98,849
2002	$343	$15,846	$5,634	$0	$2,979	$24,802
2003	$6,461	$95,818	$28,945	$0	$3,883	$135,107
2004	$10,857	$49,741	$70,404	$0	$4,244	$135,246
2005	$16,696	$91,135	$25,010	$0	$1,454	$134,295
2006	$21,314	$87,996	$27,587	$0	$4,368	$141,265
2007	$23,951	$156,802	$38,796	$0	$2,781	$222,330
2008	$13,181	$104,296	$76,683	$0	$3,910	$198,070
2009	$13,333	$134,244	$25,456	$0	$18,998	$192,031
5-yr avg ('05-'09)	$17,695	$114,895	$38,706	$0	$6,302	$177,598
10-yr avg ('00-'09)	$14,225	$95,126	$35,029	$0	$5,120	$149,501

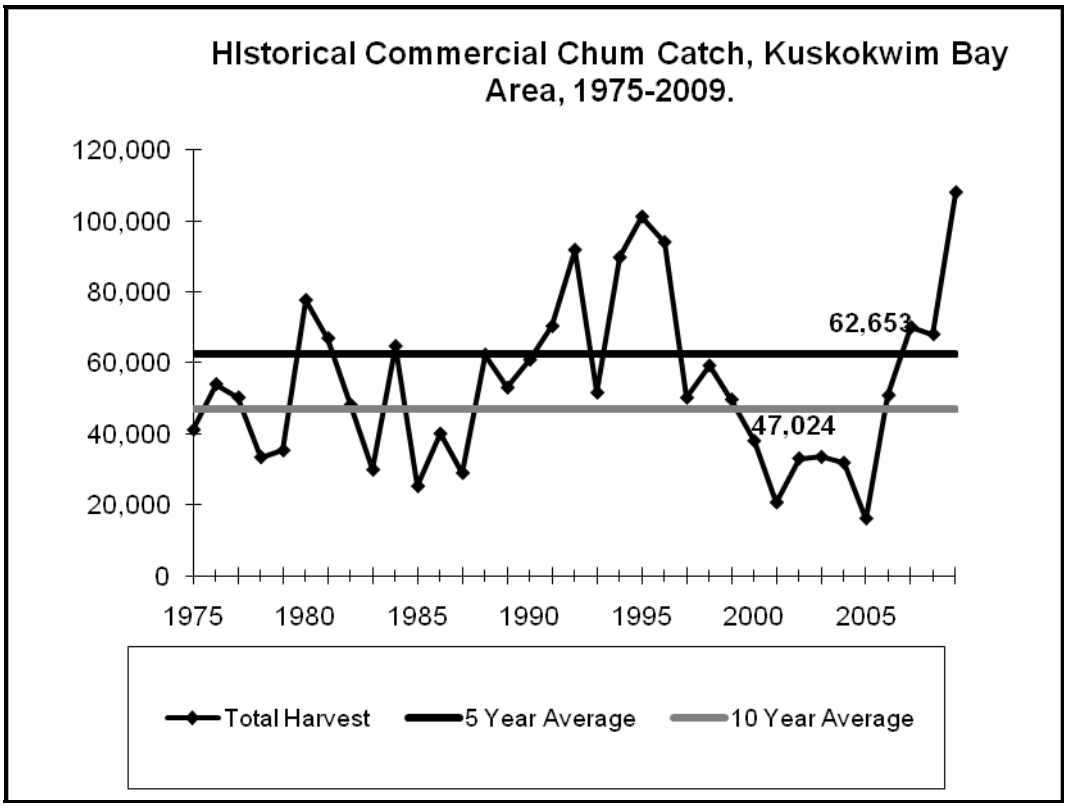


Fig. 3-50 Kuskokwim Bay commercial chum salmon catch, 1960-2010
Source: Data provided to NMFS by ADF&G, in 2010, in response to a special data request.

Table 3-30 Kuskokwim Bay real value of commercial chum salmon catch : 1960–2009

Year	District 4 (Quinhagak)	District 5 (Goodnews Bay)	Kuskokwim Bay Total	Chum Percent of Total Value
1990	$135,640	$25,769	$2,086,203	8%
1991	$155,891	$31,395	$1,271,738	15%
1992	$199,468	$39,112	$2,003,888	12%
1993	$147,467	$28,305	$1,876,882	9%
1994	$115,822	$41,310	$2,040,602	8%
1995	$140,518	$21,428	$1,792,840	9%
1996	$81,380	$9,016	$999,098	9%
1997	$38,384	$9,359	$803,674	6%
1998	$46,785	$11,134	$835,925	7%
1999	$35,838	$8,328	$483,536	9%
2000	$29,589	$6,002	$803,221	4%
2001	$15,728	$2,587	$395,973	5%
2002	$27,814	$2,980	$229,124	13%
2003	$22,437	$3,884	$512,150	5%
2004	$20,811	$4,245	$612,348	4%
2005	$7,512	$1,455	$774,167	1%
2006	$14,894	$4,369	$735,084	3%
2007	$21,701	$2,782	$910,772	3%
2008	$20,770	$3,911	$957,501	3%
2009	$95,993	$18,999	$939,356	12%
5-yr avg ('04-'08)	$17,137	$3,352	$797,974	3%
10-yr avg ('99-'08)	$21,709	$4,054	$641,388	4%

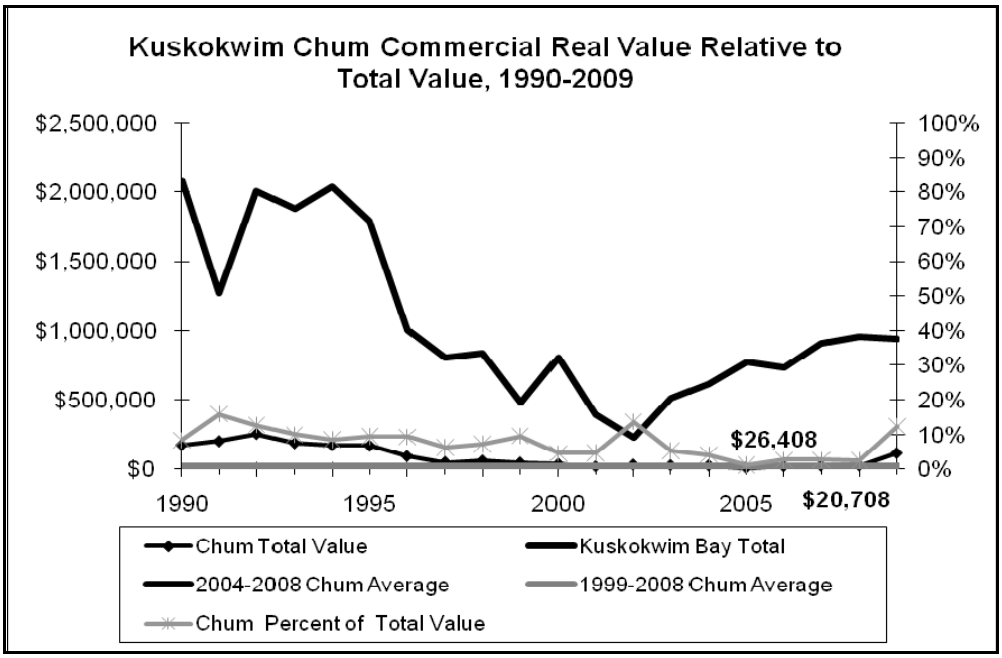


Fig. 3-51 Kuskokwim Bay real value of commercial chum salmon catch, 1960-2010
Source: Data provided to NMFS by ADF&G, in 2010, in response to a special data request.

3.5.4 Yukon River

The Yukon River salmon fishery is among the most complex, in terms of management, in Alaska. The fishery is composed of four stocks; Chinook, summer chum, fall chum, and coho. ADF&G manages the overall Yukon salmon fishery for escapement needs and, in portions of the region, jointly manages subsistence harvest with the U.S. Fish and Wildlife Service. In addition, the U.S./Canada panel of the Pacific Salmon Treaty annually negotiates escapement objectives for the Canadian portion of the Yukon River. The fishery supports subsistence, personal use, sport, and commercial harvests of salmon. For a complete treatment of the management of this fishery please refer to 2007 Yukon Area Management Report (JTC 2008) (This section was developed from ADF&G 2008, ADF&G 2007e, Bue and Hayes 2007, ADF&G 2010 g and h, and data supplied in ADF&G 2010 and 2007)

As in other areas of the State, subsistence fishing has highest priority over other uses. ADF&G utilizes a subsistence fishery schedule, as well as emergency orders, to ensure adequate subsistence fishing opportunities are made available. There is also a personal use fishery schedule. Commercial openings are made when available surpluses are determined to be available.

The Yukon River drainage is divided into fishery districts and sub-districts for management purposes (Fig. 3-52). ADF&G uses an adaptive management strategy that evaluates run strength in season to determine a harvestable surplus above escapement requirements and subsistence uses. Preseason, a management strategy was developed in cooperation with federal subsistence managers that outlined run and harvest outlooks along with the regulatory subsistence salmon fishing schedule described in an information sheet. The 2007 strategy was to implement the subsistence salmon fishing schedule as salmon began to arrive in each district or sub-district in a stepwise manner. Before implementing this schedule, subsistence fishing would be allowed 7 days a week to provide opportunity to harvest non-salmon species, such as whitefish, sheefish, pike, and suckers. Additionally, an informational sheet was used to prepare fishermen for possible reductions to the subsistence salmon fishing schedule or to allow for a small commercial fishery contingent on how the runs developed. The information sheet was mailed to Yukon River commercial permit holders and approximately 2,800 families

identified from ADF&G's survey and permit databases. State and federal staff presented the management strategy to the YRDFA, State of Alaska Advisory Committees, Federal Regional Advisory Councils, and other interested and affected Parties.

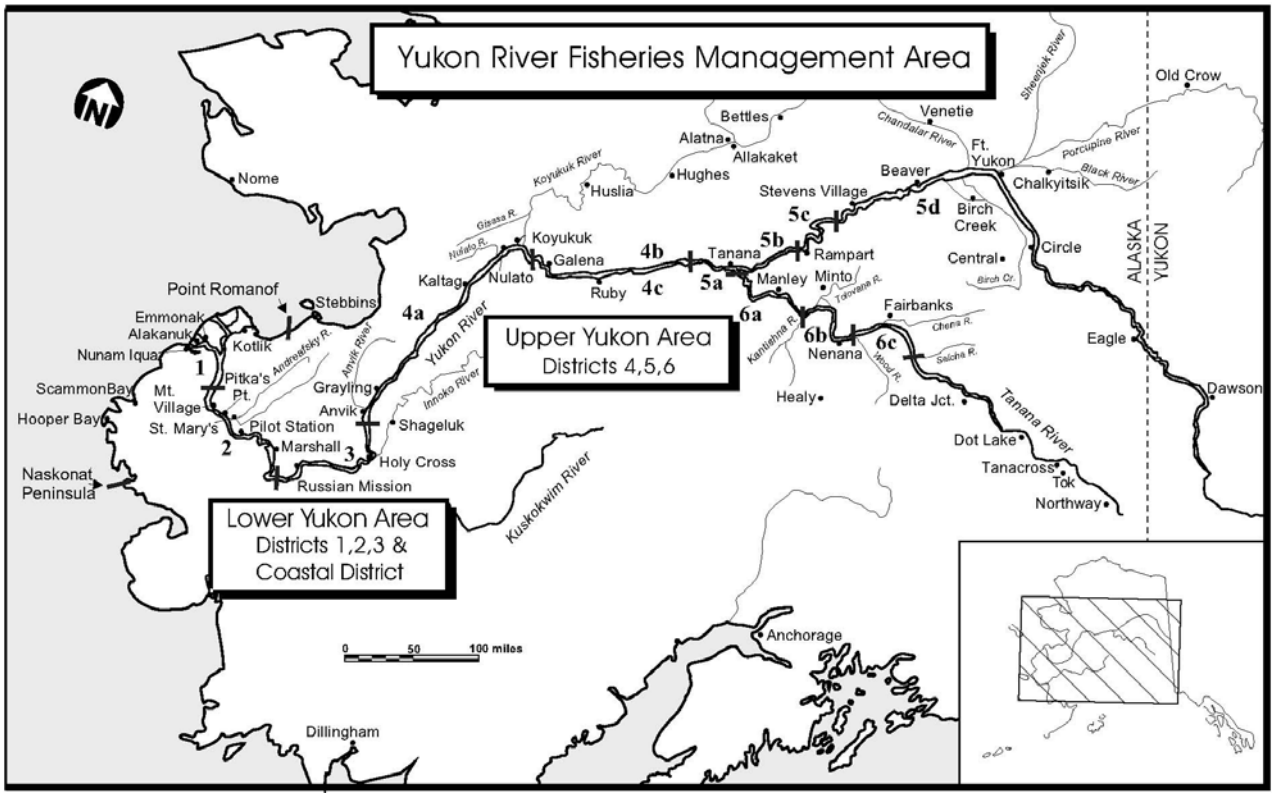


Fig. 3-52 Yukon River fisheries management areas.

Recent Management Actions

At its September 2000 work session, the BOF classified the Yukon River summer chum salmon as a stock of management concern. This determination of management concern was based on documented low escapements during 1998-2000 and an anticipated low run in 2001. The classification as a management concern was continued at the January 2004 BOF meeting due to established escapement goals not being achieved in East Fork Andreafsky River from 1998-2003 and in Anvik River from 1998-2001 and 2003 (Bergstrom et al., 2009).

Given the collectively large spawning escapements of the Yukon River summer chum salmon stock over the three years preceding the January 2007 BOF meeting (2004-2006), including a near record run in 2006, the summer chum salmon stock no longer met stock of concern criteria and the classification was discontinued in February 2007 (Bergstrom et al., 2009).

In addition to the above actions, in January 2010, the BOF modified The Yukon River Summer Chum Salmon Management Plan to allow, by emergency order, a commercial harvest up to 50,000 fish if the total run size is between 900,000 and 1,000,000 fish, distributed by district or subdistrict in proportion to the guideline harvest levels (Hayes and Norris, 2010).

Similar to that of summer chum salmon, Yukon River fall chum salmon was classified as a stock of yield concern by the BOF at its September 2000 work session. Additionally, Toklat and Fishing Branch Rivers fall

chum salmon were classified as stocks of management concern. The determination for the entire Yukon River fall chum salmon as a stock of yield concern was based on substantial decrease in yields and harvestable surpluses during the period 1998-2000, and the anticipated very low run expected in 2001. The 2000 fall chum salmon run was the worst on record. The determination for Toklat and Fishing Branch Rivers as stocks of management concern was based on escapements not meeting the OEG of 33,000 fish for Toklat River from 1996-2000, and not meeting the escapement objective of 50,000-120,000 fish for Fishing Branch River from 1997-2000 (Borba et al., 2009).

Classification as a stock of yield concern continued at the January 2004 BOF meeting because the combined commercial and subsistence harvests showed a substantial decrease in fall chum salmon yield from the 10-year period (1989-1998) to the more recent five year average (1999-2003). Toklat River stock was removed from management concern classification as a result of the BEG review presented at the BOF meeting; however, as a component of the Yukon River drainage, Toklat River fall chum salmon stock was included in the drainage-wide yield concern classification. Fishing Branch River stock was also removed from the management concern classification because management of the portion of the drainage is covered by an annex to the Pacific Salmon Treaty, which is governed under the authority of the Yukon River Panel (Borba et al., 2009).

In January 2007, the BOF determined that Yukon River fall chum salmon stock no longer met the criteria for a yield concern. Run strength was poor from 1998-2002; however, steady improvement had been observed since 2003. The 2005 run was the largest in 30 years and 2006 was above average for an even-numbered year run. The drainage-wide OEG of 300,000 fall chum salmon was exceeded in the preceding five years. The five year average (2002-2006) total reconstructed run of approximately 950,000 fish was greater than the 1989-1998 10-year average of approximately 818,000 fish, which indicated a return to historical run levels (Borba et al., 2009).

As with summer chum salmon, the BOF also modified The Yukon River Fall Chum Salmon Management Plan in January 2010 by lowering the threshold required to allow a directed fall chum salmon commercial fishery from a run size of 600,000 fall chum salmon to 500,000 fall chum salmon (Hayes and Norris, 2010).

Fishery and Reporting Requirements

All processors, buyers, and catcher/sellers of salmon are required to register with ADF&G before operating in the Yukon Area. Processors, buyers, and catcher/sellers in Districts 1, 2, and 3 must register with the ADF&G office in Emmonak. Processors, buyers, and catcher/sellers in Districts 4, 5, and 6 must register with the ADF&G office in Fairbanks. Registered salmon buyers are required to provide a verbal report of their salmon purchases within 18 hours following the closure of a commercial fishing period. Buyers may verbally report harvest information in the Upper Yukon Area after office hours by calling a 24-hour message recording. Buyers are also required to mail fish tickets to ADF&G within 24 hours or deliver fish tickets within 48 hours following the closure of each commercial fishing period in the Lower Yukon Area. In the Upper Yukon Area, buyers are required to mail fish tickets to ADF&G within 36 hours or deliver fish tickets within 36 hours following the closure of each commercial fishing period. If there is incomplete reporting, ADF&G may delay additional commercial fishing periods until the needed harvest reports are received. In addition, it is very important for buyers to accurately report on each fish ticket the statistical area where salmon were harvested (maps of statistical areas are available upon request and are noted in regulation) (Hayes and Norris, 2010).

All salmon caught by CFEC permit holders during commercial periods must be reported on fish tickets. In fisheries directed at the harvest of roe, the number of salmon from which the roe was extracted must be reported on the fish ticket and the pounds of roe produced and the number of male chum salmon and Chinook salmon released alive. Regulations also require commercial fishermen to report, on each fish ticket, the number of salmon harvested but not sold during commercial fishing periods. Buyers are required to ensure this

information is reported on fish tickets even though a portion of the commercial harvest may have been used for subsistence (Hayes and Norris, 2010).

Status of Runs and Conservation Concerns

In response to the guidelines established in the Sustainable Salmon Policy, the BOF discontinued the Yukon River summer and fall chum salmon as stocks concern during the February 2007 work session. The Yukon River Chinook salmon stock was continued as a stock of yield concern based on the inability, despite the use of specific management measures, to maintain expected yields, or harvestable surpluses, above the stock's escapement needs since 1998.

Commercial Fishery Situation and Outlook

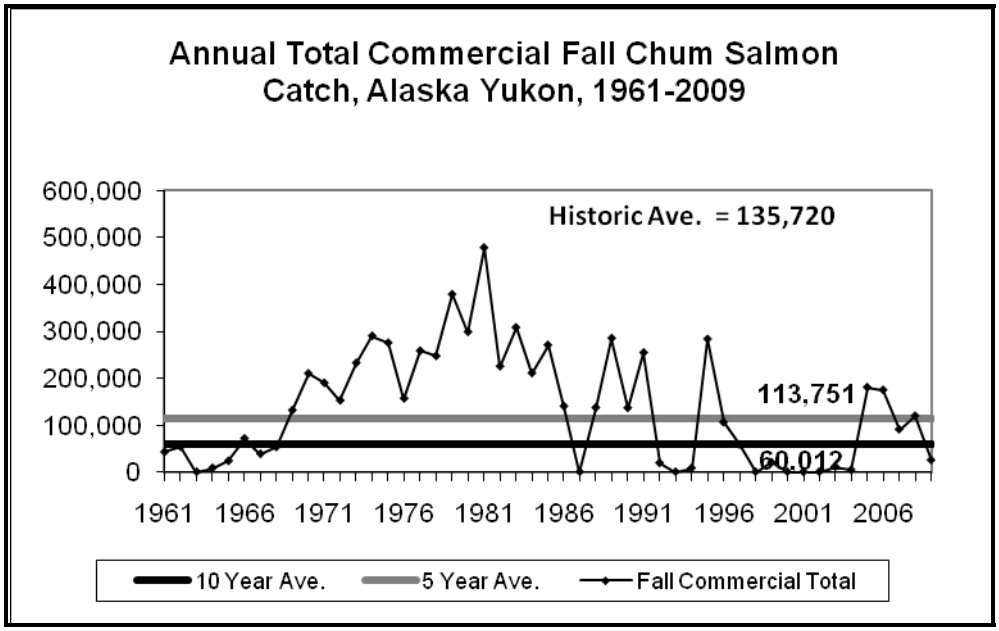
Since 2007, there has been a renewed market interest for summer chum salmon in the lower river districts. Based on the projected average run estimate for summer chum salmon, the department initiated eleven short commercial periods restricted to 6-inch maximum mesh size in Districts 1 and 2 directed at chum salmon. Additionally, seven commercial periods were established in Subdistrict 4-A. Six commercial periods were established in District 6 directed at summer chum salmon, but due to high water events, fishing effort was limited.

Table 3-31 provides historic summer and fall chum salmon catches in the Alaska Yukon from 1961 through 2009. The catch data document a long term decline in commercial harvest of fall chum salmon prior to and during the early 2000s. Some recovery in fall chum commercial catch occurred from 2005 through 2008; however, the 2009 fishery declined significantly from 2009 catch numbers. In 2009, the summer chum commercial harvest was 170,272 (Table 3-31), which was well above the 5-year and 10-year averages; however, well below the historic average of more than half a million summer chum salmon.

Table 3-31 Alaska Yukon Area commercial Fall chum salmon catch totals, 1961-2009 and commercial Summer chum salmon catches, 1970-2009.

Year	Summer Commercial Total	Fall Commercial Total
1961		42,461
1962		53,116
1963		0
1964		8,347
1965		23,317
1966		71,045
1967		38,274
1968		52,925
1969		131,310
1970	137,006	209,595
1971	100,090	189,594
1972	135,668	152,176
1973	285,509	232,090
1974	589,892	289,776

1975	710,295	275,009
1976	600,894	156,390
1977	534,875	257,986
1978	1,077,987	247,011
1979	819,533	378,412
1980	1,067,715	298,450
1981	1,279,701	477,736
1982	717,013	224,992
1983	995,469	307,662
1984	866,040	210,560
1985	934,013	270,269
1986	1,188,850	140,019
1987	622,541	0
1988	1,616,682	136,990
1989	1,452,740	284,944
1990	517,177	136,342
1991	658,102	254,218
1992	543,577	19,022
1993	140,116	0
1994	258,741	7,999
1995	818,414	283,057
1996	682,233	105,630
1997	228,252	58,187
1998	28,798	0
1999	29,413	20,371
2000	6,624	0
2001	0	0
2002	13,577	0
2003	10,685	10,996
2004	26,410	4,110
2005	41,264	180,162
2006	92,116	174,542
2007	198,201	90,677
2008	151,201	119,265
2009	170,272	25,269
2004-2008 Ave.	101,838	113,751
1999-2008 Ave.	56,949	60,012
1961-2008 Ave.	517,370	135,720



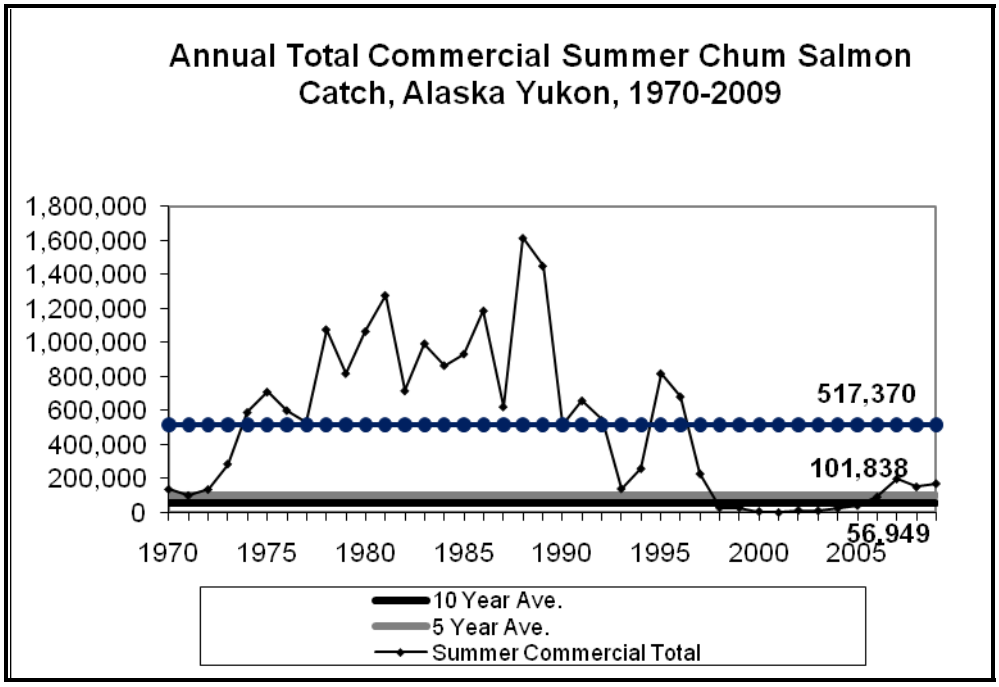


Fig. 3-53 Alaska Yukon annual commercial chum salmon catch: Fall chum 1961-2007, and Summer chum, 21070-2009
Source: ADF&G 2009d

The run size projection, along with 2009 commercial buyers willing to purchase fish harvested during the overlap of summer and fall chum salmon, resulted in a continuation of commercial fishing periods immediately following the summer season. The harvests took advantage of unusually good quality late summer chum salmon when they were mixed with overlapping early fall chum salmon. The relationship

between the summer and fall chum salmon runs suggested the fall run would perform similarly and thereby provided confidence that there would be surplus fall chum salmon available for commercial harvest.

Districts 1, 2, Subdistricts 5-B and 5-C, and District 6 had commercial buyer commitments prior to the season. The first fall season commercial fishing periods began on July 17 in District 1 and July 20 in District 2. Commercial fishing periods continued to be scheduled in both District 1 and District 2 until August 5 and August 3, respectively. Fall chum salmon were harvested commercially prior to and during the first small pulse of fish. Seven commercial fishing periods were opened, four in District 1 and three in District 2 through August 5. The Pilot Station sonar cumulative estimate through August 5 of 57,000 fish was well below the historical average of 243,000 fall chum salmon for that date of operation. According to the management plan, additional fish were needed to achieve the run passage necessary to support normal escapement and meet subsistence requirements before additional commercial harvest could take place. Consequently, commercial fishing activity was suspended.

Overall, the fall season fishery was extremely challenging. The fall chum salmon pulses were spread out over the length of the season, separated with long durations of low passage rates of fish entering the river and relatively small pulses, which made in-season run size projection difficult in 2009. Management struggled between meeting escapement needs and providing opportunity for subsistence fishing during the entire second half of the fall chum salmon run. The resulting fall chum commercial harvest was 25,269 fish, which is well below all averages (Table 3-31)

The total 2009 Canadian Yukon commercial fall chum salmon catch of 293 fish was only 4.8% of the 1999 to 2008 average of 6,058 (Table 3-32). Within the 1999–2008 period, the commercial fall chum salmon catch ranged from 1,319 in 2000, when the fishery was closed most of season due to conservation concerns, to 11,931 fall chum salmon in 2005. The fall chum salmon commercial fishery is somewhat of a misnomer as virtually all of the catch is used for what could be termed personal needs. License holders use most of the catch to feed their personal sled dog teams. This situation could change with the development of local value-added products such as smoked fall chum salmon and salmon caviar.

Table 3-32 Canadian Yukon Area chum salmon catch totals, 1961-2009

	Mainstem Yukon River Harvest						Porcupine River	Total
				Aboriginal	Combined		Aboriginal	Canadian
Year	Commercial	Domestic	Test	Fishery	Non-Commercial	Total	Fishery Harvest	Harvest
1961	3,276			3,800	3,800	7,076	2,000	9,076
1962	936			6,500	6,500	7,436	2,000	9,436
1963	2,196			5,500	5,500	7,696	20,000	27,696
1964	1,929			4,200	4,200	6,129	6,058	12,187
1965	2,071			2,183	2,183	4,254	7,535	11,789
1966	3,157			1,430	1,430	4,587	8,605	13,192
1967	3,343			1,850	1,850	5,193	11,768	16,961
1968	453			1,180	1,180	1,633	10,000	11,633
1969	2,279			2,120	2,120	4,399	3,377	7,776
1970	2,479			612	612	3,091	620	3,711
1971	1,761			150	150	1,911	15,000	16,911
1972	2,532				0	2,532	5,000	7,532
1973	2,806			1,129	1,129	3,935	6,200	10,135
1974	2,544	466		1,636	2,102	4,646	7,000	11,646

1975	2,500	4,600			2,500	7,100	9,600	11,000	20,600
1976	1,000	1,000			100	1,100	2,100	3,100	5,200
1977	3,990	1,499			1,430	2,929	6,919	5,560	12,479
1978	3,356	728			482	1,210	4,566	5,000	9,566
1979	9,084	2,000			11,000	13,000	22,084		22,084
1980	9,000	4,000			3,218	7,218	16,218	6,000	22,218
1981	15,260	1,611			2,410	4,021	19,281	3,000	22,281
1982	11,312	683			3,096	3,779	15,091	1,000	16,091
1983	25,990	300			1,200	1,500	27,490	2,000	29,490
1984	22,932	535			1,800	2,335	25,267	4,000	29,267
1985	35,746	279			1,740	2,019	37,765	3,500	41,265
1986	11,464	222			2,200	2,422	13,886	657	14,543
1987	40,591	132			3,622	3,754	44,345	135	44,480
1988	30,263	349			1,882	2,231	32,494	1,071	33,565
1989	17,549	100			2,462	2,562	20,111	2,909	23,020
1990	27,537	0			3,675	3,675	31,212	2,410	33,622
1991	31,404	0			2,438	2,438	33,842	1,576	35,418
1992	18,576	0			304	304	18,880	1,935	20,815
1993	7,762	0			4,660	4,660	12,422	1,668	14,090
1994	30,035	0			5,319	5,319	35,354	2,654	38,008
1995	39,012	0			1,099	1,099	40,111	5,489	45,600
1996	20,069	0			1,260	1,260	21,329	3,025	24,354
1997	8,068	0			1,218	1,218	9,286	6,294	15,600
1998[a]					1,795	1,792	1,792	6,159	7,954
1999	10,402	0			3,234	3,234	13,636	6,000	19,636
2000	1,319	0			2,927	2,917	4,236	5,000	9,246
2001	2,198	3	1	[b]	3,077	3,030	5,228	4,594	9,872
2002	3,065	0	2,756	[b]	3,109	3,093	6,158	1,860	8,034
2003	9,030	0	990	[b]	1,493	1,943	10,973	382	10,905
2004	7,365	0	995	[b]	2,180	2,180	9,545	205	9,750
2005	11,931	13			2,035	1,813	13,744	4,593	18,572
2006	4,096	0			2,521	2,521	6,617	5,179	11,796
2007	7,109	0	3,765		2,221	2,221	9,330	4,500	13,830
2008	4,062	0			2,068	2,068	6,130	3,436	9,566
2009[c]	293	0			820	820	1,113	898	2,011
Average									
1961-2008	10,954	545	2,127		2,512	2,846	13,572	4,703	18,177
1999-2008	6,058	2	2,127		2,487	2,488	8,546	3,575	12,121
2004-2008	6,913	3	2,380		2,205	2,208	9,120	3,583	12,703

[a] A test fishery and aboriginal fisheries took place, but all other fisheries were closed.

[b] The chum salmon test fishery is a live-release test fishery.

[c] Data are preliminary.

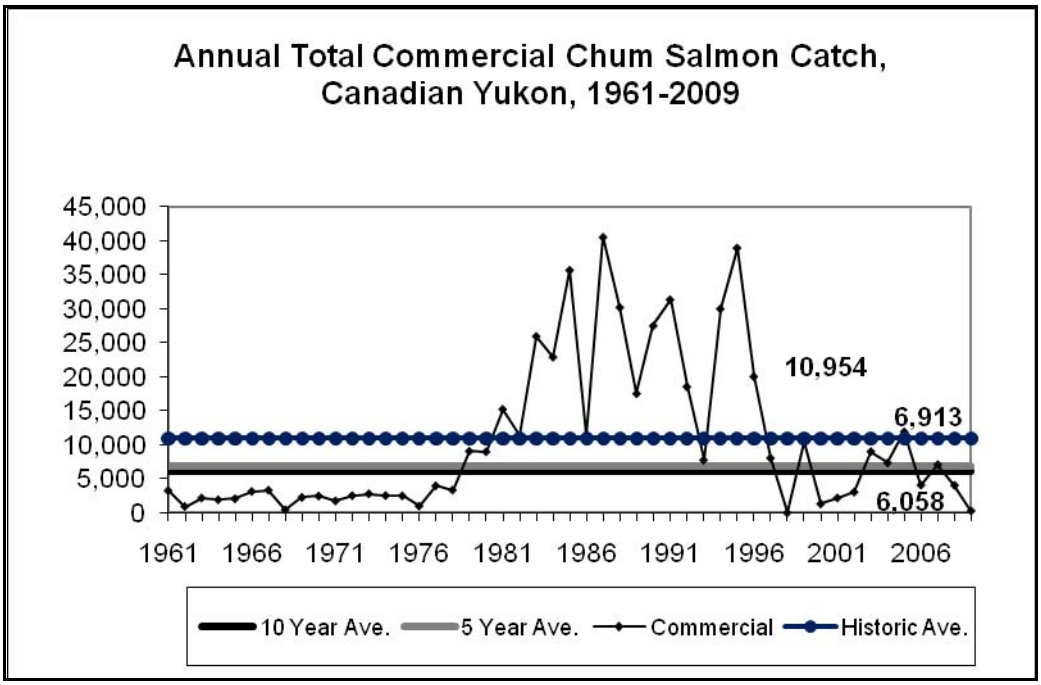


Fig. 3-54 Canadian Yukon commercial chum salmon catch, 1960-2010
Source: Data provided to NMFS by ADF&G, in 2010, in response to a special data request.

A total of 387 permit holders participated in the summer chum salmon fishery, which was approximately 33% below the 1999–2008 average of 575 permit holders. The Lower Yukon Area (Districts 1–3) and Upper Yukon Area (Districts 4–6) are separate Commercial Fisheries Entry Commission (CFEC) permit areas. A total of 376 permit holders fished in the Lower Yukon Area in 2009, which was approximately 32% below the 1999–2008 average of 555. In the Upper Yukon Area, 11 permit holders fished, which was approximately 48% below the 1999–2008 average of 21 (ADF&G 2010d Appendix A4).

Yukon River fishermen in Alaska received an estimated $556,000 for their Chinook and summer chum salmon harvest in 2009, approximately 73% below the 2004–2008 average of $2.1 million. Two buyer-processors operated in the Lower Yukon Area. Lower Yukon River fishermen received an estimated average price per pound of $5.00 for incidentally harvested Chinook and $0.50 for summer chum salmon. The average income for Lower Yukon Area fishermen in 2009 was $1,425. Two buyer-processors and one catcher-seller operated in the Upper Yukon Area. Upper Yukon Area fishermen received an estimated average price per pound of $0.26 for summer chum salmon sold in the round and $3.00 for summer chum salmon roe. The average price paid for summer chum salmon sold in the round in the Upper Yukon Area was approximately 8% above the 1999–2008 average of $0.24 per pound. No Chinook salmon were sold in the Upper Yukon Area. The average income for Upper Yukon Area fishermen that participated in the 2009 fishery was $1,857.

The preliminary 2009 commercial fall chum and coho salmon season value for the Yukon Area was $164,400 ($162,700 for the Lower Yukon Area, $1,700 for the Upper Yukon Area) (Appendix A5). The previous 5 year average value for the Yukon Area was $344,700 ($312,000 for the Lower Yukon Area, $32,700 for the Upper Yukon Area). Yukon River fishers received an average price of $0.70 per pound for fall chum salmon in the Lower Yukon Area and $0.19 per pound in the Upper Yukon Area in 2009. This compares to the 1999–2008 average of $0.28 per pound in the Lower Yukon Area and $0.16 per pound in the Upper Yukon Area. For coho salmon, fishermen in the Lower and Upper Yukon Areas received an average price of $1.00 per pound and

$0.15 per pound compared to the recent 10-year average price of $0.39 and $0.12 per pound, respectively (ADF&G 2010d Appendix A5).

Table 3-33 (ADF&G 2007 NMFS data request) provides historic data on Yukon Chinook and Summer chum commercial sales value, from 1977-2007. In the lower Yukon River, Chinook commercial harvest value peaked in 1992 at just under $14 million, approximately 99 percent of which came from the lower Yukon. As harvest trended downward in the late 1990s so did Chinook value and, by 2001, there were no commercial Chinook openings in the Yukon River, partly due to the need to conserve chum stocks. Since 2001, the Chinook and chum runs have improved enough to allow for commercial openings; however, the catch, and value, are still much lower than historic levels and the 2009 harvest was worth just over a half a million dollars, which is the lowest level since complete closure of the Yukon in 2001. A review of the summer chum data shows that the value of the summer chum fishery has fallen precipitously since the late 1980s. Also evident is that the Chinook fishery is often more than ten times as valuable as the chum fishery. This fact highlights the importance of the commercial Chinook fishery as a major source of cash income in the region.

Table 3-33 Real gross ex-vessel revenue from commercial salmon fishing to Yukon Area fishermen, summer season, 1977-2009. (Values are inflation adjusted to 2009 value using the base 2005 GDP deflator)

	Yukon Chinook			Yukon Summer Chum			
Year	Lower Value	Upper Value	Subtotal	Lower Value	Upper Value	Subtotal	Total Season
1977	$5,345,682	$431,962	$5,777,643	$2,924,770	$889,908	$3,814,678	$9,592,322
1978	$5,558,550	$180,355	$5,738,904	$5,620,303	$1,779,176	$7,399,479	$13,138,383
1979	$6,922,002	$311,178	$7,233,180	$5,617,300	$1,114,471	$6,731,770	$13,964,950
1980	$7,825,785	$260,917	$8,086,702	$2,359,228	$1,439,884	$3,799,112	$11,885,814
1981	$9,278,538	$433,171	$9,711,708	$5,753,456	$1,468,969	$7,222,425	$16,934,133
1982	$7,454,000	$321,848	$7,775,848	$2,448,465	$895,794	$3,344,258	$11,120,107
1983	$7,789,799	$200,920	$7,990,719	$3,300,210	$536,406	$3,836,616	$11,827,335
1984	$6,439,277	$187,724	$6,627,001	$1,700,039	$702,038	$2,402,077	$9,029,078
1985	$7,644,767	$147,119	$7,791,886	$1,838,369	$1,057,060	$2,895,429	$10,687,315
1986	$5,512,497	$127,774	$5,640,271	$3,041,735	$1,104,372	$4,146,107	$9,786,378
1987	$9,188,631	$230,516	$9,419,147	$2,223,338	$547,721	$2,771,059	$12,190,206
1988	$8,940,623	$232,825	$9,173,447	$8,183,489	$1,986,499	$10,169,989	$19,343,436
1989	$8,170,431	$170,574	$8,341,005	$3,496,838	$2,171,419	$5,668,257	$14,009,262
1990	$7,318,991	$159,858	$7,478,849	$755,408	$769,133	$1,524,541	$9,003,390
1991	$10,451,693	$142,429	$10,594,123	$1,147,028	$919,583	$2,066,611	$12,660,733
1992	$14,260,996	$242,050	$14,503,046	$869,346	$752,228	$1,621,574	$16,124,620
1993	$6,843,993	$158,651	$7,002,643	$317,775	$285,531	$603,306	$7,605,949
1994	$5,721,837	$170,546	$5,892,383	$108,701	$544,404	$653,105	$6,545,488
1995	$7,148,727	$117,040	$7,265,767	$324,798	$1,425,471	$1,750,269	$9,016,037
1996	$4,606,318	$62,377	$4,668,696	$117,441	$1,274,774	$1,392,215	$6,060,911
1997	$7,065,806	$143,526	$7,209,331	$73,291	$125,497	$198,787	$7,408,119
1998	$2,450,151	$22,157	$2,472,308	$33,861	$1,052	$34,913	$2,507,221
1999	$6,254,051	$94,085	$6,348,136	$24,871	$2,173	$27,044	$6,375,179
2000	$897,236	$0	$897,236	$10,675	$0	$10,675	$907,911
2001 [a]	$0	$0	$0	$0	$0	$0	$0
2002	$2,012,315	$24,684	$2,037,000	$5,167	$7,349	$12,516	$2,049,515
2003	$2,179,722	$47,710	$2,227,432	$1,846	$8,013	$9,860	$2,237,291
2004	$3,470,330	$43,373	$3,513,703	$10,063	$10,925	$20,988	$3,534,691
2005	$2,139,804	$26,763	$2,166,567	$12,062	$14,775	$26,837	$2,193,404

2006	$3,492,970	$34,640	$3,527,610	$25,331	$45,635	$70,966	$3,598,576
2007 [b]	$1,999,661	$28,039	$2,027,700	$227,607	$35,496	$263,102	$2,290,803
2008	$328,469	$0	$328,469	$329,928	$66,444	$396,372	$724,840
2009	$20,970	$0	$20,970	$514,856	$20,430	$535,286	$556,256
2004-2008 Ave.	$2,286,247	$26,563	$2,312,810	$120,998	$34,655	$155,653	$2,468,463
1999-2008 Ave.	$2,277,456	$29,929	$2,307,385	$64,755	$19,081	$83,836	$2,391,221

Source: Data provided to NMFS by ADF&G in response to a special data request
a No commercial salmon fisheries occurred in the Yukon River in 2001.
b Preliminary.

Table 3-34 provides historic data on Yukon fall chum and coho commercial fisheries. The data shows that these fisheries have fallen in real commercial ex-vessel gross value from historic highs in the late 1980s and have had several periods of no commercial harvest since then. From 2000 through 2002, there were no commercial harvest of fall chum and coho in the Yukon River. Subsequently, harvests have been allowed; however, total value remains well below historic highs and averages.

Table 3-34 Real gross ex-vessel revenue from commercial salmon fishing to Yukon Area fishermen, fall season, 1977-2009. (Values are inflation adjusted to 2009 value using the 2005 GDP Deflator)

	Yukon Fall Chum			Yukon Coho			
Year	Lower Value	Upper Value	Subtotal	Lower Value	Upper Value	Subtotal	Total Season
1977	$2,086,466	$296,664	$2,383,130	$409,162	$6,536	$415,698	$2,798,828
1978	$1,877,168	$279,711	$2,156,879	$262,704	$16,564	$279,269	$2,436,147
1979	$2,901,838	$871,224	$3,773,062	$209,070	$16,530	$225,600	$3,998,662
1980	$904,820	$454,722	$1,359,542	$39,883	$5,450	$45,333	$1,404,874
1981	$3,156,207	$748,898	$3,905,104	$183,412	$9,588	$193,000	$4,098,104
1982	$1,674,515	$105,354	$1,779,869	$268,692	$37,162	$305,855	$2,085,723
1983	$1,124,658	$245,384	$1,370,042	$33,296	$21,831	$55,126	$1,425,168
1984	$686,600	$189,674	$876,274	$469,614	$23,518	$493,132	$1,369,406
1985	$1,129,717	$317,091	$1,446,807	$313,760	$47,703	$361,463	$1,808,270
1986	$695,482	$52,788	$748,270	$369,131	$968	$370,100	$1,118,370
1987	$0	$0	$0	$0	$0	$0	$0
1988	$1,045,129	$247,578	$1,292,707	$1,201,727	$55,825	$1,257,552	$2,550,259
1989	$1,124,879	$353,194	$1,478,073	$509,775	$53,546	$563,321	$2,041,394
1990	$361,580	$265,631	$627,211	$208,451	$56,213	$264,663	$891,874
1991	$642,661	$231,416	$874,077	$440,134	$31,606	$471,740	$1,345,817
1992	$0	$77,573	$77,573	$0	$27,971	$27,971	$105,543
1993	$0	$0	$0	$0	$0	$0	$0
1994	$0	$11,689	$11,689	$0	$11,993	$11,993	$23,682
1995	$248,758	$225,278	$474,036	$107,576	$15,181	$122,756	$596,792
1996	$64,089	$59,945	$124,033	$127,698	$17,177	$144,875	$268,908
1997	$112,170	$9,401	$121,571	$103,675	$1,377	$105,052	$226,623
1998	$0	$0	$0	$0	$0	$0	$0
1999	$45,023	$1,107	$46,130	$4,573	$0	$4,573	$50,703
2000	$0	$0	$0	$0	$0	$0	$0
2001 [a]	$0	$0	$0	$0	$0	$0	$0
2002	$0	$0	$0	$0	$0	$0	$0
2003	$6,981	$3,958	$10,939	$21,163	$5,935	$27,099	$38,038

2004	$1,275	$961	$2,236	$3,142	$7,218	$10,360	$12,596
2005	$347,149	$52,789	$399,938	$91,850	$21,026	$112,876	$512,814
2006	$215,114	$35,888	$251,002	$53,396	$11,823	$65,219	$316,221
2007 [b]	$148,760	$17,435	$166,195	$131,862	$1,411	$133,272	$299,467
2008	$432,903	$22,292	$455,194	$218,765	$3,751	$222,516	$677,710
2009	$110,408	$1,262	$111,670	$52,303	$467	$52,770	$164,440
2004-2008 Ave.	$229,040	$25,873	$254,913	$99,803	$9,046	$108,849	$363,762
1999-2008 Ave.	$119,721	$13,443	$133,163	$52,475	$5,116	$57,591	$190,755

Source: Derived from data provided to NMFS by ADF&G in response to a special data request

a No commercial salmon fisheries occurred in the Yukon River in 2001.

b Preliminary.

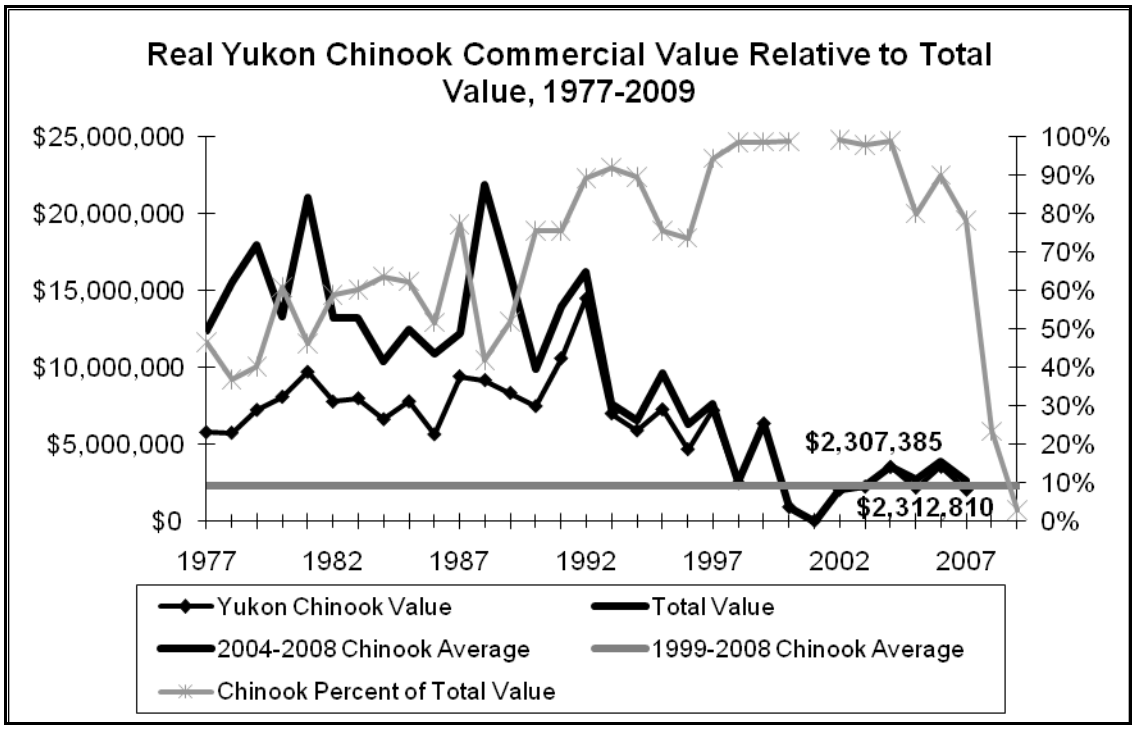


Fig. 3-55 Real Yukon Chinook commercial value relative to total value, 1977-2009. (Values are inflation adjusted to 2009 value using the base 2005 GDP deflator)
Source: Derived from data provided to NMFS by ADF&G in response to a special data request

Fig. 3-55, depicts the comparison between Yukon Chinook commercial value and total commercial value from all salmon fisheries from 1977-2009. Also shown is the percent of total value that the commercial Chinook value represents. Since the early 1990s, Chinook has accounted for 70 percent to nearly 100 percent of the total commercial value. Also clearly shown is the decline in Chinook value and total value during the 1990s, as well as the fall to zero when all the fisheries were closed in 2001. As Chinook catch improved, since 2001, so has Chinook value and total value; however, the 2008 and 2009 Chinook catch and values fell sharply from previous years.

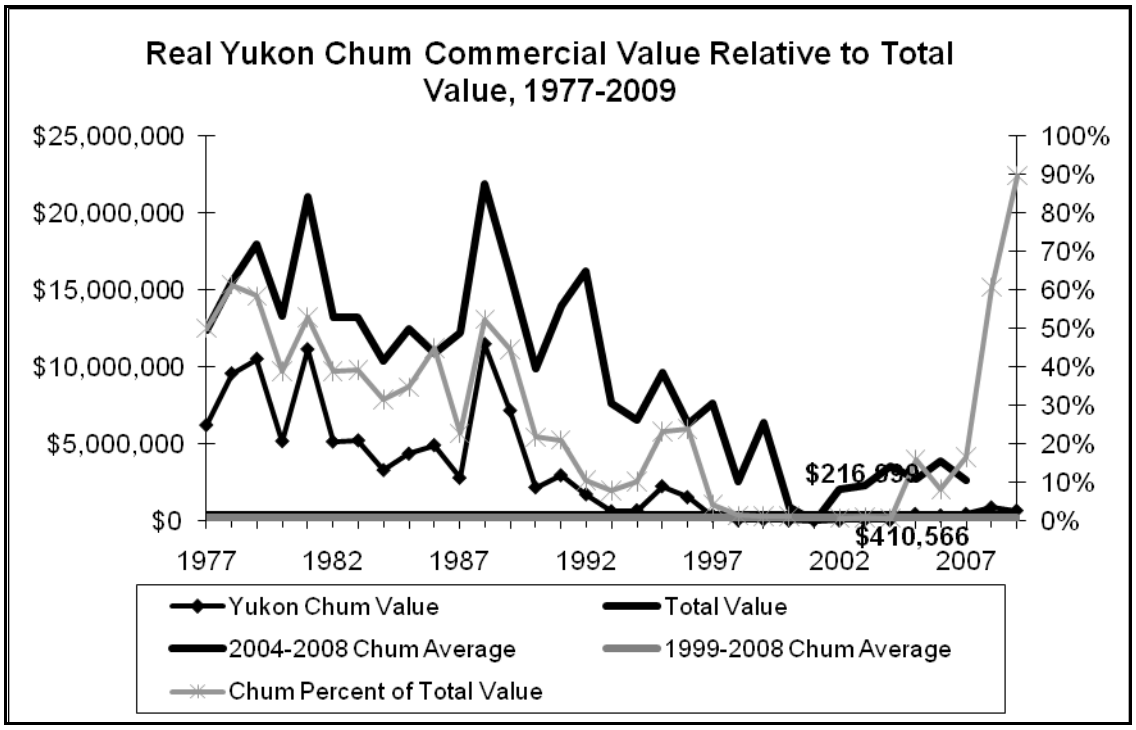


Fig. 3-56 Real Yukon Chum commercial value relative to total value, 1977-2009. (Values are inflation adjusted to 2009 value using the base 2005 GDP deflator)
Source: Derived from data provided to NMFS by ADF&G in response to a special data request

Fig. 3-56, depicts the comparison between Yukon Chum commercial value and total commercial value from all salmon fisheries from 1977-2009. Also shown is the percent of total value that the commercial chum value represents. Historically, chum salmon has represented as much as half of all commercial value earned in the Alaska Yukon. As chum harvests trended downward the proportion of chum to total value also fell. However, with the concurrent decline in Chinook value, some improvement in chum harvests overall, and continued decline in Chinook value, chum salmon value has become increasingly important in the past several years. In 2009, for example, chum value was 90 percent of the total value earned in the Alaska Yukon commercial salmon fishery.

3.5.5 Bristol Bay

The Bristol Bay management area includes all coastal and inland waters east of a line from Cape Newenham to Cape Menshikof (Fig. 3-57). The area includes nine major river systems: Naknek, Kvichak, Alagnak, Egegik, Ugashik, Wood, Nushagak, Igushik, and Togiak. Collectively, these rivers are home to the largest commercial sockeye salmon fishery in the world. Sockeye salmon *Oncorhynchus nerka* are by far the most abundant salmon species that return to Bristol Bay each year, but Chinook *O. tshawytscha*, chum *O. keta*, coho *O. kisutch*, and (in even-years) pink salmon *O. gorbuscha* returns are important to the fisheries as well. The Bristol Bay area is divided into five management districts (Naknek-Kvichak, Egegik, Ugashik, Nushagak, and Togiak) that correspond to the major river drainages. The management objective for each river is to achieve desired escapement goals for the major salmon species while harvesting all fish in excess of the established requirement through orderly fisheries. In addition, regulatory management plans have been adopted for individual species in certain districts. This section was developed from ADF&G 2009a, ADF&G 2010a, and data supplied in ADF&G 2010 and 2007. .

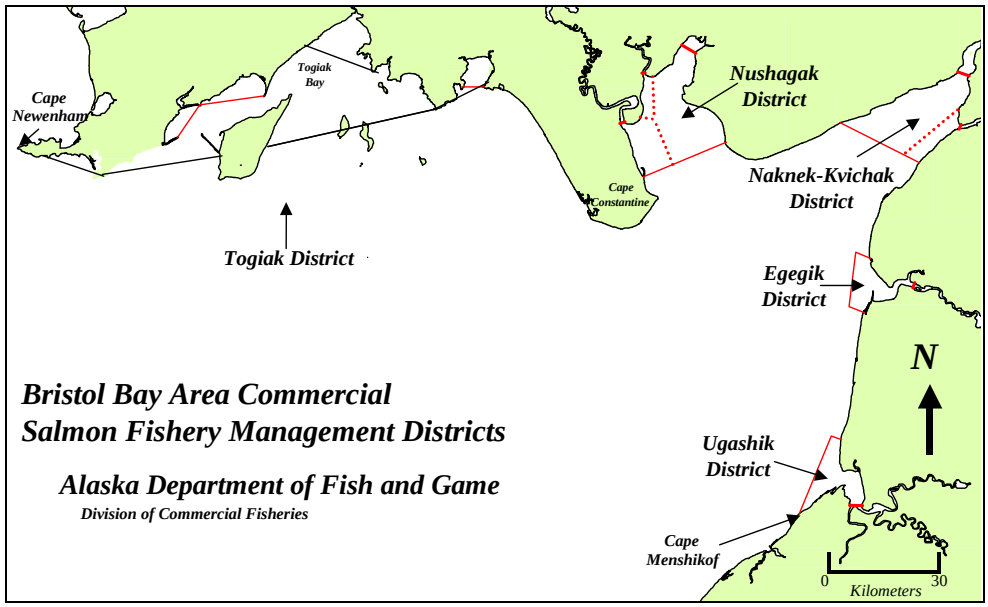


Fig. 3-57 Bristol Bay area commercial fisheries salmon management districts.

Overview of Bristol Bay Salmon Fisheries

The 5 species of Pacific salmon found in Bristol Bay are the focus of major commercial, subsistence, and sport fisheries. Annual commercial catches for the most recent 20-year span (1989–2008) average nearly 25.7 million sockeye, 64,900 Chinook, 947,000 chum, 97,000 coho, and 170,000 (even-years only) pink salmon (ADF&G 2009a Appendices A3–A7). Since 1989, the real value of the commercial salmon harvest in Bristol Bay has averaged $225.5 million, with sockeye salmon being the most valuable, worth an average $221.5 million (Table 3-36).

Management of the commercial fishery in Bristol Bay is focused on discrete stocks with harvests directed at terminal areas around the mouths of major river systems. Each stock is managed to achieve a spawning escapement goal based on sustained yield. Escapement goals are achieved by regulating fishing time and area by emergency order (EO) and/or adjusting weekly fishing schedules. Legal gear for the commercial salmon fishery includes both drift (150 fathoms) and set (50 fathoms) gillnets. However, the Alaska Board of Fisheries (BOF) passed a regulation in 2003 allowing for 2 drift permit holders to concurrently fish from the same vessel and jointly operate up to 200 fathoms of drift gillnet gear. This regulation does not apply in special harvest areas. Drift gillnet permits are the most numerous at 1,863 in Bristol Bay (Area T), and of those, 1,642 fished in 2009. There are a total of 981 set gillnet permits in Bristol Bay and of those, 855 fished in 2009 (ADF&G 2009a--Appendix A).

Recent Management Actions

Management of the commercial fishery in Bristol Bay is focused on discrete stocks with harvest directed at terminal areas around the mouths of major river systems. Each stock is managed to achieve a spawning escapement goal based on sustained yield. Escapement goals are achieved by regulating fishing time and area by emergency order and/or adjusting weekly fishing schedules (Morstad et al., 2010).

In the Nushagak District, the Nushagak-Mulchatna Chinook Salmon Management Plan (5 AAC 06.361) was adopted to ensure an adequate spawning escapement of Chinook salmon into the Nushagak River system. The plan (adopted in 1992 and amended in 119, 1997, and 2003) directs ADF&G to manage the commercial fishery for an inriver goal of 75,000 Chinook salmon past the sonar site at Portage Creek. The inriver goal

provides: 1) a biological escapement goal of 65,000 spawners; 2) a reasonable opportunity for inriver subsistence harvest; and 3) a guideline sport harvest of 5,000 fish. The plan addresses poor run scenarios by specifying management actions to be taken in commercial, sport, and subsistence fisheries. The Nushagak Coho Salmon Management Plan (5 AAC 06.368) also establishes spawning and inriver escapement goals and provides guidance for managing sport, subsistence, and commercial fisheries that harvest coho salmon. The plan directs ADF&G to manage the commercial coho salmon fishery to achieve an inriver escapement goal of 100,000 fish and a biological escapement goal of 90,000 spawners and 10,000 additional fish for upriver sport and subsistence harvests (Morstad et al., 2010).

Fishery and Reporting Requirements

Requirements for commercial fishing in the Bristol Bay Area are set out in commercial fishing regulations (5 AAC 06). Subsistence, personal use, and sport fishing regulations affecting commercial fishing activities are set out in subsistence fishing regulations (5 AAC 01 and 02), personal use fishing regulations (5 AAC 77), and sport fishing regulations (5 AAC 67 and 75).

Commercial fishermen are required to have a valid CFEC limit entry permit to participate in the commercial salmon fisheries in the Bristol Bay Area. All salmon caught by CFEC permit holders during commercial periods must be reported on fish tickets. Regulations also require commercial fishermen to report, on each fish ticket, the number of salmon harvested but not sold during commercial fishing periods. Buyers are required to ensure this information is reported on fish tickets even though a portion of the commercial harvest may have been used for subsistence or personal use.

All processors, buyers, and catcher/sellers are required to register with ADF&G prior to commencing operations in Bristol Bay. In addition, commercial operators are required by Alaska State statutes to submit the following catch and production information (5 AAC 39.130, Commercial Fishing Regulations):

- Processor Checklist: this is required to be completed and signed by an ADF&G representative before your company buys any fish;
- Daily Catch Reports: these reports must be transmitted to ADF&G by 10:00 a.m. the day after each fishing period of the season or from midnight to midnight if the fishing period extends beyond midnight;
- Weekly Catch Reports: these must be submitted for each week (Sunday through Saturday) that your company operates;
- Fish Tickets: these must be submitted to the local ADF&G office each week with the weekly catch report. Each ticket should have the number of fish, pounds of fish, and price for each species on every delivery. Also include fish by species kept by fishers for personal use; and
- Final Operations Report: must be filed with the King Salmon or Dillingham ADF&G office upon completion of the salmon buying activity in Bristol Bay or by September 30, whichever is earlier. Report the final, confirmed tally of salmon delivered to your company by district, species, and date. Also report all germane information in full as requested. Information specific to each company will remain confidential and is used to compile catch totals, preliminary ex-vessel values, average fish weights, and the overall production totals for the Bristol Bay season. It is extremely important that you file this report as soon as possible after completion of your company's fish buying activities.

ADF&G compiles this information for use in daily management strategies and distributes catch data to the fishing industry.

Commercial Chum Fishery Situation and Outlook

In 2009, the commercial harvest of approximately 1.366 million chum salmon was 38% more than the 20-year average of 946,000 fish. Chum salmon catches were above 20-year averages in all districts except Ugashik and Togiak

Table 3-29,). Preliminary data for 2010 indicates a chum harvest of 1.09 million fish with and ex-vessel value of $1.9 million. Data for 2010 will be included in tabular format in the initial review draft of this document. Table 3-29 shows that, historically, Bristol Bay chum harvests generally trended downwards during the 1990's; however, since 2001, the trend has been generally upwards with a peak harvest of 2.2 million fish in 2006. Recent chum salmon harvest, though below peak levels, have continued to be above the 5-year, 10-year, and 20-year averages. These trends are also depicted in Fig. 3-58 below.

Table 3-29 Chum salmon commercial catch by district, in numbers of Fish, Bristol Bay, 1989-2009

Year	Naknek-Kvichak	Egegik	Ugashik	Nushagak	Togiak	Total
1989	310,869	136,185	84,673	523,910	203,171	1,258,808
1990	422,276	122,843	31,798	375,361	102,861	1,055,139
1991	443,189	75,892	60,299	463,780	246,589	1,289,749
1992	167,168	121,472	57,170	398,691	176,123	920,624
1993	43,684	70,628	73,402	505,799	144,869	838,382
1994	219,118	62,961	52,127	328,260	232,559	895,025
1995	236,472	68,325	62,801	390,158	221,126	978,882
1996	97,574	85,151	106,168	331,414	206,226	826,533
1997	8,628	59,139	16,903	185,635	47,285	317,590
1998	82,281	29,405	8,088	208,551	67,345	395,670
1999	259,922	74,890	68,004	170,795	111,677	685,288
2000	68,218	38,777	36,349	114,454	140,175	397,973
2001	16,472	33,579	43,394	526,602	211,701	831,748
2002	19,180	23,516	35,792	276,777	112,987	468,252
2003	34,481	37,116	52,908	740,311	68,154	932,970
2004	29,972	75,061	49,358	458,902	94,025	732,481[a]
2005	204,777	62,029	39,513	966,050	124,694	1,397,063
2006	457,855	153,777	168,428	1,240,235	223,364	2,243,659
2007	383,927	157,991	242,025	953,275	202,486	1,939,704
2008	237,260	92,901	135,292	492,341	301,967	1,259,761
2009	258,141	124,131	65,439	775,340	143,418	1,366,469
20-Year Ave.	187,166	79,082	71,225	482,565	161,969	946,641
1989-98 Avg.	203,126	83,200	55,343	371,156	164,815	877,640
1999-08 Avg.	171,206	74,964	87,106	593,974	159,123	1,015,642

a Total includes General District catch of 25,163.
Source: ADF&G 2009XXX, Table A5.

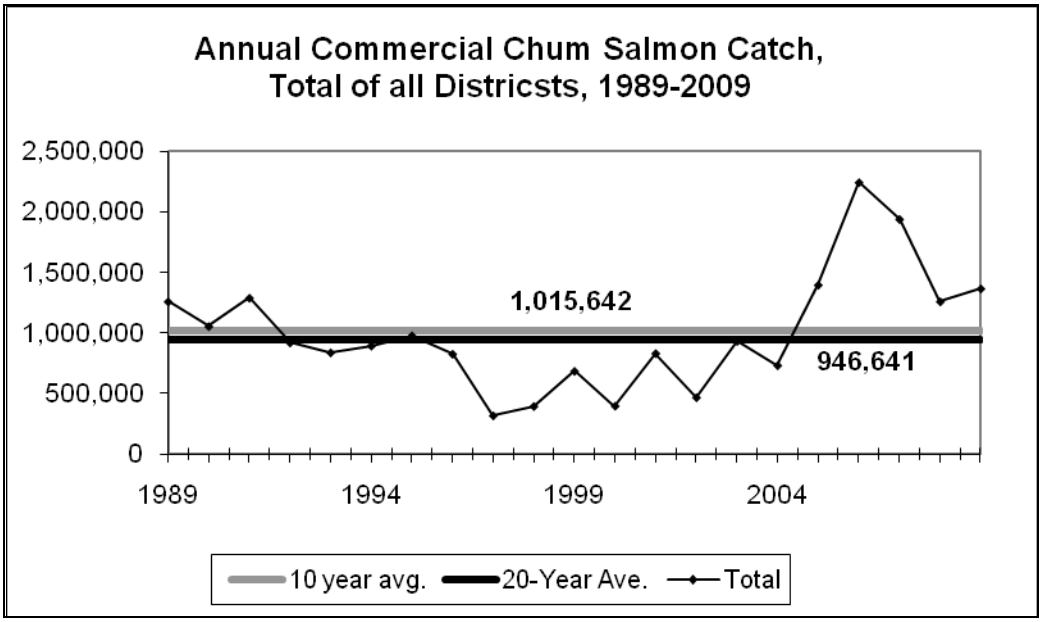


Fig. 3-58 Bristol Bay annual commercial Chum catch, total all districts, 1989-2009

Table 3-36 provides the historic estimated real ex-vessel value of Bristol Bay commercial salmon catch, by species, in thousands of dollars. It is evident that the Sockeye fishery dwarfs all other salmon species in terms of total value. Also evident is a significant decline in Chinook and chum salmon values since the mid-1990s and while Chinook values have continued to be low, chum values have rebounded considerably in recent years.

Table 3-36 Estimated real ex-vessel revenue of the commercial salmon catch by species, in thousands of dollars, Bristol Bay, 1989-2009 (Inflation adjusted to 2009 value using the GDP deflator)

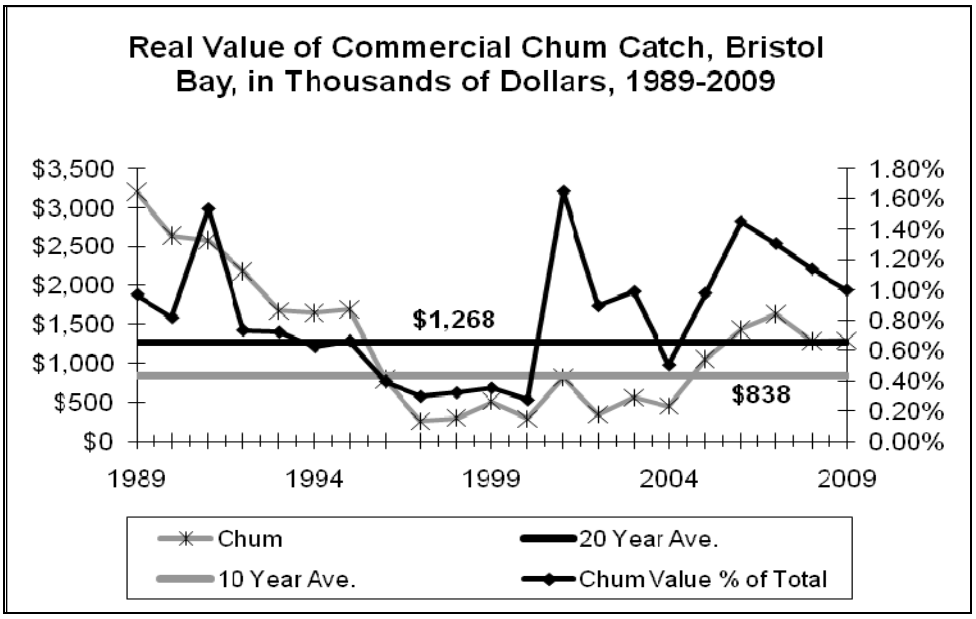
Year	Sockeye	Chinook	Chum	Pink[a]	Coho	Total
1989	$324,272	$989	$3,198		$1,991	$330,452
1990	$318,907	$796	$2,642	$840	$856	$324,041
1991	$164,384	$463	$2,578		$721	$168,147
1992	$293,046	$1,537	$2,186	$359	$1,134	$298,261
1993	$228,536	$1,588	$1,673		$369	$232,165
1994	$259,268	$2,218	$1,648	$56	$1,398	$264,590
1995	$252,558	$1,741	$1,697		$191	$256,187
1996	$199,167	$995	$799	$9	$443	$201,413
1997	$85,228	$845	$257		$237	$86,568
1998	$90,410	$1,813	$300	$9	$645	$93,177
1999	$144,654	$262	$514		$123	$145,552
2000	$103,795	$204	$287	$20	$498	$104,804
2001	$48,846	$160	$821		$48	$49,875
2002	$37,958	$324	$345		$23	$38,648
2003	$55,906	$290	$561		$90	$56,847
2004	$88,237	$733	$451	$22	$179	$89,621
2005	$105,943	$809	$1,054		$169	$107,974

2006	$95,789	$1,412	$1,433	$20	$189	$98,843
2007	$122,918	$559	$1,632		$124	$125,233
2008	$110,912	$301	$1,283	$159	$291	$112,945
2009	$127,615	$400	$1,291		$162	$129,468
20 Year Ave.	$156,537	$902	$1,268	$166	$486	$159,267
1989-98 Ave.	$221,578	$1,298	$1,698	$255	$799	$225,500
1999-08 Ave.	$91,496	$505	$838	$55	$173	$93,034

Note: Gross revenue paid to fishermen, derived from price per pound times commercial catch. Blank cells represent no data.
a: Included even-years only. Source: ADF&G 2009a and data provided in ADF&G 2010 and 2007/.

Fig. 3-59 depicts the historical trends in commercial chum value as well as the percent of total value (right vertical axis) that chum value represents. Historically, chum value has never exceeded 2 percent of the total commercial value in Bristol Bay, and in 2009 it represented only about six tenths of a percent.

Fig. 3-59 Historical real value of commercial Chum catch, Bristol Bay, 1989-2009
Source: Derived from data provided to NMFS by ADF&G in response to a special data request



3.6 Identification of Regions and Communities Principally Dependent on Commercial Salmon Fisheries ANALYSIS NOT YET UPDATED

3.6.1 Northern Region

Table 3-31 is adapted from an Alaska Department of Labor and Workforce Development (ADOLWD) (Windish-Cole 2008) analysis of local resident crew members, by census areas, with the region defined by ADOLWD as the Northern Region. The Northern Region includes the communities, Boroughs, and Census areas associated with the fisheries of the Kotzebue, Norton Sound, and part of the upper Yukon area. Overall, in the Northern Region, 310 crew licenses were purchased in 2005 with about half of these coming from the Nome Census area. ADOLWD estimates that 168 of those licenses were used in local fisheries.

The crew counts shown below are in addition to limited entry commercial salmon permits, shown in Table 3-32, that are actively used in the area's fisheries. Overall, in the Northern Region, 263 permit holders were active in 2005 with 109 of these coming from the Nome Census area. ADOLWD estimates that 202 of those permits were used in local fisheries in 2006.

Table 3-31 Local resident crew members, Northern Region, 2001–2006

Borough/Census Area	Local Residents Who Bought Commercial Crew Licenses					
	2000	2001	2002	2003	2004	2005
Fairbanks North Star Borough	88	N/A	63	63	62	67
Nome Census Area	168	N/A	83	106	78	151
North Slope Borough	7	N/A	2	4	6	5
Northwest Arctic Borough	90	N/A	3	3	60	58
Southeast Fairbanks Census Area	8	N/A	10	14	11	14
Yukon-Koyukuk Census Area	30	N/A	9	20	15	15
Local Resident Total	391	N/A	170	210	232	310
Region's Harvest Total	250	211	62	87	70	168

N/A: Crew member licensing data from 2001 was not released by CFEC because of data problems
Notes: 2005 data are preliminary. "Region's Harvest Total" represents total estimated number of crew workers working in the region's fisheries. Crew members do not necessarily work in their local fisheries.

Source: Commercial Fisheries Entry Commission, and ADOLWD.

Table 3-32 Fishermen by residency, Northern Region, 2001 - 2006

Borough/Census Area	Residents Who Fished Their Permits					
	2001	2002	2003	2004	2005	2006
Fairbanks North Star Borough	41	39	38	41	51	54
Nome Census Area	99	72	80	63	99	109
North Slope Borough	4	1	2	3	4	3
Northwest Arctic Borough	69	6	7	44	45	43
Southeast Fairbanks Census Area	2	7	6	12	16	15
Yukon-Koyukuk Census Area	4	17	43	24	24	39
Local Resident Total	219	142	176	187	239	263
Region's Harvest Total	213	123	128	133	177	202

Source: Commercial Fisheries Entry Commission, and ADOLWD
Notes: "Region's Harvest Total" represents total fishermen who fished in the region's fisheries. Permit holders do not necessarily work in their local fisheries.

ADOLWD has also tabulated data on fish harvesting employment and earning by gear type in the Northern Region, which is reprinted with permission (Windish-Cole 2008) in Table 3-33. The largest proportions of the total estimated workforce have historically come from the salmon fisheries (gillnet and set-net combined). Salmon harvesting gross revenue declined substantially during the early 2000s; however, set-net revenue improved considerably in 2005. Norton Sound pot fishing for crab is the other major source of harvesting gross earnings in the region and accounts for more than half of the total value.

Table 3-33 Fish harvesting employment and gross earnings by gear type, 2000-2005, Northern Region.

Year	Gear Type	Vessels[1]	Total Estimated Workforce[2]	Total Gross Earning of Permit Holders[3]	Percent of Gross Earnings Earned by Nonresident Permit Holders
2000	Gillnet	87	218	$696,579	32
2001	Gillnet	65	163	$323,491	27.5
2002	Gillnet	32	80	$128,430	ND
2003	Gillnet	26	65	$148,152	ND
2000	Pot Gear	15	45	$960,425	38.8
2001	Pot Gear	29	87	$1,059,025	16.6
2002	Pot Gear	26	78	$1,520,502	15.8
2003	Pot Gear	24	72	$1,040,259	6.5
2004	Pot Gear	25	75	$1,020,500	ND
2005	Pot Gear	28	84	$1,199,263	ND
2000	Set-net	-	234	$387,436	ND
2001	Set-net	-	174	$373,789	0
2002	Set-net	-	22	$11,649	0
2003	Set-net	-	58	$86,588	0
2004	Set-net	-	118	$199,428	0
2005	Set-net	-	128	$411,674	0
2000	Total	102	494	$2,133,833	23.1
2001	Total	94	424	$1,830,630	14.5
2002	Total	56	185	$1,743,438	14
2003	Total	50	215	$1,446,598	ND
2004	Total	25	203	$1,280,487	ND
2005	Total	73	345	$2,024,124	ND

[1]Skiffs and small vessels are usually not registered as commercial vessels and are therefore not counted in these data.
[2]'Workforce' refers to the number of fisherman fishing permits plus the requisite crew members needed for the permits(s) they fish. Regional crew member counts are estimates derived by applying a crew factor to catch data.
[3]Gross earnings, or revenue, are currently the most reliable data available, but are not directly comparable to wages as expenses have not been deducted.

Source: Commercial Fisheries Entry Commission, and ADOLWD.

Fig. 3-60 depicts Northern Region resident permit holder salmon fishery gross earnings, by community, as tabulated by ADOLWD. None of the communities in the region have gross earnings of resident permit holders that exceed $1 million from the salmon fisheries.

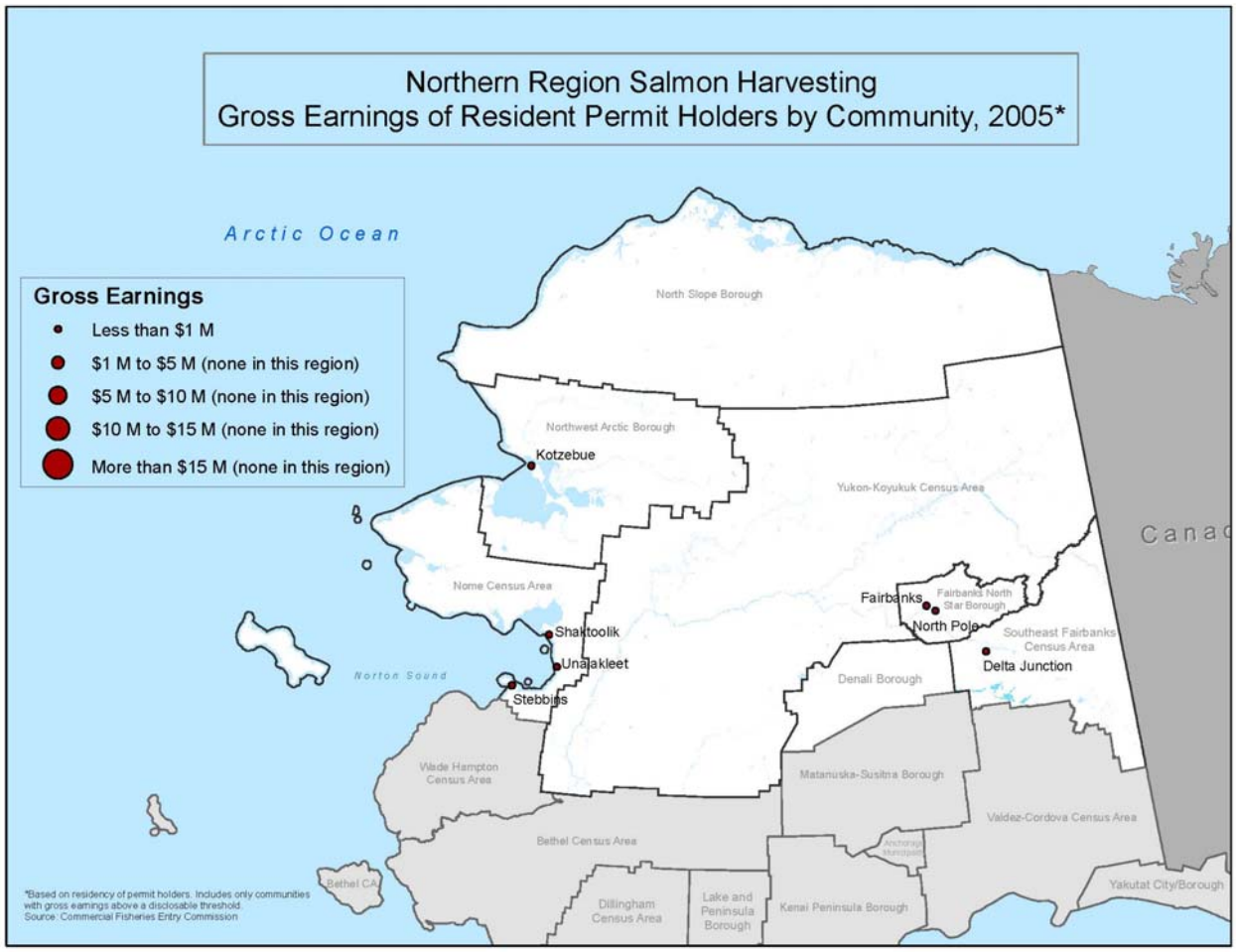


Fig. 3-60 Northern region salmon harvesting, gross earnings of resident permit holders by community, 2005.
Source: ADOLWD

Northern Region fish harvesting employment, by species and month, also tabulated by ADOLWD, are shown in Table 3-34. Given the prevalence of the salmon fisheries in overall employment in the region, it is not surprising that harvesting employment tends to be dominated by the salmon industry and is greatest in the summer months of June, July and August. In 2006, for example, 324 individuals were engaged in fish harvesting activity in August as compared to the monthly average of 74. Norton Sound crab and Kuskokwim bay herring fisheries also contribute to harvesting employment as has halibut fishing in recent years.

Table 3-34 Fish harvesting employment by species and month, 2000–2006 Northern Region

All Species[1]													
Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Monthly Average
2000	9	18	12	15	9	321	223	291	15	0	0	0	76
2001	3	6	6	6	6	190	294	278	3	0	0	0	66
2002	9	14	18	15	131	79	138	119	0	0	0	0	44
2003	0	18	33	36	86	31	151	160	34	4	0	0	46
2004	0	3	6	6	0	33	221	220	48	4	0	0	45
2005	5	3	13	12	3	190	242	259	71	6	0	0	67
2006[2]	0	0	0	0	3	138	283	324	124	10	0	0	74
Crab													
Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Monthly Average
2000	9	18	12	15	9	0	39	39	15	0	0	0	13
2001	3	6	6	6	6	0	96	90	3	0	0	0	18
2002	9	12	18	15	18	51	75	87	0	0	0	0	24
2003	0	18	33	36	3	27	87	96	0	0	0	0	25
2004	0	3	6	6	0	30	75	78	0	0	0	0	17
2005	3	3	9	12	3	24	90	90	0	0	0	0	20
2006	0	0	0	0	3	33	72	87	0	0	0	0	16
Halibut[2]													
Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Monthly Average
2000	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-	-	-	-
2002	0	0	0	0	0	0	3	4	0	0	0	0	1
2003	0	0	0	0	3	0	0	0	0	0	0	0	0
2004	-	-	-	-	-	-	-	-	-	-	-	-	-
2005	0	0	0	0	0	0	3	15	27	6	0	0	4
20062	0	0	0	0	0	0	3	15	24	6	0	0	4
Herring													
Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Monthly Average
2000	0	0	0	0	0	238	0	0	0	0	0	0	20
2001	0	0	0	0	0	190	0	0	0	0	0	0	16
2002	0	0	0	0	113	28	0	0	0	0	0	0	12
2003	0	0	0	0	80	0	0	0	0	0	0	0	7
2004	0	0	0	0	0	3	0	0	0	0	0	0	0
2005	0	0	0	0	0	140	3	0	0	0	0	0	12
2006	0	0	0	0	0	105	0	0	0	0	0	0	9
Salmon													
Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Monthly Average
2000	0	0	0	0	0	82	184	252	0	0	0	0	43
2001	0	0	0	0	0	0	198	188	0	0	0	0	32
2002	0	0	0	0	0	0	60	28	0	0	0	0	7
2003	0	0	0	0	0	4	64	64	34	4	0	0	14
2004	0	0	0	0	0	0	146	142	48	4	0	0	28
2005	0	0	0	0	0	26	146	154	44	0	0	0	31
2006	0	0	0	0	0	0	208	222	96	0	0	0	44

[1]A small number of fishermen in unknown or other fisheries are included in the totals; however, they are not listed separately in this exhibit.

[2]2006 halibut fishing employment data are not yet available. The 2005 monthly halibut figures have instead been used as a temporary proxy for 2006 and are part of the 2006 "All Species" calculation. They will be revised once they become available.

Counting Employment: Harvesting data in this table are counted differently than in other tables in this report. In this table, the permit itself is considered the employer.

In other tables where a count of workers was estimated, the employer was considered to be the vessel, or permit holders for fisheries that did not typically use vessels. This means that a permit holder who makes landings under two different permits (in the same vessel) in the same month will generate two sets of jobs whereas for tables where the vessel is the employer there would be only one set of workers.

Source: Commercial Fisheries Entry Commission; National Marine Fisheries Service and ADOLWD, Research and Analysis Section

Fig. 3-61 shows the locations of canneries and land-based seafood processors in the Northern Region in 2006. As is shown in the figure, there are no processing facilities in the Kotzebue area; however, Norton Sound Economic Development Corporation has filed intent to operate processing facilities in Nome, Unalakleet, and Savoonga in 2006. Note, however, that these data do not include any floating processors or buying stations that may be in operation in the area.

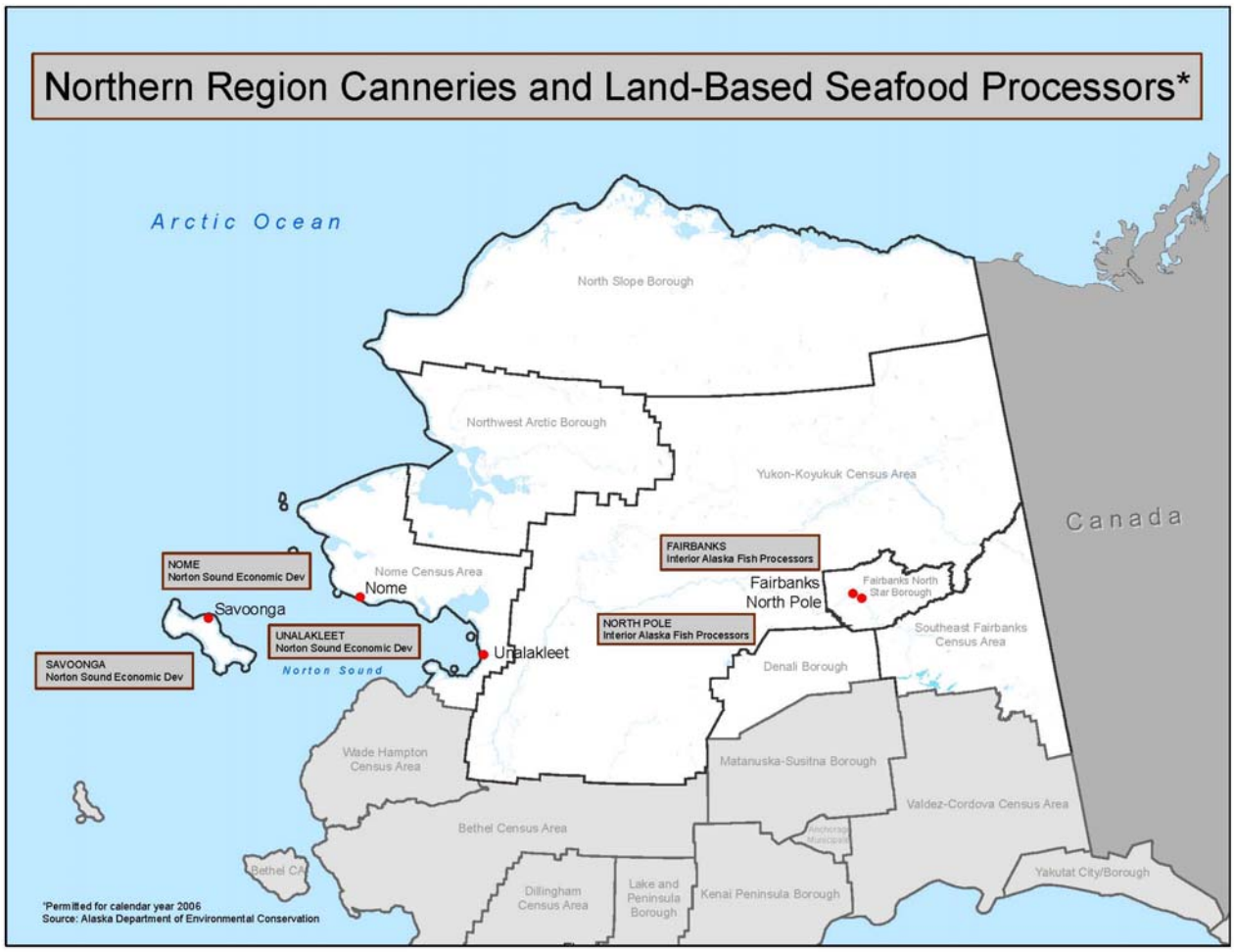


Fig. 3-61 Northern Region canneries and land based seafood processors.
Source: ADOLWD

Table 3-35 provides estimated seafood processing employment and percent of non-resident workers and percent of non-resident earnings in the Northern Region. The total worker count in the Northern Region seafood processing sector declined continuously from 2000 to 2004. In 2000, the area's fisheries supported 189 seafood processors. That number declined to 20 in 2003 and 2004, before rebounding to 54 in 2005. Data for more recent years has not been compiled at present. Non-resident workers have made up a relatively small proportion, about 20 percent in most years. Non-resident wages cannot be disclosed; however, percent of non-resident wages is higher than percent of non-resident workers and indicates relatively higher wages (more highly skilled jobs) for non-resident workers.

Table 3-35 Northern Region seafood processing employment, 2000-2005

Seafood Processing				
Year	Total Worker Count	Percent Nonresident Workers	Wages	Percent Nonresident Wages
2000	189	21.2	ND	27.4
2001	135	7.4	ND	19
2002	84	16.7	ND	26.5
2003	20	20	ND	21.6
2004	20	15	ND	26.3
2005	54	20.4	ND	37.6

Sources: ADOLWD, Research and Analysis Section and CFEC

3.6.2 Yukon Delta Region

Table 3-36 reprints an ADOLWD analysis of local resident crew members by census areas with the region defined by ADOLWD as the Yukon Delta Region. The Yukon Delta Region includes the communities, Boroughs, and Census areas associated with the fisheries of the lower Yukon River area. Overall, in the Yukon Delta region 1,297 crew licenses were purchased in 2005; nearly equal numbers of licenses were purchased in each of the Bethel and Wade Hampton Census Areas.

Table 3-36 Local resident crew members, Yukon Region, 2001–2006

Borough/Census Area	Local Residents Who Bought Commercial Crew Licenses					
	2000	2001	2002	2003	2004	2005
Bethel Census Area	1,074	N/A	500	523	583	654
Wade Hampton Census Area	744	N/A	547	639	526	643
Local Resident Total	1,818	N/A	1,047	1,162	1,109	1,297

N/A: Crew member licensing data from 2001 was not released by CFEC because of data problems

Note: 2005 data are preliminary.

Source: Commercial Fisheries Entry Commission

The crew counts shown above are in addition to limited entry commercial salmon permits that are actively used in the area's fisheries, which are shown in Table 3-37. Overall, in the Northern Region 1,203 permit holders were active in 2006 with 1,048 of these having fished in the region. These numbers represent a slight decline over 2005, which was the peak of the period 2001–2006.

Table 3-37 Fishermen by residency, Yukon Region, 2001–2006

Borough/Census Area	Residents Who Fished Their Permits					
	2001	2002	2003	2004	2005	2006
Bethel Census Area	803	635	667	676	693	658
Wade Hampton Census Area	44	535	549	520	547	545
Local Resident Total	847	1,170	1,216	1,196	1,240	1,203
Region's Harvest Total	595	1,007	1,045	1,055	1,092	1,048

Notes: "Region's Harvest Total" represents total fishermen who fished in the region's fisheries. Permit holders do not necessarily work in their local fisheries.

Source: Commercial Fisheries Entry Commission

Fig. 3-62 depicts Yukon Delta Region resident permit holder salmon fishery gross earnings by community, as tabulated by ADOLWD. None of the communities in the region have gross earnings of resident permit holders that exceed $1 million from the salmon fisheries. However, earnings from salmon fishing are spread throughout many communities in both the Wade Hampton and Bethel Census Areas.

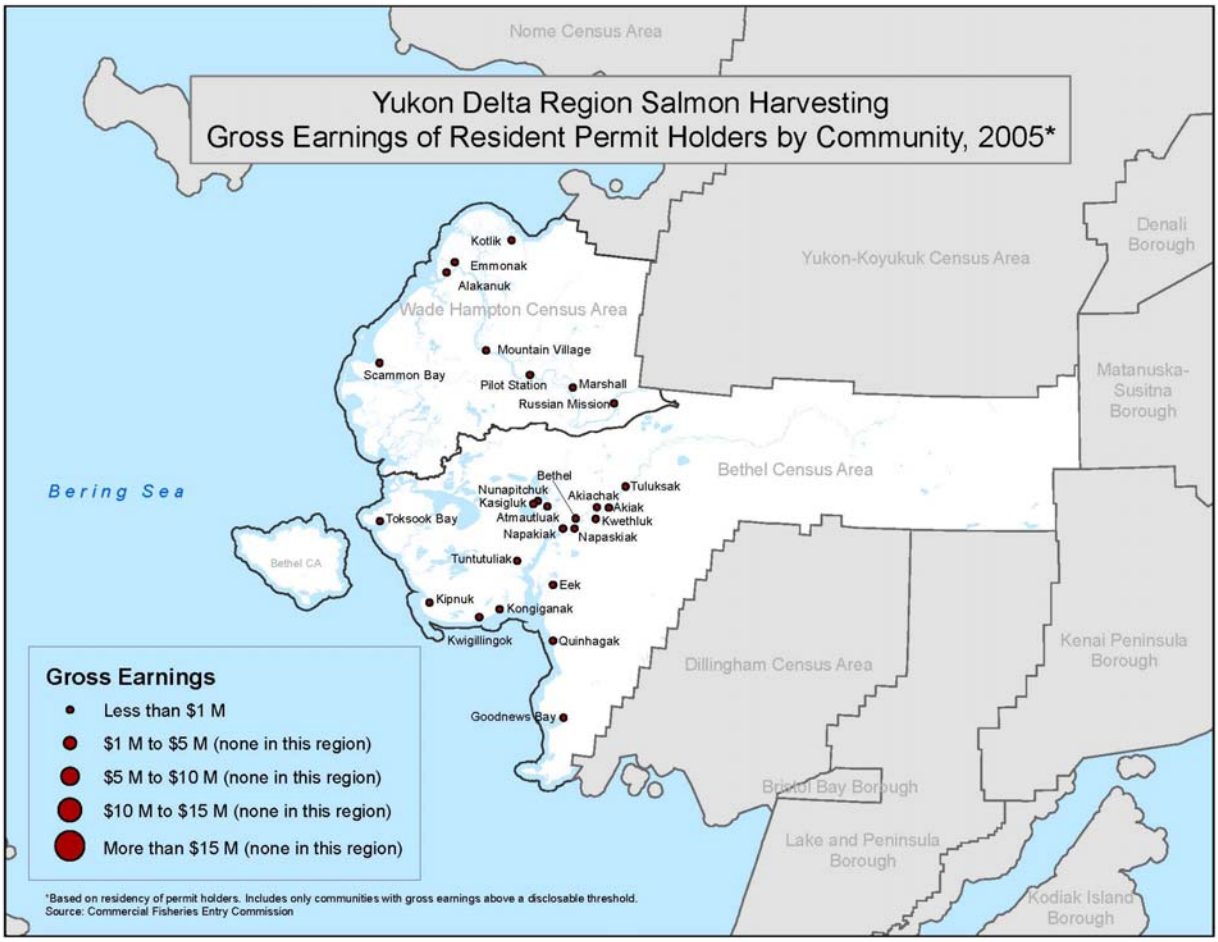


Fig. 3-62 Yukon Delta Region salmon harvesting gross earnings of resident permit holders by community, 2005
Source: ADOLWD

ADOLWD has also tabulated data on fish harvesting employment and earning by gear type in the Yukon Delta Region, which is reprinted with permission (Windish-Cole 2008) in Table 3-38. Salmon fisheries of the Yukon Delta region have had an increasing total harvesting workforce (permit holders and crew) over the past several years. In 2005, workforce in the set-net salmon fishery peaked at 1,596 total workers. The total workforce for the region is slightly larger than the set-net number, and it is not clear from the ADOLWD data what fishery contributes the additional workforce. Total gross earning of permit holders shows the decline in value, due to poor harvests, that occurred in the early 2000s, and also shows how that gross earnings improved in the mid 2000s. However, ADOLWD has not compiled this data for 2006 or 2007.

Table 3-38 Fish harvesting employment and gross earnings by gear type, 2000-2005, Yukon Region.

Year	Gear Type	Vessels[1]	Total Estimated Workforce[2]	Total Gross Earning of Permit Holders[3]	Percent of Gross Earnings Earned by Nonresident Permit Holders
2000	Set-net	-	952	$1,190,875	ND
2001	Set-net	-	698	$721,157	ND
2002	Set-net	-	540	$599,446	ND
2003	Set-net	-	1,142	$1,890,795	ND
2004	Set-net	-	1,474	$3,240,140	ND
2005	Set-net	-	1,596	$2,908,123	ND
2000	Total	63	1,369	$2,107,980	ND
2001	Total	21	751	$841,656	ND
2002	Total	31	1,007	$2,255,956	ND
2003	Total	26	1,208	$2,939,374	ND
2004	Total	15	1,678	$4,517,680	ND
2005	Total	20	1,646	$3,576,085	ND

[1]Skiffs and small vessels are usually not registered as commercial vessels and are therefore not counted in these data.
[2]'Workforce' refers to the number of fisherman fishing permits plus the requisite crew members needed for the permit(s) they fish. Regional crew member counts are estimates derived by applying a crew factor to catch data.
[3]Gross earnings, or revenue, are currently the most reliable data available, but are not directly comparable to wages as expenses have not been deducted.

Source: Commercial Fisheries Entry Commission.

Fig. 3-63 shows the locations of canneries and land based seafood processors in the Yukon Delta Region in 2006. As is shown in the figure, there are as many as 10 processing facilities in the region. Note, however, that these data do not include any floating processors or buying stations that may be in operation in the area.

Yukon Delta Region Fish harvesting employment by species and month, also tabulated by ADOLWD, are shown in Table 3-39.

Salmon fisheries dominate overall employment in the region, with the greatest employment in the summer months of June, July and August. In 2006, for example, 1,900 individuals were engaged in fish harvesting activity in June as compared to the monthly average of 467. Groundfish, halibut and herring fisheries also provide harvesting employment in the region. Of note is that there is little or no fish harvesting employment in the region from October through April. Thus, all fish harvesting related income occurs from May through September.

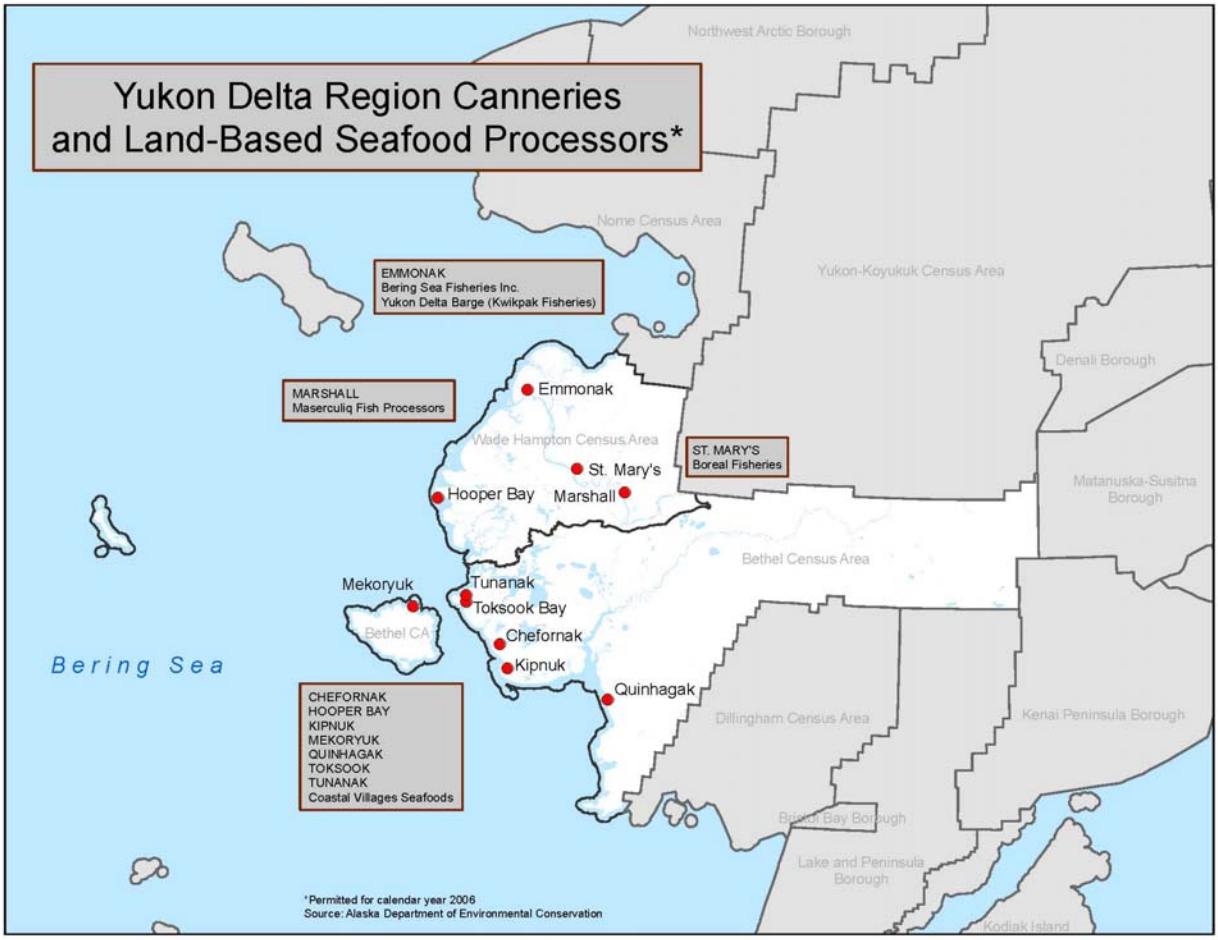


Fig. 3-63 Yukon Delta Region canneries and land based seafood processors.
Source: ADOLWD

Table 3-39 Fish harvesting employment by species and month, 2000 - 2006 Yukon Region

All Species[1]													
Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Monthly Average
2000	0	0	0	0	310	1,808	714	1,198	0	0	0	0	336
2001	0	0	0	0	58	463	302	958	0	0	0	0	148
2002	0	0	0	0	155	1,332	216	768	0	0	0	0	206
2003	0	0	0	0	118	1,302	1,100	992	216	0	0	0	311
2004	0	0	0	0	108	1,396	1,264	914	438	0	0	0	343
2005	0	8	0	0	90	2,034	1,783	1,329	338	26	0	0	467
2006[2]	0	0	0	0	120	1,900	1,603	1,503	118	0	2	0	437
Groundfish													
Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Monthly Average
2005	0	8	0	0	15	0	40	0	0	0	0	0	5
2006	0	0	0	0	107	5	0	0	0	0	0	0	9
Halibut[2]													
Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Monthly Average
2005	0	0	0	0	0	245	261	87	0	0	0	0	49
2006[2]	0	0	0	0	0	245	261	87	0	0	0	0	49
Herring													
Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Monthly Average
2000	0	0	0	0	310	328	0	0	0	0	0	0	53
2001	0	0	0	0	58	173	0	0	0	0	0	0	19
2002	0	0	0	0	155	60	0	0	0	0	0	0	18
2003	0	0	0	0	118	0	0	0	0	0	0	0	10
2004	0	0	0	0	108	0	0	0	0	0	0	0	9
2005	0	0	0	0	75	13	0	0	0	0	0	0	7
2006	0	0	0	0	13	20	0	0	0	0	0	0	3
Salmon													
Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Monthly Average
2000	0	0	0	0	0	1,480	714	1,198	0	0	0	0	283
2001	0	0	0	0	0	290	302	958	0	0	0	0	129
2002	0	0	0	0	0	1,272	216	768	0	0	0	0	188
2003	0	0	0	0	0	1,302	1,100	992	216	0	0	0	301
2004	0	0	0	0	0	1,396	1,264	914	438	0	0	0	334
2005	0	0	0	0	0	1,776	1,482	1,242	338	0	0	0	403
2006	0	0	0	0	0	1,630	1,342	1,416	108	0	0	0	375

[1]A small number of fishermen in unknown or other fisheries are included in the totals; however, they are not listed separately in this exhibit.

[2]2006 halibut fishing employment data are not yet available. 2005's monthly halibut figures have instead been used as a temporary proxy for 2006 and are part of the 2006 "All Species" calculation. They will be revised once they become available. Counting Employment: Harvesting data in this table are counted differently than in other tables in this report. In this table, the permit itself is considered the employer.

In other tables where a count of workers was estimated, the employer was considered to be the vessel, or permit holders for fisheries that did not typically use vessels. This means that a permit holder who makes landings under two different permits (in the same vessel) in the same month will generate two sets of jobs whereas for tables where the vessel is the employer there would be only one set of workers.

Source: Commercial Fisheries Entry Commission; National Marine Fisheries Service and ADOLWD, Research and Analysis Section

Table 3-40 provides estimated seafood processing employment, percent of non-resident workers, and percent of non-resident earnings in the Yukon Delta Region. The total worker count in the Yukon Delta Region seafood processing sector declined during the early 2000s, as commercial harvests declined. In 2000, the

area's fisheries supported 436 seafood processors. That number declined to 281 in 2002 and, before rebounding steadily to 557 by 2005. 2006 data show a decline in processing workers to 486, which is consistent with the 2006 decline in Lower Yukon commercial catches. Non-resident workers have made up a relatively small proportion of about 5 percent in recent years. Seafood processing wages are estimated to have been approximately $1.8 million in 2005 and $1.1 million in 2006, with non-resident wages accounting for 18.5 percent and 16.5 percent of the total in each year, respectively. As in the Northern region, percent of non-resident wages is higher than percent of non-resident workers and indicates relatively higher wages for non-resident workers.

Table 3-40 Yukon Region seafood processing employment, 2000-2005

Seafood Processing				
Year	**Total Worker Count**	**Percent Nonresident Workers**	**Wages**	**Percent Nonresident Wages**
2000	436	32.8	$1,306,791	49.6
2001	397	6.8	$1,103,900	18.9
2002	281	6.4	ND	15.1
2003	459	5.4	ND	15.7
2004	468	4.9	ND	11.5
2005	557	5.0	$1,762,231	18.5
2006	486	5.3	$1,051,618	16.5

Source: ADOLWD, Research and Analysis Section and CFEC.

3.6.3 Bristol Bay Region

Table 3-41, and the other tables and figures in this section, are reprinted from an ADOLWD analysis of local resident crew members, by census areas, with the region defined by ADOLWD as the Bristol Bay Region. Overall, in the Bristol Bay Region 979 crew licenses were purchased in 2005; the majority of licenses, 643, were purchased by Dillingham residents. Given the large scale of the Bristol Bay commercial Sockeye salmon fishery it is not surprising that the regions harvest employment total, which is an estimate of the total number of crew members participating in the fishery, is much larger (4,368 in 2005) then the local resident crew counts. This indicates that non-resident crew participation in the Bristol Bay fishery is about three times more than resident crew participation.

Table 3-41 Local resident crew members, Bristol Bay Region, 2001 - 2005

Borough/Census Area	**Local Residents Who Bought Commercial Crew Licenses**					
	2000	**2001**	**2002**	**2003**	**2004**	**2005**
Bristol Bay Borough	241	N/A	187	183	175	172
Dillingham Census Area	858	N/A	524	596	608	643
Lake and Peninsula Borough	225	N/A	115	157	137	164
Local Resident Total	1,324	N/A	862	936	920	979
Region's Harvest Total	5,710	N/A	3,745	4,416	4,313	4,368

N/A: Crew member licensing data from 2001 was not released by CFEC because of problems with the crew data.
Notes: 2005 data are preliminary. "Region's Harvest Total" represents total estimated number of crew workers working in the region's fisheries. Crew members do not necessarily work in their local fisheries.

Source: Commercial Fisheries Entry Commission

The crew counts shown above are in addition to limited entry commercial salmon permits that are actively used in the area's fisheries, which are shown in Table 3-42. Overall, in the Bristol Bay Region, 669 resident permit holders and a total of 2,405 permit holder were active in 2006.

Table 3-42 Fishermen by residency, Bristol Bay Region, 2001 - 2006

Borough/Census Area	Residents Who Fished Their Permits					
	2001	2002	2003	2004	2005	2006
Bristol Bay Borough	162	160	172	166	167	173
Dillingham Census Area	489	396	434	392	401	403
Lake and Peninsula Borough	52	51	56	53	49	93
Local Resident Total	703	607	662	611	617	669
Region's Harvest Total	2,713	2,121	2,451	2,406	2,476	2,405

Source: Commercial Fisheries Entry Commission
Notes: "Region's Harvest Total" represents total fishermen who fished in the region's fisheries. Permit holders do not necessarily work in their local fisheries.

Fig. 3-64 depicts Bristol Bay Region resident permit holder salmon fishery gross earnings by community, as tabulated by ADOLWD. Dillingham recorded total earnings of between $5 million and $10 million in 2006, while Togak, Naknek, and King Salmon all recorded values of between $1 million and $5 million. Several other communities reported values less than $1 million.

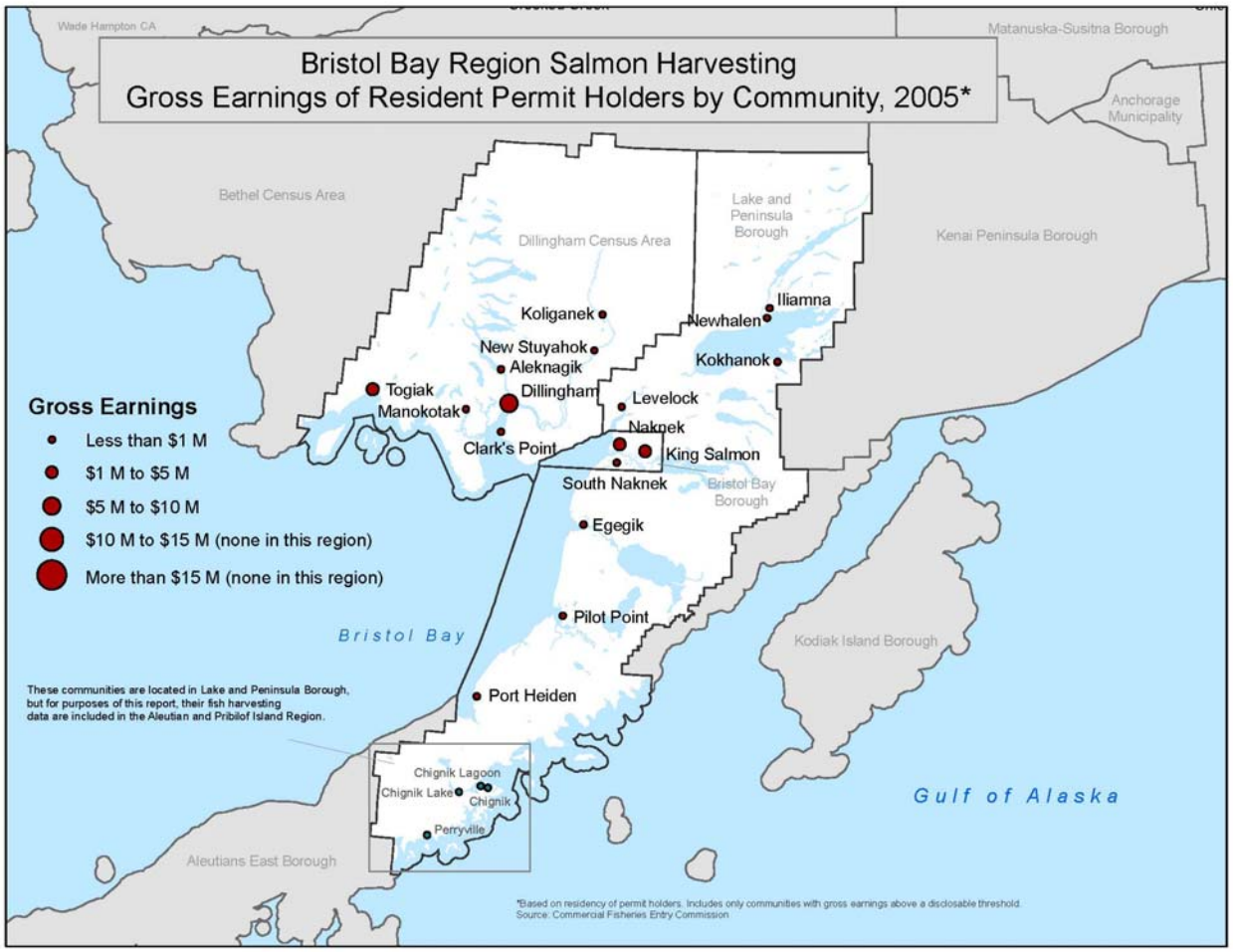


Fig. 3-64 Bristol Bay Region salmon harvesting gross earnings of resident permit holders by community, 2005.
Source: ADOLWD

ADOLWD has also tabulated data on fish harvesting employment and earning by gear type in the Bristol Bay Region, which is shown in

Table 3-43. Salmon fishery workforce and earnings in the Bristol Bay Region have declined since 2000 when the total workforce is estimated to have been 8,091 and total gross earnings are estimated to have been about $84 million. In 2002, total workforce is estimated to have been 5,334 and gross revenues were about $32 million. In 2005, total workforce had rebounded to 6,444 and total gross earnings of about $95 million, with is the period high for the 2000s. ADOLWD has not compiled this data for 2006 or 2007.

Table 3-43 Fish harvesting employment and gross earnings by gear type, 2000-2005, Bristol Bay Region

Year	Gear Type	Vessels[1]	Total Estimated Workforce[2]	Total Gross Earning of Permit Holders[3]	Percent of Gross Earnings Earned by Nonresident Permit Holders
2000	Gillnet	1,825	5,475	$68,363,343	56.5
2001	Gillnet	1,547	4,641	$32,371,000	59.1
2002	Gillnet	1,160	3,480	$25,158,287	62.5
2003	Gillnet	1,397	4,191	$37,615,449	57.2
2004	Gillnet	1,354	4,062	$65,242,638	60.2
2005	Gillnet	1,376	4,128	$76,609,611	61.1
2000	Set-net	-	2,685	$15,925,879	30.1
2001	Set-net	-	2,385	$8,432,444	26
2002	Set-net	-	1,893	$6,548,040	35.4
2003	Set-net	-	2,193	$10,386,571	29.4
2004	Set-net	-	2,277	$11,629,112	38.3
2005	Set-net	-	2,358	$17,252,681	34.3
2000	Total	1,825	8,091	$84,392,479	51.2
2001	Total	1,547	6,969	$40,905,918	51.5
2002	Total	1,160	5,334	$32,029,016	56.5
2003	Total	1,397	6,324	$48,415,926	50.8
2004	Total	1,354	6,294	$77,333,163	56.3
2005	Total	1,376	6,444	$94,571,755	55.5

[1]Skiffs and small vessels are usually not registered as commercial vessels and are therefore not counted in these data.
[2]'Workforce' refers to the number of fisherman fishing permits plus the requisite crew members needed for the permit(s) they fish. Regional crew member counts are estimates derived by applying a crew factor to catch data.

[3]Gross earnings, or revenue, are currently the most reliable data available, but are not directly comparable to wages as expenses have not been deducted.

Source: Commercial Fisheries Entry Commission.

Bristol Bay Region Fish harvesting employment by species and month, also tabulated by ADOLWD, are shown in Table 3-44. Salmon fisheries dominate overall employment in the region, with the greatest employment in the summer months of June and July. In 2006, for example, 6,936 individuals were engaged in fish harvesting activity in July as compared to the monthly average of 1,185. Halibut and herring fisheries provide most of the remaining harvesting employment in the region. Of note is that there is little or no fish harvesting employment in the region from October through March. Thus, all fish harvesting related income occurs from April through September.

Table 3-44 Fish harvesting employment by species and month, 2000 - 2006, Bristol Bay Region

All Species[1]													
Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mo. Avg.
2000	0	0	0	0	1,447	8,039	8,588	761	12	0	0	0	1,571
2001	0	0	0	0	939	7,246	7,476	493	18	21	12	0	1,350
2002	0	3	0	13	699	5,270	5,846	516	28	22	9	4	1,034
2003	4	0	8	380	643	6,474	6,782	389	32	22	0	0	1,228
2004	0	0	0	268	526	6,441	6,721	466	108	9	0	0	1,211
2005	0	0	3	285	411	6,135	6,755	279	15	5	5	0	1,158
2006[2]	0	0	0	0	349	6,367	6,936	549	6	3	8	0	1,185
Halibut													
Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mo. Avg.
2000	0	0	0	0	42	368	335	143	0	0	0	0	74
2001	0	0	0	0	69	350	365	199	6	0	0	0	82
2002	0	0	0	0	84	422	313	191	24	18	0	0	88
2003	0	0	0	0	96	426	294	123	27	22	0	0	82
2004	0	0	0	0	116	340	199	88	24	6	0	0	64
2005	-	-	-	-	-	-	-	-	-	-	-	-	-
2006[2]	0	0	0	0	63	93	0	0	0	0	0	0	13
Herring													
Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mo. Avg.
2000	0	0	0	0	1,391	0	3	0	0	0	0	0	116
2001	0	0	0	0	855	120	0	0	0	0	0	0	81
2002	0	0	0	0	600	0	0	0	0	0	0	0	50
2003	0	0	0	365	537	0	0	0	0	0	0	0	75
2004	0	0	0	263	405	0	0	0	0	0	0	0	56
2005	0	0	0	280	408	0	0	0	0	0	0	0	57
2006	0	0	0	0	274	63	0	0	0	0	0	0	28
Sablefish													
Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mo. Avg.
2000	0	0	0	0	15	3	0	3	5	0	0	0	2
2001	0	0	0	0	15	5	5	14	8	21	8	0	6
2002	0	3	0	13	15	18	19	16	0	0	5	0	7
2003	0	0	8	15	10	3	15	13	5	0	0	0	6
2004	0	0	0	5	5	8	5	3	0	3	0	0	2
2005	0	0	3	5	3	0	5	0	0	5	5	0	2
2006	0	0	0	0	10	11	0	9	3	3	8	0	4
Salmon													
Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mo. Avg.
2000	0	0	0	0	0	7,668	8,250	603	3	0	0	0	1,377
2001	0	0	0	0	0	6,771	7,098	276	0	0	0	0	1,179
2002	0	0	0	0	0	4,830	5,514	309	0	0	0	0	888
2003	0	0	0	0	0	6,045	6,465	249	0	0	0	0	1,063
2004	0	0	0	0	0	6,093	6,513	375	84	0	0	0	1,089
2005	0	0	0	0	0	6,135	6,750	279	15	0	0	0	1,098
2006	0	0	0	0	3	6,201	6,936	540	3	0	0	0	1,140

[1]A small number of fishermen in unknown or other fisheries are included in the totals; however, they are not listed separately in this exhibit.

[2]2006 halibut fishing employment data are not yet available. 2005's monthly halibut figures have instead been used as a temporary proxy for 2006 and are part of the 2006 "All Species" calculation. They will be revised once they become available. Counting Employment: Harvesting data in this table are counted differently than in other tables in this report. In this table, the permit itself is considered the employer.

In other tables where a count of workers was estimated, the employer was considered to be the vessel, or permit holders for fisheries that did not typically use vessels. This means that a permit holder who makes landings under two different permits (in the same vessel) in the same month will generate two sets of jobs whereas for tables where the vessel is the employer there would be only one set of workers.

Source: Commercial Fisheries Entry Commission; National Marine Fisheries Service and ADOLWD, Research and Analysis Section

Fig. 3-65 shows the locations of canneries and land based seafood processors in the Bristol Bay Region in 2006. As is shown in the figure, there are many processing facilities in the region. Note, however, that these data do not include any floating processors or buying stations that may be in operation in the area.

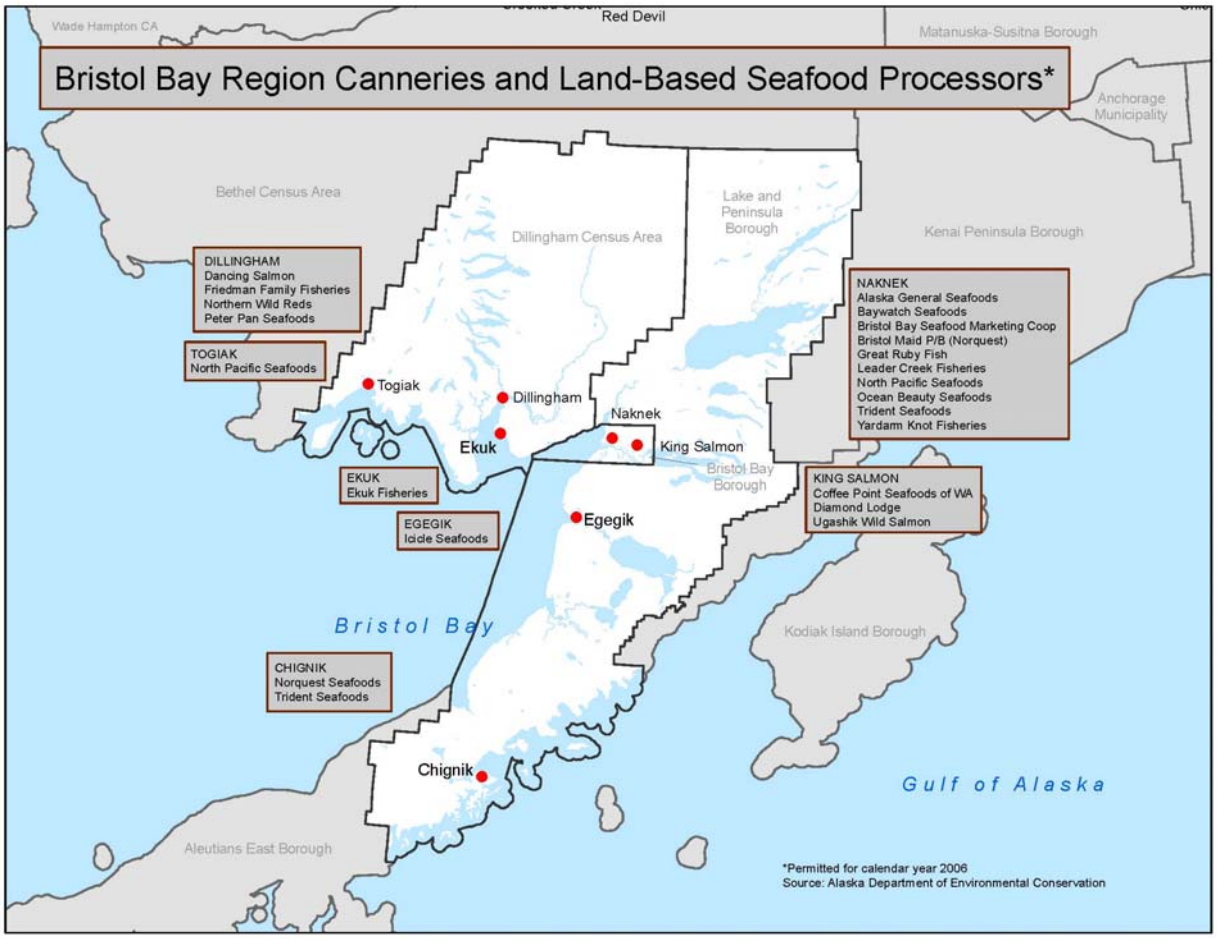


Fig. 3-65 Bristol Bay Region canneries and land-based seafood processors
Source: ADOLWD

Table 3-45 provides estimated seafood processing employment, percent of non-resident workers, and percent of non-resident earnings in the Bristol Bay Region. The total worker count in the Bristol Bay Region seafood processing sector declined during the early 2000s. In 2000, the area's fisheries supported 4,091 seafood processing workers. That number declined to 2,273 in 2002, increased to 3,474 by 2004 but had fallen to 2,940 by 2006. In contrast, overall wages have increased steadily since 2002, with a prior high of $24 million in total wages estimated for 2006.

Non-resident workers have made up a substantial proportion of the Bristol Bay Region workforce and accounted for nearly 85 percent in 2006. Bristol Bay Non-resident wage percentages have historically been close the overall percentages of non-resident workers. Thus, wages of non-resident workers do not appear to be much higher than wages of resident workers.

Table 3-45 Bristol Bay Region seafood industry, 2000-2005

Seafood Processing				
Year	**Total Worker Count**	**Percent Nonresident Workers**	**Wages**	**Percent Nonresident Wages**
2000	4,091	82.7	$22,636,368	83.4
2001	2,862	75.7	$18,520,996	78.2
2002	2,273	77.6	$12,515,578	77.3
2003	2,484	75	$14,830,448	79.6
2004	3,474	83	$21,416,637	84.6
2005	3,272	81.4	$22,216,128	84.4
2006	2,940	84.6	$24,009,778	85.1

Sources: Commercial Fisheries Entry Commission and ADOLWD, Research and Analysis Section

3.7 Importance of Commercial Chum Salmon Revenue to Western Alaska Limited Entry Permit Holders

The importance of Chinook salmon varies by the region in which commercial salmon fishermen live and by the fisheries in which they participate. Table 3-46 and Table 3-47 summarize information on the importance of Chinook salmon revenues for western Alaskan permit holders. Table 3-46 provides information on relative importance, and Table 3-47 provides information on absolute importance. Table 3-46 shows the percentage of the gross revenues earned by State of Alaska limited entry permit holders who live in a particular western or interior Alaska census district from salmon limited entry fisheries in western Alaska. Table 3-47 shows the average revenues per person fishing received by these permit holders.

Table 3-46 Percent of commercial salmon revenue from western Alaska salmon fisheries accruing to permit holders resident in different Alaska census districts that is attributable to Chinook harvests (source: AKFIN)

	Aleutians east	Aleutians west	Bethel	Bristol Bay	Dillingham	Lake and Peninsula	Nome	Northwest	Wade Hampton	Yukon-Koyukuk
1991	1%	4%	11%	0%	1%	1%	41%	0%	81%	41%
1992	1%	4%	11%	0%	2%	1%	31%	3%	91%	51%
1993	1%	1%	7%	0%	2%	2%	25%	8%	93%	53%
1994	1%	1%	5%	0%	3%	1%	13%	3%	98%	17%
1995	1%	3%	10%	0%	2%	1%	9%	0%	89%	4%
1996	1%	2%	4%	0%	2%	0%	6%	0%	91%	2%
1997	1%	3%	18%	1%	3%	1%	51%	2%	96%	28%
1998	0%	0%	10%	0%	7%	1%	28%	4%	98%	40%
1999	0%	1%	9%	0%	0%	1%	32%	0%	99%	85%
2000	0%	0%	5%	0%	0%	0%	5%	0%	98%	5%
2001	0%	0%	5%	0%	1%	0%	2%	0%	0%	0%
2002	1%	0%	17%	0%	3%	1%	88%	4%	100%	28%
2003	0%	0%	8%	0%	1%	0%	14%	1%	97%	38%
2004	0%	0%	7%	0%	3%	0%	17%	1%	100%	15%
2005	0%	0%	11%	0%	3%	0%	2%	0%	79%	5%
2006	1%	0%	11%	0%	4%	1%	3%	0%	90%	5%
2007	1%	0%	7%	0%	1%	0%	3%	0%	80%	10%

Table 3-47 Average commercial salmon revenue from western Alaska salmon fisheries accruing to permit holders resident in different Alaska census districts that is attributable to Chinook harvests; nominal dollars per year (Source: AKFIN)

	Aleutians east	Aleutians west	Bethel	Bristol Bay	Dillingham	Lake and Peninsula	Nome	Northwest	Wade Hampton	Yukon-Koyukuk
1991	1,601	2,856	2,622	32	629	361	2,631	11	18,500	1,780
1992	2,314	1,894	3,790	124	2,285	966	2,725	125	24,841	2,137
1993	2,230	889	1,888	170	2,578	1,105	1,722	175	13,485	1,378
1994	1,493	806	1,666	134	3,187	964	1,651	98	12,068	1,999
1995	2,493	3,058	3,262	123	2,689	445	2,128	9	15,149	1,060
1996	582	722	976	54	1,975	275	1,271	5	10,379	677
1997	701	265	2,089	76	1,374	354	3,021	63	15,778	1,635
1998	607	320	1,288	63	3,715	220	1,295	68	5,599	1,270
1999	505	697	1,542	14	424	293	1,435	11	13,972	4,225
2000	512	21	704	13	339	29	278	6	2,050	1,097
2001	209	13	383	8	317	37	80	3	0	51
2002	573	6	897	16	716	130	1,335	221	6,399	1,162
2003	293	156	875	19	802	107	533	68	6,203	1,611
2004	792	99	1,207	17	2,052	74	1,299	34	9,510	1,862
2005	543	283	1,642	61	2,508	159	354	26	6,279	1,484
2006	849	297	1,767	108	3,277	474	528	28	11,135	1,368
2007	1,160	646	1,126	13	1,236	30	266	9	7,161	1,146

These tables are meant to be indicative. These tables suggest that commercial king salmon harvest income is most important for persons living in the following census districts:

- Bethel: Chinook salmon revenues accounted for between 4 percent and 18 percent of the revenues earned by permit holders in the Bethel census district over the period 1991-2005. Average revenues were as low as $383, but as high as $3,790. Over this period, about 44 percent of the Chinook revenues were earned by persons fishing in the Kuskokwim-Goodnews Bay set net fishery, and another 45 percent by persons in the Lower-Yukon-Cape Romanzof Fishery.

- Nome: Chinook salmon revenues accounted for between 2 percent and 88 percent of the revenues earned by persons operating in the Nome census district. Average revenues ranged from $80 to $3,021. Over this period, about 65 percent of the Chinook salmon revenues earned by these persons came from the Lower-Yukon Cape Romanzof set net fishery, and another 34 percent from the Norton Sound set net fishery.

- Wade-Hampton: In a normal year, Chinook salmon revenues accounted for between 79 percent and 100 percent of the commercial fishing revenues earned by residents of this census district. Average revenues from Chinook salmon in a normal year range between $2,050 and $24,841. Average revenues in a year averaged about $14,500 from 1991 to 1998 but only $6,092 from 2000 to 2007. In one year, 2001, Chinook did not account for any revenues for these fishermen. All the revenues earned by fishermen resident in this census area are earned in the Lower-Yukon Cape-Romanzov set net fishery.

- Yukon-Koyukuk: Chinook salmon revenues accounted for between almost 0 percent and 85 percent of gross revenues earned by persons living in the Yukon-Koyukuk census district. Average revenues ranged from $51 to $4,225. About 46 percent of the revenues earned by persons in this census district came from the Lower Yukon Cape Romanzov set net fishery, another 41 percent came from the Upper Yukon fish wheel fishery, and a further 12 percent came from the Upper Yukon set net fishery.

4.0 DESCRIPTION OF THE ALTERNATIVES (PLACEHOLDER: SEE EA CHAPTER 2)

Chapter 2 of the accompanying Environmental Assessment contains a thorough treatment of the various alternatives under consideration. A synopsis of that extensive treatment will be prepared for the initial review draft of this document; however, time did not allow completion of that synopsis for this preliminary draft. Therefore, in the interest of limiting unnecessary repetition, and given that this draft only attempts to provide updated commercial salmon background information as well as general document layout (i.e. no impact analysis at this time), the reader is referred to EA Chapter 2 for coverage of the alternative set.

5.0 POTENTIAL BENEFITS OF THE PROPOSED ACTION (PLACEHOLDER)

This portion of the analysis of potential impacts of the proposed action addresses the potential benefits of each of the proposed alternatives on potentially affected subsistence, commercial, personal use, and sport salmon fisheries, and on communities dependent on each of those respective fisheries. Chapter 3 provides background information on the scale and historic trends in these fisheries.

6.0 POLLOCK INDUSTRY IMPACT ANALYSIS (PLACEHOLDER)

7.0 COMPARATIVE ANALYSIS OF ALTERNATIVES (PLACEHOLDER)

8.0 ENVIRONMENTAL JUSTICE (PLACEHOLDER)

9.0 PREPARERS AND PERSONS CONSULTED

9.1 Lead Preparers

Scott A. Miller, Industry Economist, NMFS Alaska Region, Analytical Team. Scott holds a Bachelor of Arts degree in economics and mathematics from the University of Puget Sound, and a Masters in agricultural and natural resource economics from the University of Maryland, College Park. He has worked as a resource economist for Battelle Pacific Northwest National Laboratories, the Commonwealth of the Northern Mariana Islands, the Northern Marianas College, and has been with NMFS since 2003. Primary author for RIR.

Diana L. Stram (NPFMC) graduated from Colgate University (B.A. Geology), and received her Ph.D. in Oceanography from the University of Rhode Island, in 2001. She has worked as Fishery Management Plan Team Coordinator for the North Pacific Fishery Management Council for the last seven years, and is the Co-Chair of the Council's Gulf of Alaska Fishery Management Plan Team, Interim Chair of the Council's Scallop Fishery Management Plan Team, and coordinator of the Council's King and Tanner Crab Fishery Management Plan Team. She has been working on salmon bycatch issues for the Council for the last four years. Dr Stram is the Council project leader for this EIS. In addition to preparing the background and Council presentation materials throughout the development of the EIS, and helping to develop the impacts methodology for analysis of Chinook, pollock, and chum impacts, Dr Stram was a primary author for Chapter 7.

Nicole S. Kimball (NPFMC) graduated from the University of Maine, Orono (B.S. Natural Resource Management), and received her M.A. in Environmental Policy from Tufts University in 1998. Ms Kimball has worked as a fishery analyst for the North Pacific Fishery Management Council for almost twelve years, and is the staff specialist on the impact of fisheries policy on fishing communities. She has recently developed a community outreach policy for the Council, and is coordinating the Council's outreach meetings on the proposed action. Primary author for sections 3.2 and 3.3.

James N. Ianelli (AFSC) graduated from Humboldt State University (B.S. Fisheries) and received his Ph.D. in Fisheries Science from the University of Washington, Seattle in 1993. He has worked for the National Marine Fisheries Service, Alaska Fisheries Science Center for 16 years. Dr Ianelli is the Co-Chair of the Council's Gulf of Alaska Fishery Management Plan Team, and is the primary stock assessment author for Eastern Bering Sea pollock. Dr Ianelli developed the methodology for pollock and Chinook impact assessment used in the EIS, and developed the Adult Equivalency bycatch methodology and analysis. Provided data for Chapters 5, 6, and 7.

9.2 Additional Preparers

9.3 Persons consulted

Placeholder: To be completed for Initial Review Draft.

10.0 REFERENCES

NOTE: Some references shown here do not appear in this version of this RIR; however, many will be used when the impact analysis is completed and have, thus, been retained here.

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