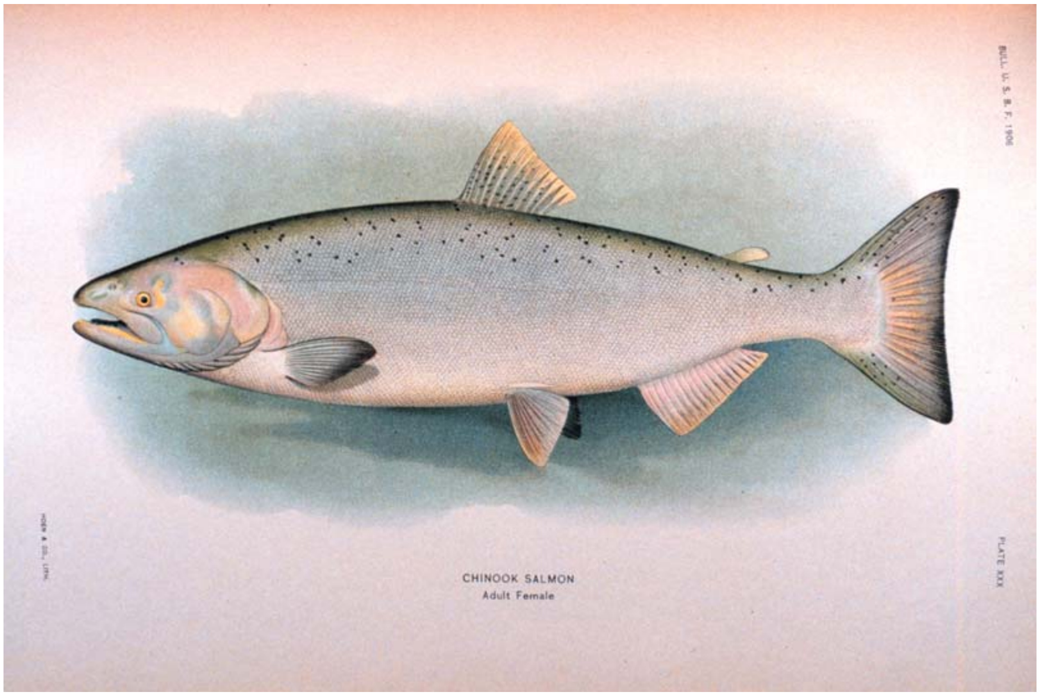
Bering Sea Chinook Salmon Bycatch Management

Volume II
Final Regulatory Impact Review



North Pacific Fishery Management Council

United States Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service, Alaska Region

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Volume II
FINAL 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 Chinook salmon bycatch in the Bering Sea pollock fishery. The alternatives analyzed generally involve limits or "caps" on the number of Chinook salmon that may be caught in the Bering Sea pollock fishery and closure of all or a part of the Bering Sea to pollock fishing once the cap is reached. These closures would occur when a Chinook salmon bycatch cap is reached, even if the entire pollock total allowable catch has not yet been harvested. This document addresses the requirements of Executive Order 12866, Executive Order 12898, and other applicable federal law. The Environmental Impact Statement in Volume I 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 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 Chinook salmon bycatch management in the Bering Sea pollock fishery is to minimize Chinook salmon bycatch to the extent practicable while achieving optimum yield. Minimizing Chinook salmon bycatch while achieving optimum yield is necessary to maintain a healthy marine ecosystem, ensure long-term conservation and abundance of Chinook salmon, provide maximum benefit to fishermen and communities that depend on Chinook 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. EIS 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 Chinook 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). Chinook salmon removals may, over time, reduce the value of Chinook 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 Chinook salmon, such as the cultural significance of Chinook salmon to the subsistence user. Thus, Chinook 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 Chinook 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.

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2.0 DESCRIPTION OF THE BERING SEA POLLOCK FISHERY

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.

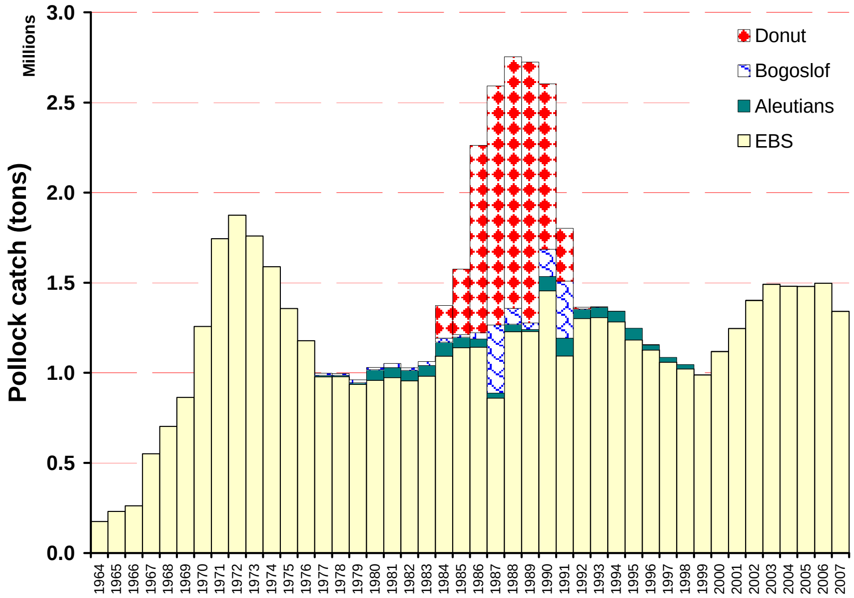


Fig. 2-1 Alaska pollock catch estimates from the Eastern Bering Sea, Aleutian Islands, Bogoslof Island, and Donut Hole regions, 1964-2007

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

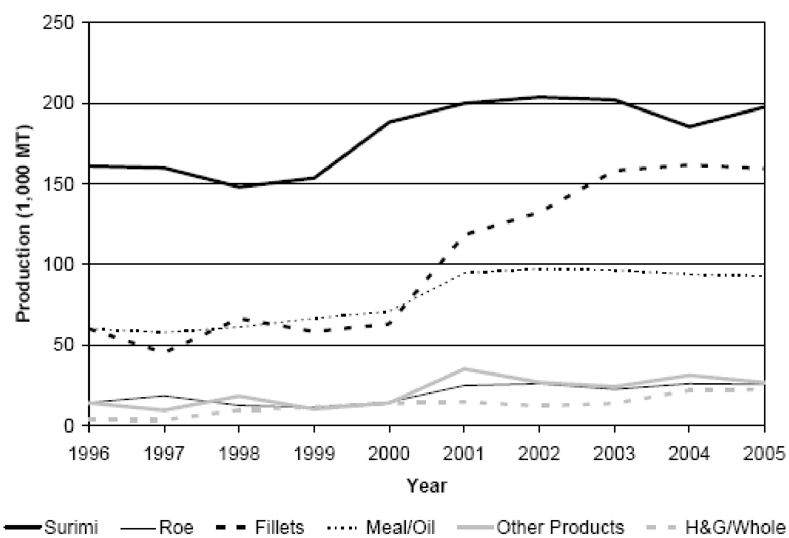
Production

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

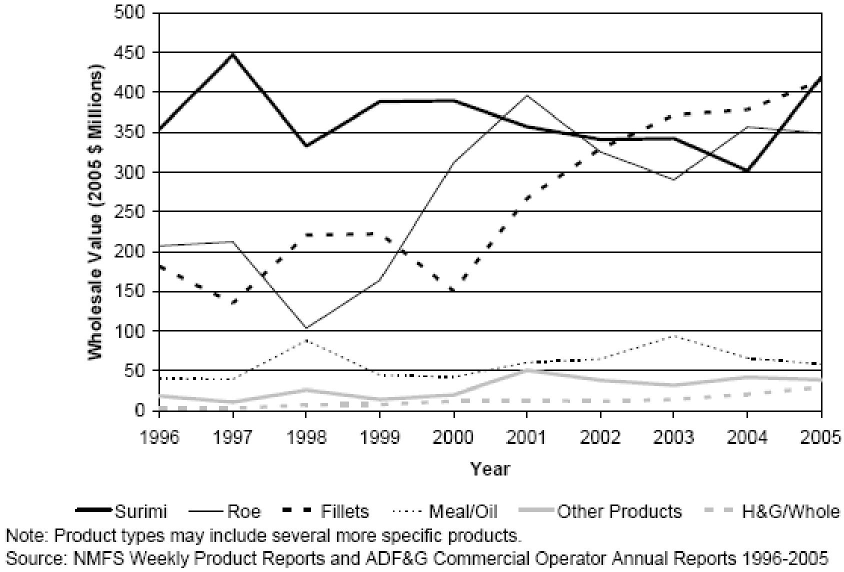


Fig. 2-3 Wholesale value of Alaska pollock by product type, 1996-2005

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.

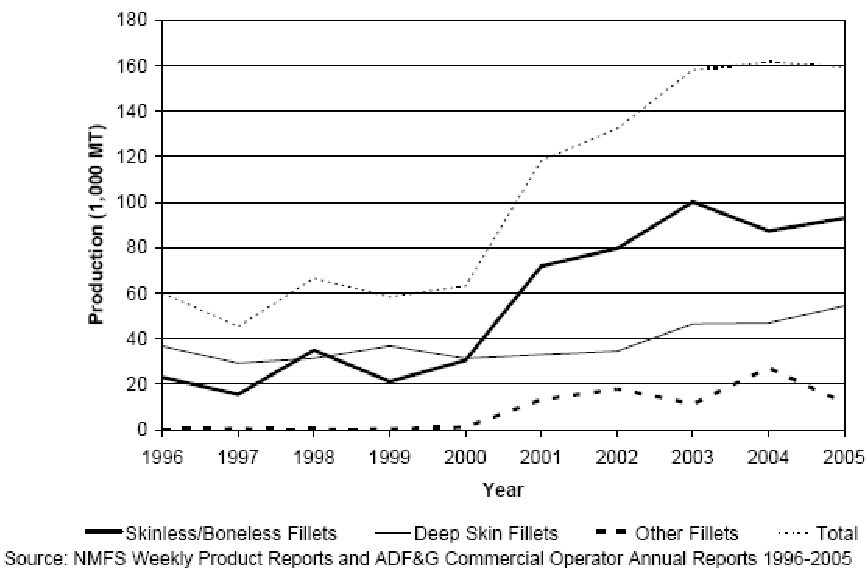


Fig. 2-4 Alaska production of pollock fillets by fillet type, 1995-2005.

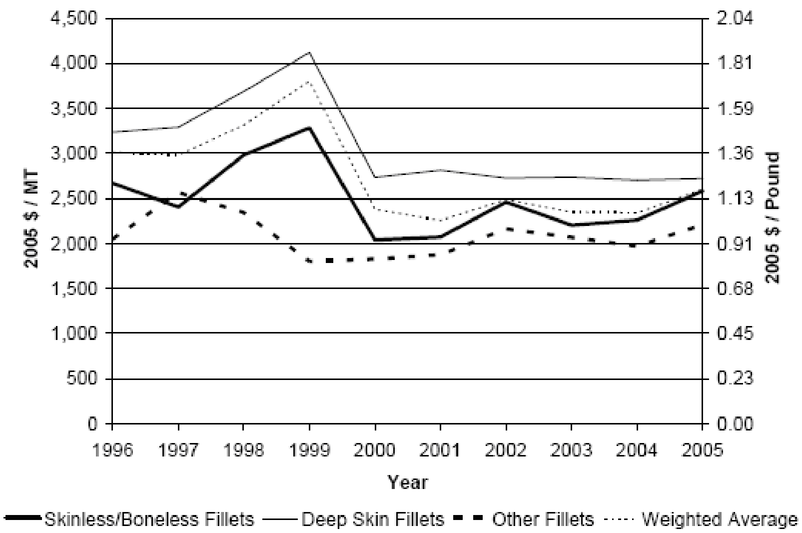


Fig. 2-5 Wholesale prices for Alaska production of pollock fillets by fillet type, 1996-2005

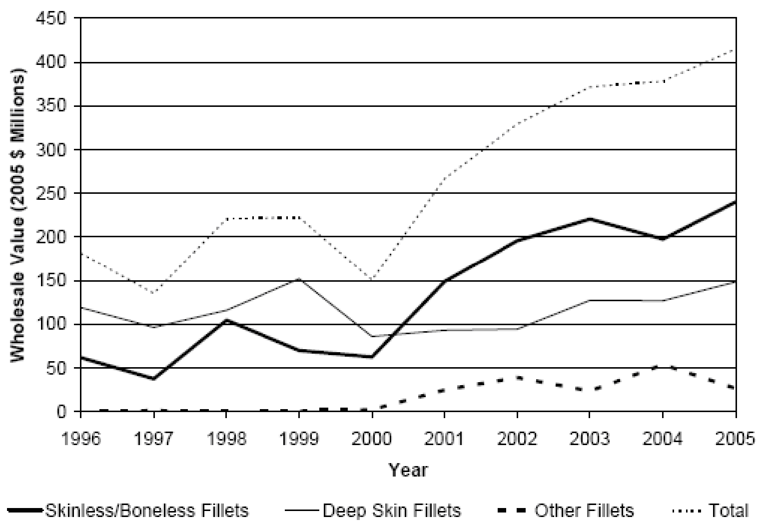
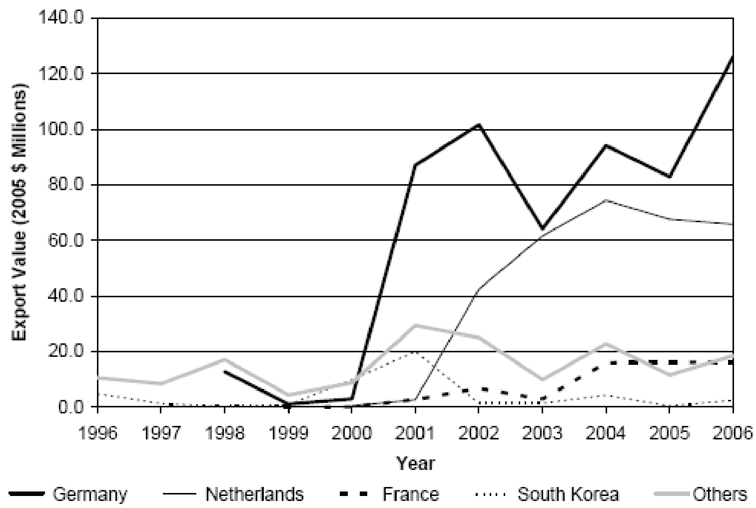


Fig. 2-6 Wholesale value of Alaska production of pollock fillets by fillet type, 1995-2005.

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.



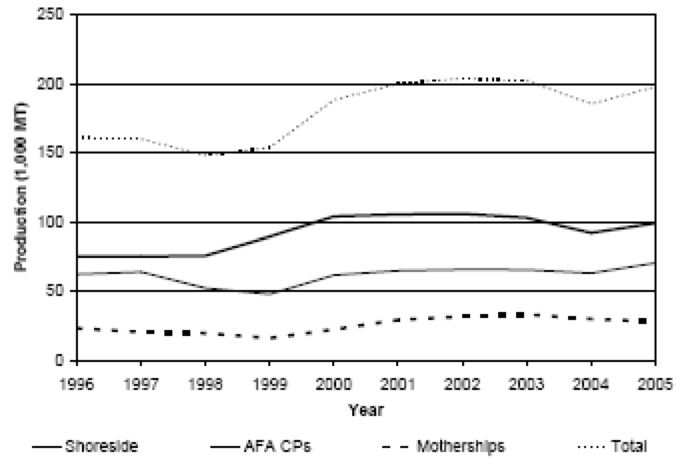
Note: Data include all exports of Alaska pollock from all U.S. Customs Districts
Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/

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

Surimi Production

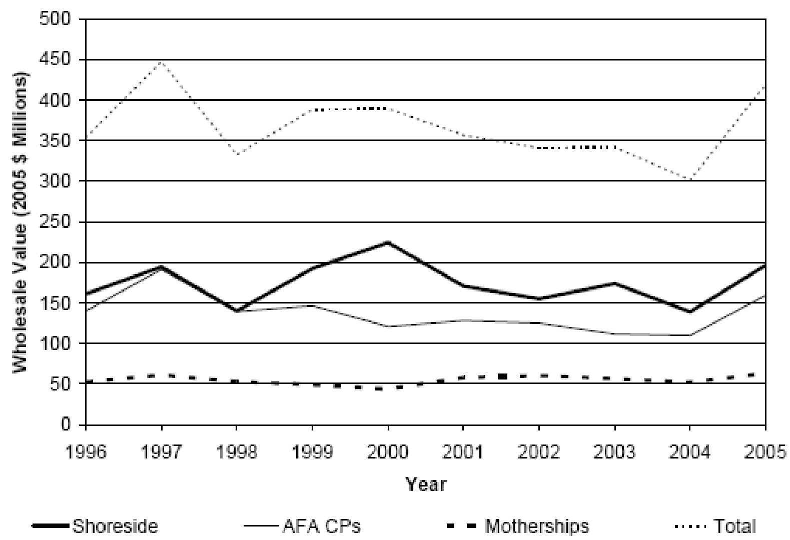
World surimi production has almost doubled in the last ten years. The chief market for surimi is Asia, particularly Japan, and the U.S. is the leading exporter of Alaska pollock surimi to the Japanese market. Chile, India, and China are increasing surimi production from other whitefishes, which now represent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



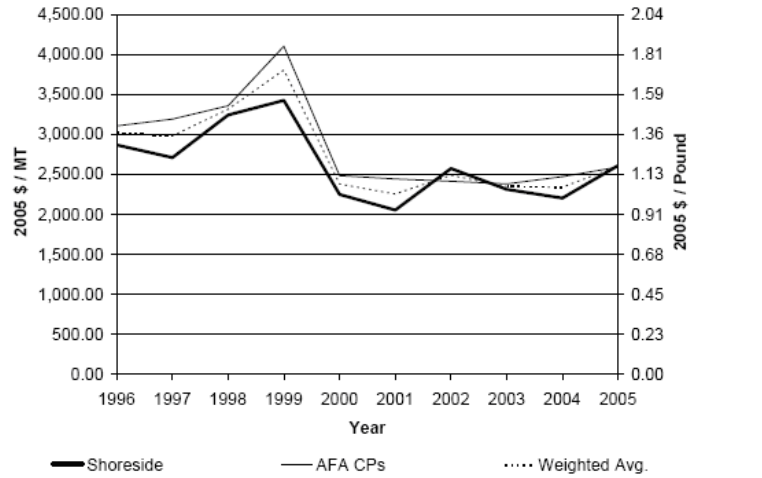
Note: Reported surimi production and value do not specify the grade of products.
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2005

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

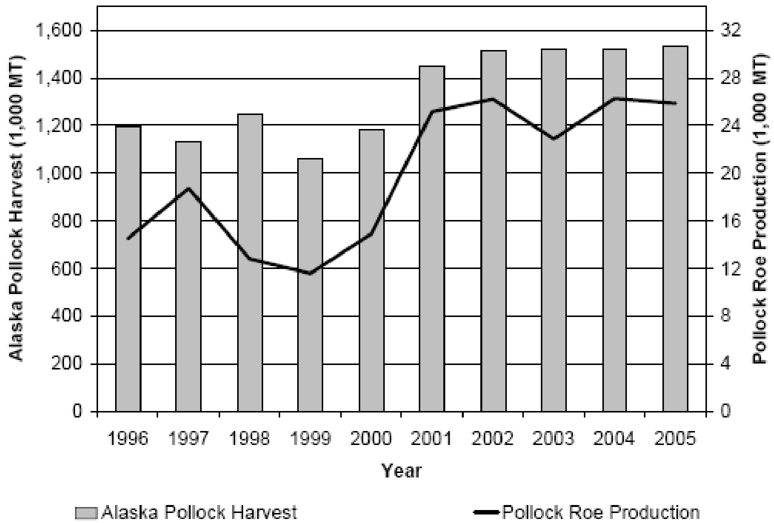
Fig. 2-10 Wholesale prices for Alaska production of pollock surimi by sector, 1996-2005.

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.

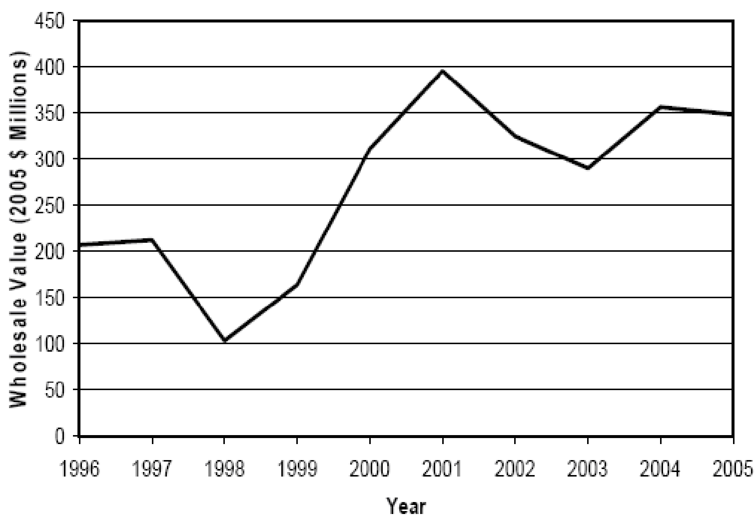
Roe Production

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.



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

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



Note: Reported roe 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. 2-12 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. The preliminary estimate for 2009 is 12,410 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.

Evaluation of Salmon Savings under the VHRS ICA

The EFP ran for both the entire pollock A and B seasons in 2007. Maps of the closures are shown in the figures below. SeaState evaluated the number of salmon saved under the EFP by tracking vessels that fished in a closed area before it closed and then comparing the subsequent bycatch of those vessels to see if the bycatch was lower than expected had the area not closed. In conducting this before-and-after comparison of the bycatch observed and expected from the vessels that triggered the closure, SeaState used the following procedure:

1. SeaState first extracted all observer data for haul locations falling inside a closure area, for a five-day period preceding the closure. Shoreside hauls that had the same “start fishing date” were aggregated, so that hauls with the same bycatch rate are not artificially repeated. For example, if two hauls from the same catcher vessel trip show up in the closed area, they would have the same bycatch rate because observers pro-rate bycatch evenly across all hauls. The two hauls would be considered as a single observation with a value equal to the sum of the two hauls’ pollock and salmon.

2. Next, SeaState considered all of independent offshore sector (C/P and mothership) hauls and combined “trip-level” hauls to be estimates of the bycatch ratio.[2] SeaState extracted the same haul or “grouped” haul information, for the same vessels, for the next five days. Their associated

[2] The bycatch ratio is $Ri = \sum yi / \sum xi$, where y are counts of chinook or chum salmon, and x is the pollock catch from individual hauls (offshore sector) or grouped, same-trip hauls (shoreside), and *i* indicates a separate closure.

bycatch was available from either observer or plant delivery information. SeaState computed the expected bycatch had the vessels been able to stay and fish inside the now-closed area, by summing the pollock catch of all vessels in this category and multiplying this summed pollock catch by the matching bycatch ratio.

3. Finally, SeaState computed the standard error of this estimated overall salmon bycatch if vessels had stayed in the area and fished with the bycatch rate (R) treating R as a ratio estimator.

The three maps below illustrate this procedure for the Chinook closure of 9/22/06. Fig. 2-13 shows the Chinook closure that began on 9/22/06, and includes the locations of observed hauls taken in that area during the five-day period preceding the closure. After the closure, vessels that had been in that closure area (i.e. those whose hauls are shown in Fig. 2-13) either moved a small distance to the southwest, or made large moves to the northwest (Fig. 2-14 and Fig. 2-15). Lower Chinook rates were found in all of the new fishing areas.

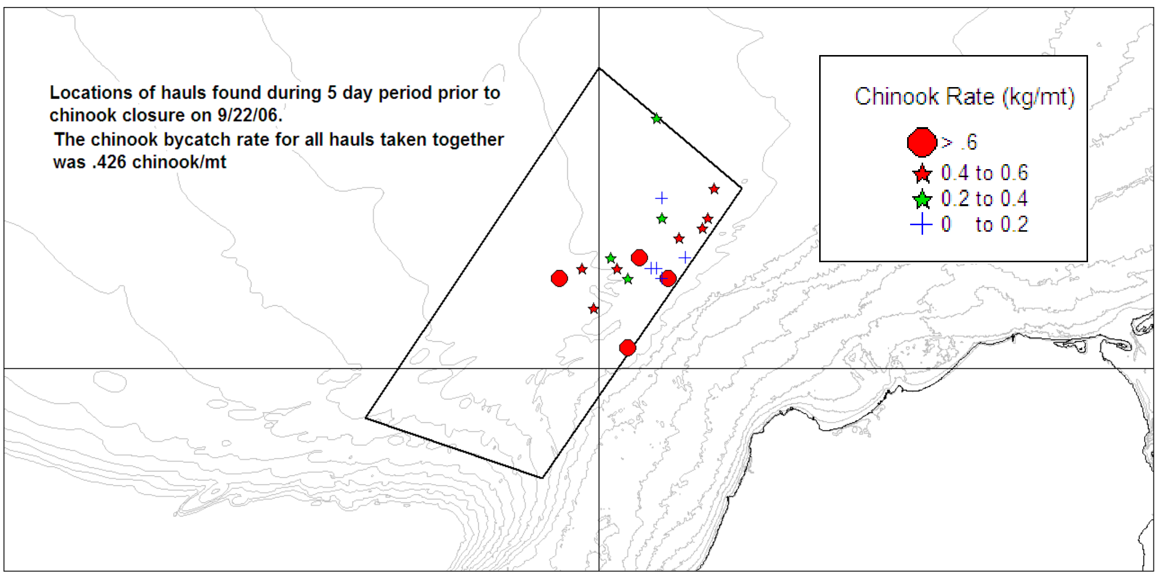


Fig. 2-13 Hauls selected for analysis of Chinook closure on 9/22

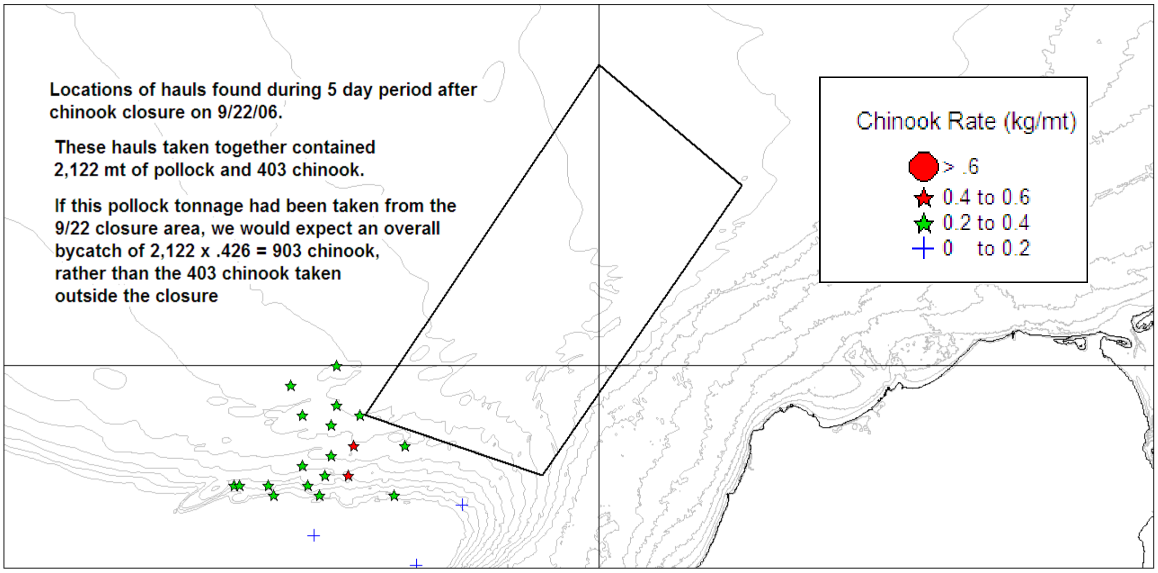


Fig. 2-14 View at the same scale as above of five day fishing activity for vessels in the first map (Fig. 2-13) showing positions that led to a reduction from an expected Chinook take of 903 to 403 actual (i.e. counted by observers from the haul positions shown).

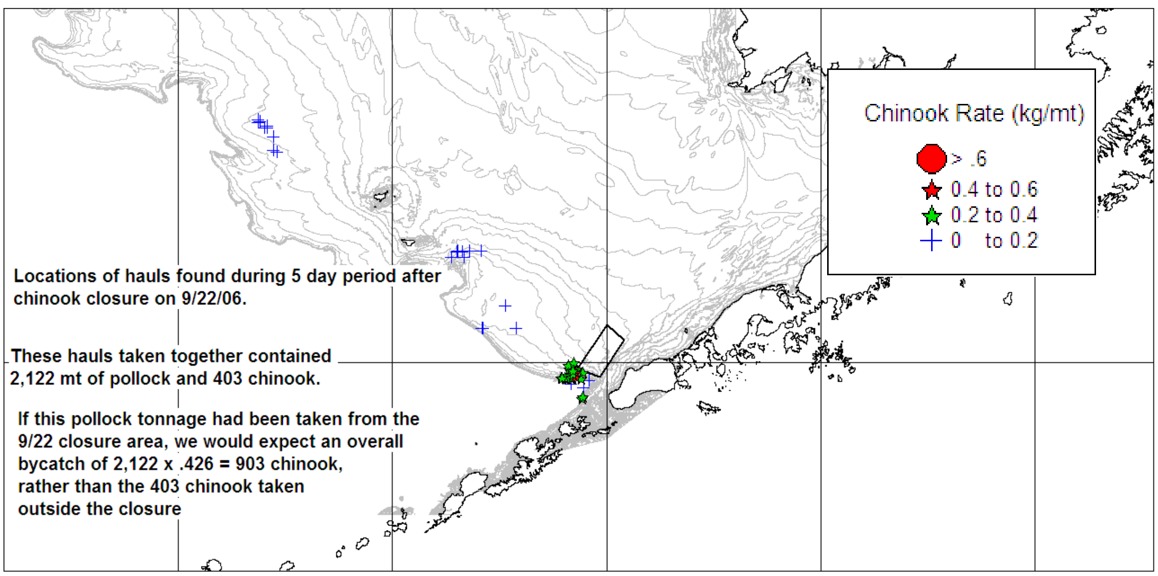


Fig. 2-15 Full view of all hauls from boats in map 1-A for the 5 day period after the start of the 9/22 closure

2.3.2 Salmon Avoidance Results from the 2007 EFP Report

This section reprints results that are documented in the Report to the Council for the BSAI groundfish fishery EFP #07-02, which authorized the VRHS system in 2007, prior to implementation of regulations under Amendment 84. This section is included as an informational item to document the efforts to reduce salmon bycatch by the participants in the VRHS. The information presented here has not been amended from its original form.

The results from these calculations for the 2007 A and B seasons are shown in Table 2-4 and Table 2-5 below. During the A season there were 12 closures. Of these there were 10 closures for which observer data could be found from vessels fishing inside the areas before they closed. (Note that closures may be based on deliveries from catcher vessels that did not carry observers, and thus there could be closures for which there is no observer information prior to the closure). Of these 10 closures, all had post-closure observer information for vessels that fished inside prior to the closure (that is, SeaState had observer information for boats both before and after the closure). Note that before-and-after comparisons were not possible for inshore CV that had observers aboard before the closure, but then delivered and came back to the grounds without an observer.

Table 2-4 summarizes the results for A-season Chinook savings resulting from these closures. For the approximately 103,000 mt of observed groundfish harvested from vessels that fished inside areas before they were closed and that also carried observers after the closures, the results indicate that 35,500 Chinook were avoided. This represents a reduction of 70 percent from the bycatch of Chinook that would have been expected had the vessels continued to fish in those closure areas for another five days.

Table 2-5 shows results obtained for the B season. Fifty-five closures were put in place during the B season. Of these, 40 closures had both pre- and post-closure observer data that allowed for analysis of bycatch reductions. As with the A season, some closures were based on inshore CV delivery information and Vessel Monitoring System (VMS) track inspection alone, leaving no pre-closure information for analysis. Post-closure information was not available for two periods after the 10/23/07 closure because that closure was continued forward for another week (two closure periods). Rates in that area were judged too high to allow more fishing, and the ICA agreement allows an area to be kept closed in the absence of data. However, with no pre-closure information (since the area was already closed, no one could be fishing in it), SeaState could not determine the effectiveness of continuing that closure.

Table 2-4 Summary of 2007 A-season Chinook closure effectiveness

	Chinook closures
Pollock catch (after closure)	102,592
Actual Chinook bycatch (in moved tows)	15,600
Expected Chinook bycatch	51,150
Chinook savings	35,550
% reduction	70%

Table 2-5 Summary of 2007 B-season Chinook and chum closure effectiveness

	Chinook closures	Chum closures	All closures
Pollock catch (after closure)	74,465	107,646	182,111
Actual Chinook bycatch (in moved tows)	10,879	1,593	12,472
Expected Chinook bycatch	23,448	3,600	27,048
Chinook savings	12,569	2,007	14,576
% reduction	54%	56%	54%
Actual chum bycatch	20,317	16,926	37,243
Expected chum bycatch	30,757	92,896	123,653
Chum savings	10,440	75,970	86,410
% reduction	34%	82%	70%

Table 2-6 summarizes these documented savings (i.e., based on a direct before-and-after comparison of the performance of vessels that triggered the closures) for both the 2006 and 2007 EFP. However, the portion of the entire pollock harvest affected by closures whose savings could not be documented should not be underestimated. This analysis does not include vessels without observers or vessels that avoided the closure areas entirely and fished the B seasons to the northwest, where salmon are rarely encountered. For inshore CV in particular, the uncertainty over whether or not the grounds they are fishing will be closed is significant. These catcher vessels often have only two days to fill their vessels; if their grounds are closed in the middle of a trip, they may eventually be forced to return to shore with only a partial load. SeaState could not quantify the weight of this factor in a captain's decision to fish away from the closure areas, but notes in its report that this is another factor by which salmon closures may reduce bycatch; however, that factor cannot be analyzed with the methods at hand.

Table 2-6 Documented savings summary for 2006 and 2007 EFP

	2006B	2007A	2007 B
Pollock harvest moved from closures	41,691	102,592	182,111
% of pollock harvest affected	8%	19%	23%
Chinook savings	1,537	35,550	14,576
% reduction	20%	70%	54%
Chum savings	15,419		86,410
% reduction	67%		70%

Conclusions and Projected Changes to the ICA Closure System for 2008

Finally, Fig. 2-16 and Fig. 2-17 show Chinook bycatch rates for various pollock fishing areas and contrast the 2006 and 2007 seasons (both A and B season). In Fig. 2-17, data are limited to October, when most Chinook were encountered. Comparing years shows elevated Chinook rates in 2007 relative to 2006 in areas near the horseshoe. Rates around the Pribilof Islands did not change markedly between 2006 and 2007, while rates north of the Pribilof, while still low, increased by an order of magnitude in the B season (from .013 to .12 salmon/mt). The net result is the increase in the Chinook bycatch rate shown in Table 2-7. Inshore CV and offshore sectors are shown separately only because offshore records go back further. Both sectors have shown a similar increase in Chinook bycatch rates, especially in the A season.

Table 2-7 Inshore CV and offshore Chinook rates based on data compiled by Sea State.

Year	Inshore CV A	Offshore A	Inshore CV B	Offshore B
1996		0.057		0.021
1997		0.014		0.027
1998		0.042		0.032
1999		0.015		0.010
2000	0.006	0.011	0.010	0.003
2001	0.037	0.034	0.010	0.024
2002	0.039	0.036	0.026	0.007
2003	0.035	0.054	0.023	0.012
2004	0.047	0.036	0.064	0.013
2005	0.062	0.043	0.102	0.011
2006	0.147	0.071	0.063	0.004
2007	0.153	0.113	0.147	0.024

Note: Sea State inshore CV recording began in 2000.

The pollock fishery encountered record levels of Chinook bycatch during the 2007 seasons. Catch Per Unit Effort (CPUE) estimates, on Chinook salmon, measured simply as the number of salmon caught per hour of fishing, summed across all vessels, rose dramatically in 2006 and continued to stay at high levels throughout 2007 (Fig. 2-18 and Fig. 2-19). Slight declines in salmon CPUE were seen in the inshore CV data, but offshore sectors saw increased salmon CPUEs. Also, any lowering in the inshore CV CPUEs were cancelled by a greater decrease in pollock CPUE, leading to bycatch rates higher than any seen since the mid-1990s. The situation with chum salmon was much different, with obviously lower levels of chum on the grounds and total bycatch for the season falling to the lowest level in five years.

Chinook bycatch in the A season contained unusually high numbers of small salmon (see Fig. 2-20 below). Chinook bycatch in the B season appeared to have fewer small salmon, although the separate modes that appeared in the 2007A length frequencies are not as pronounced in the 2007 B bycatch. These high levels of bycatch of small fish mean that we will not understand the correlation between bycatch of Chinook in the Bering Sea and the return of Chinook to western Alaskan drainages for several years. It may be that high bycatch levels presage very high returns, or it may alternatively mean that the distribution of Chinook throughout the North Pacific and Bering Sea has somehow changed so that more of the run is vulnerable to being taken as bycatch. Regardless, the Intercooperative group concluded that the current system of closures was insufficient to meet these high and unanticipated levels of salmon abundance on the pollock grounds. The Intercooperative group thus took the following steps to make the program more effective in 2008:

- **The base rate for Chinook in the A season will float after February 14.** It is currently adjusted on February 14, but if bycatch levels are declining the result will be that no areas are found above the threshold for closure. Although the ICA group did in fact issue salmon advisories that all vessels observed, CDQ groups and western Alaskans asked that the base rate be allowed to float so that the program would not depend on voluntary observance of salmon advisories, should this situation occur in the future.
- **The area available for closure in the A season increases to 1,500 sq mi.** The previous total area that could be closed for A season Chinook bycatch was 1,000 sq mi.
- **The area available for closure in the B season increases to 1,500 sq mi.** The previous total area that could be closed for B season Chinook bycatch was 1,000 sq mi.
- **A predefined A season closure shown below (Fig. 2-21) will be observed for the entire A season.** The area to be closed is defined by a heavy black line in the chart below. It was determined by trying to bound the areas that show the consistently highest A season bycatch rates, but still leave fishing grounds deeper than 180 fm open. This preseason closure area appears to match the highest bycatch rate areas found by Council analysts as well.

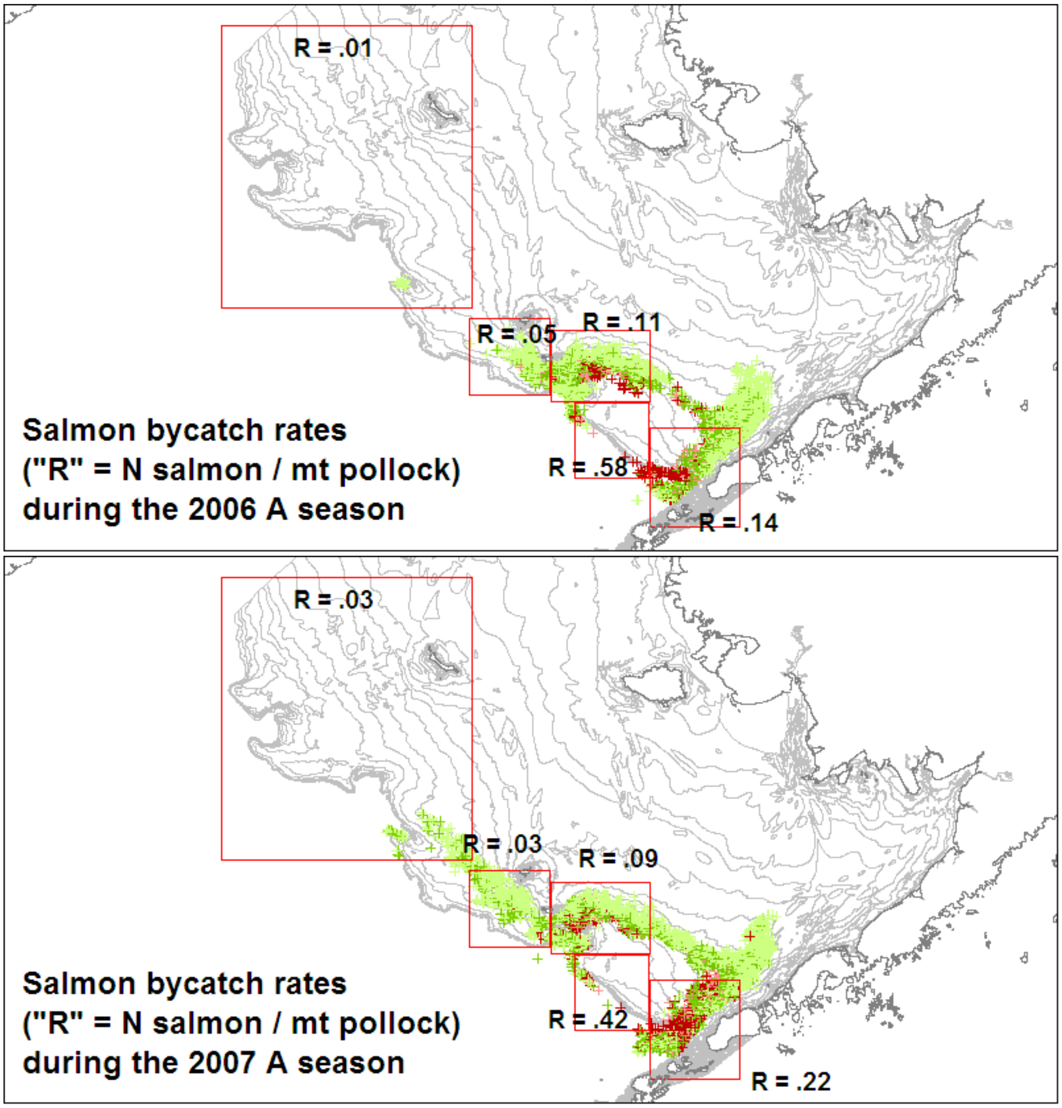


Fig. 2-16 Comparison of Salmon Bycatch Rates in the 2006 and 2007 Pollock A Seasons. Shading indicates level of Chinook bycatch, ranging from light green (lowest) to red (highest). Shading scale is the same for both years

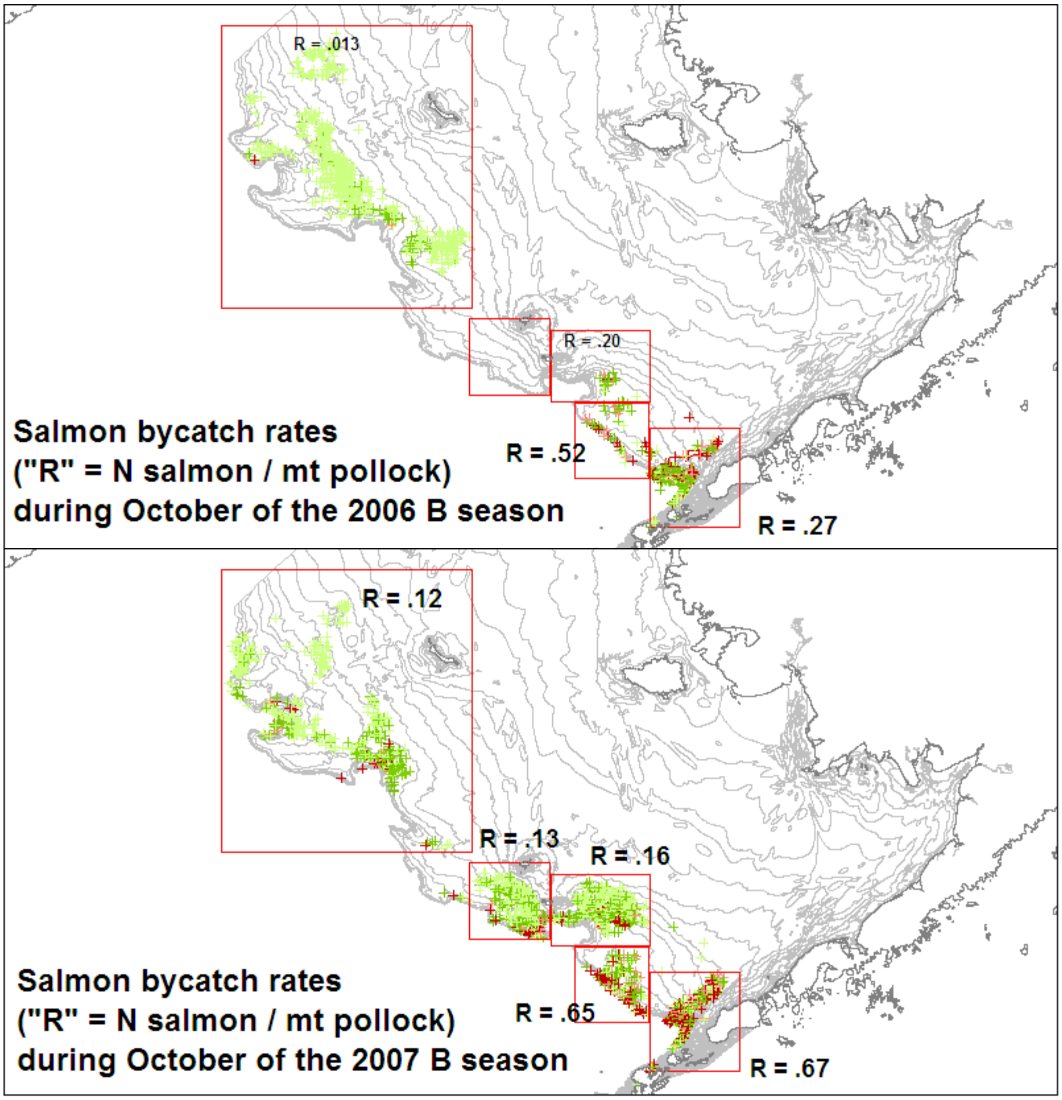


Fig. 2-17 Comparison of bycatch rates between areas fished during the 2006 and 2007 pollock B seasons. Shading indicates level of Chinook bycatch, ranging from light green (lowest) to red (highest). Shading scale is the same for both years

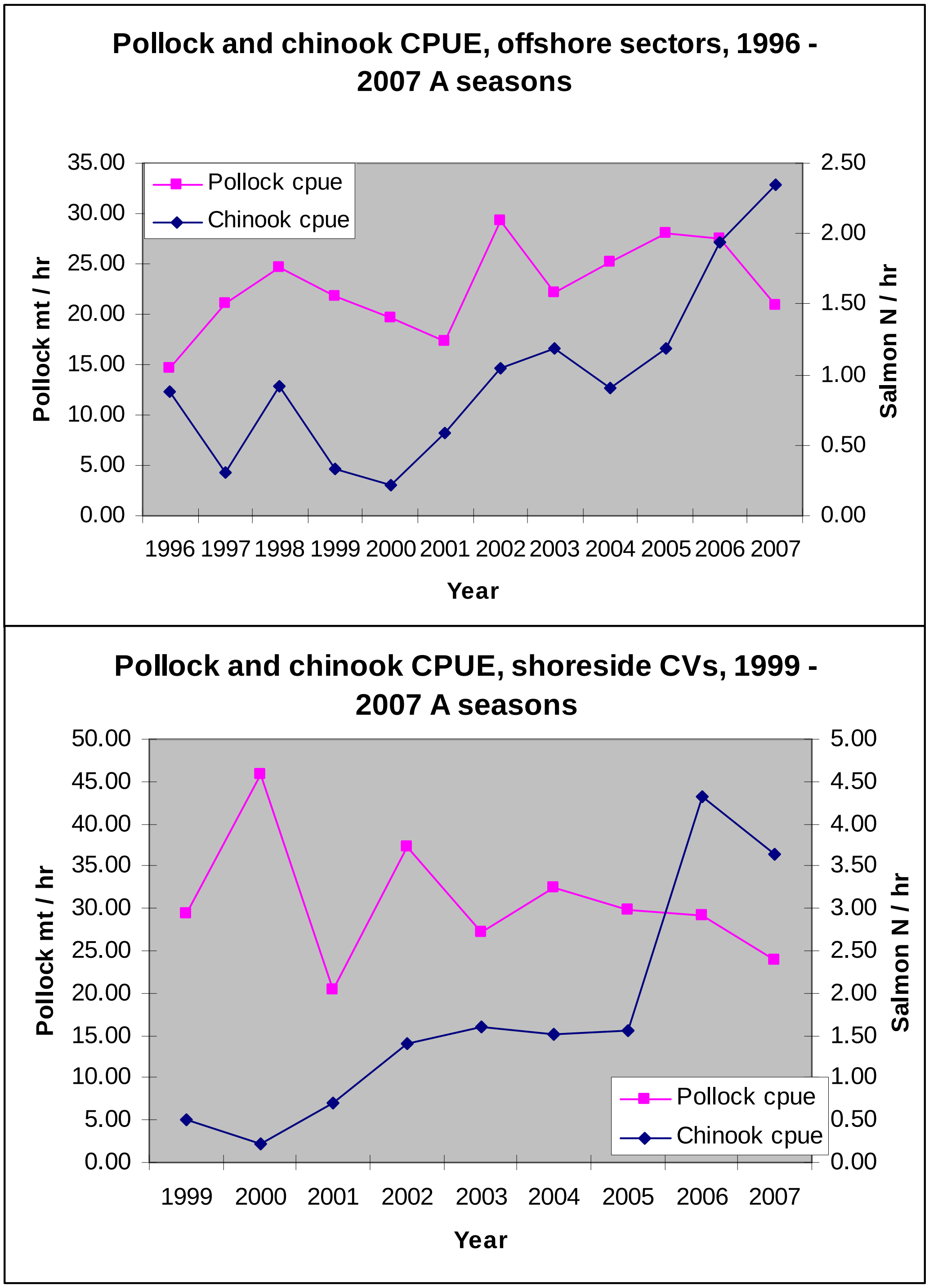


Fig. 2-18 A season pollock and Chinook CPUE, 1996–2007, offshore and CV sectors

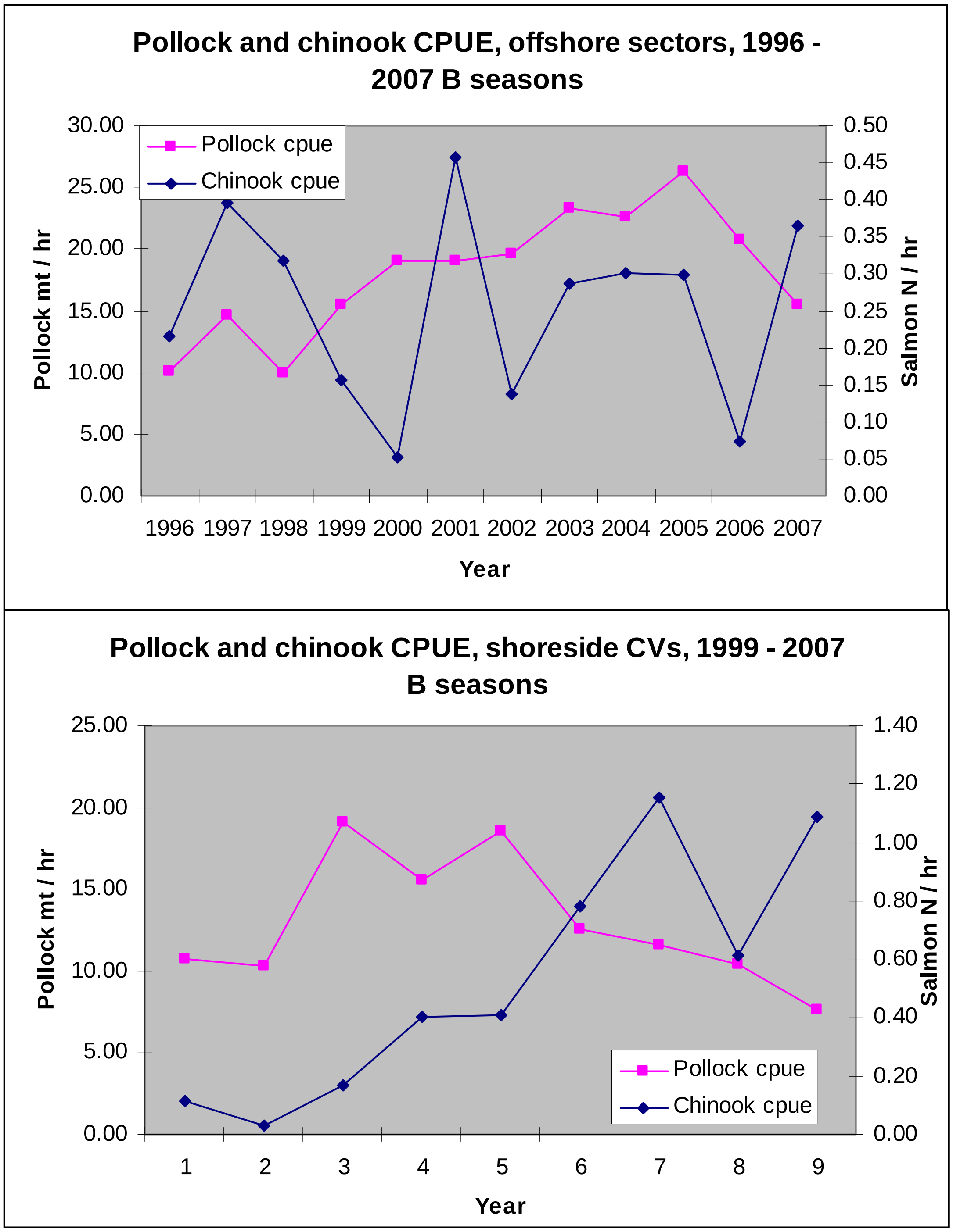


Fig. 2-19 B season pollock and Chinook CPUE, 1996–2007, offshore and CV sectors[3]

[3] Note that these graphs are excerpted from the original report and that the X-axes in the bottom graph should be in years.

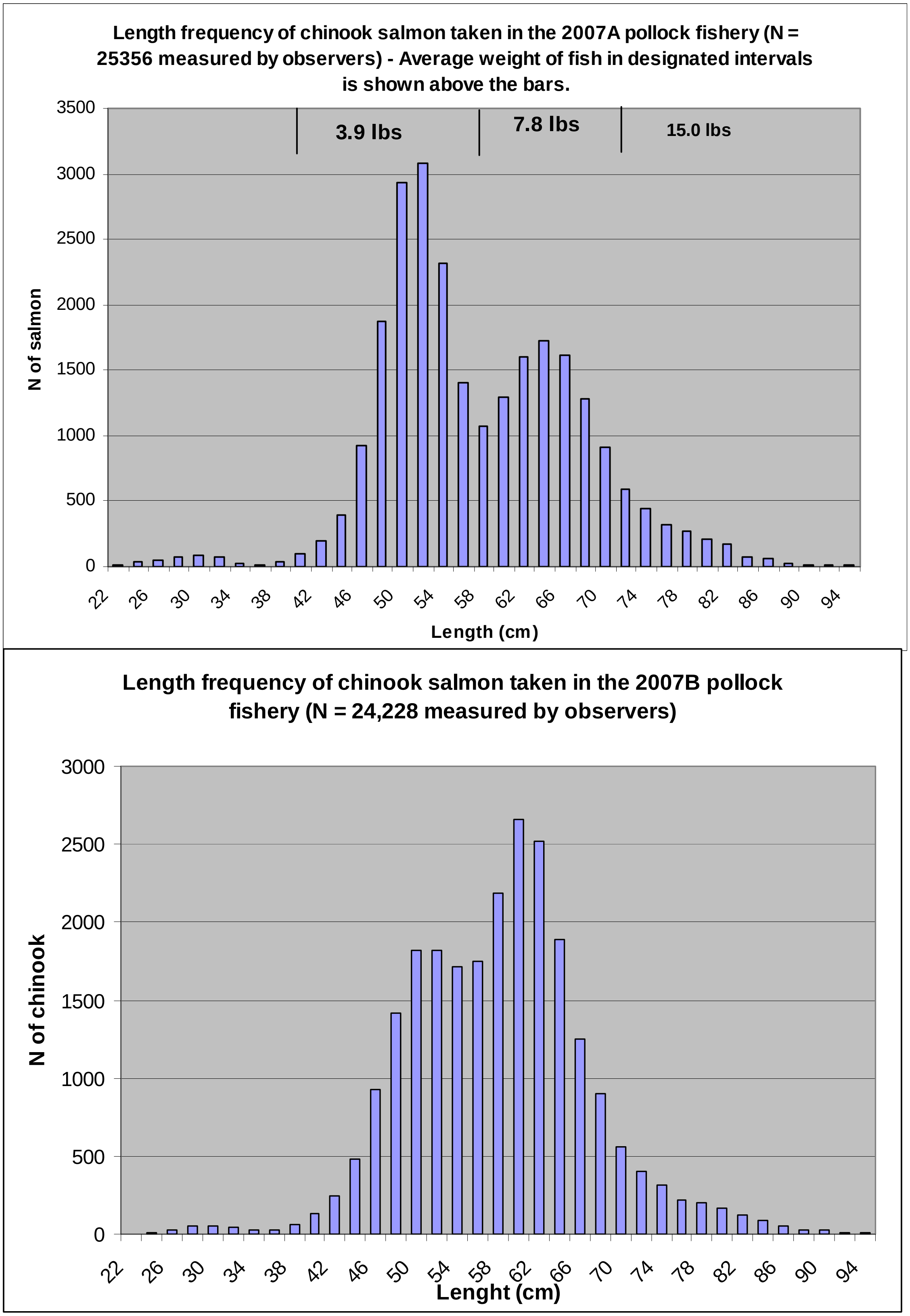


Fig. 2-20 Length frequencies of Chinook, 2007A and 2007B seasons.

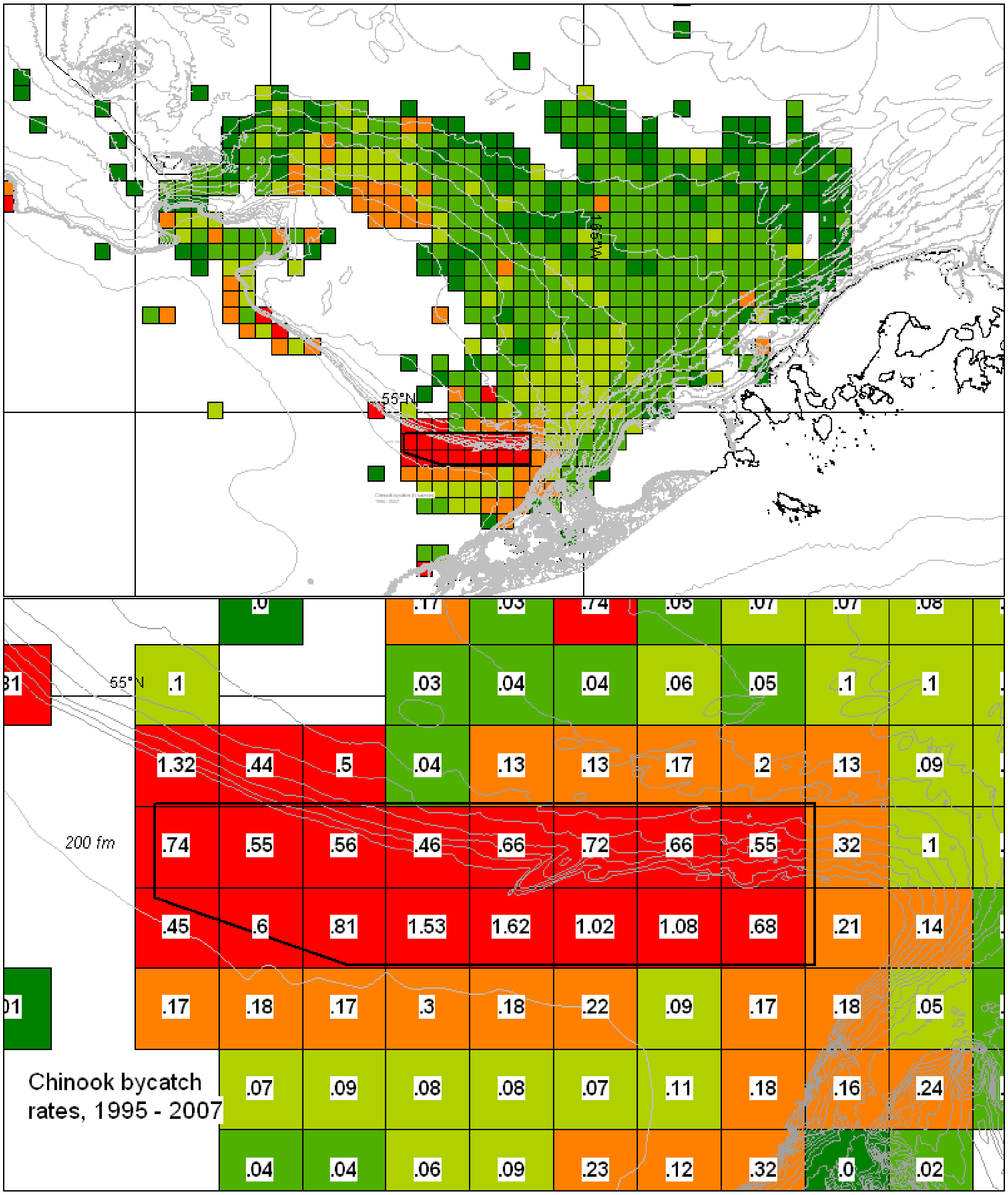


Fig. 2-21 2008 pollock A season pre-season closure

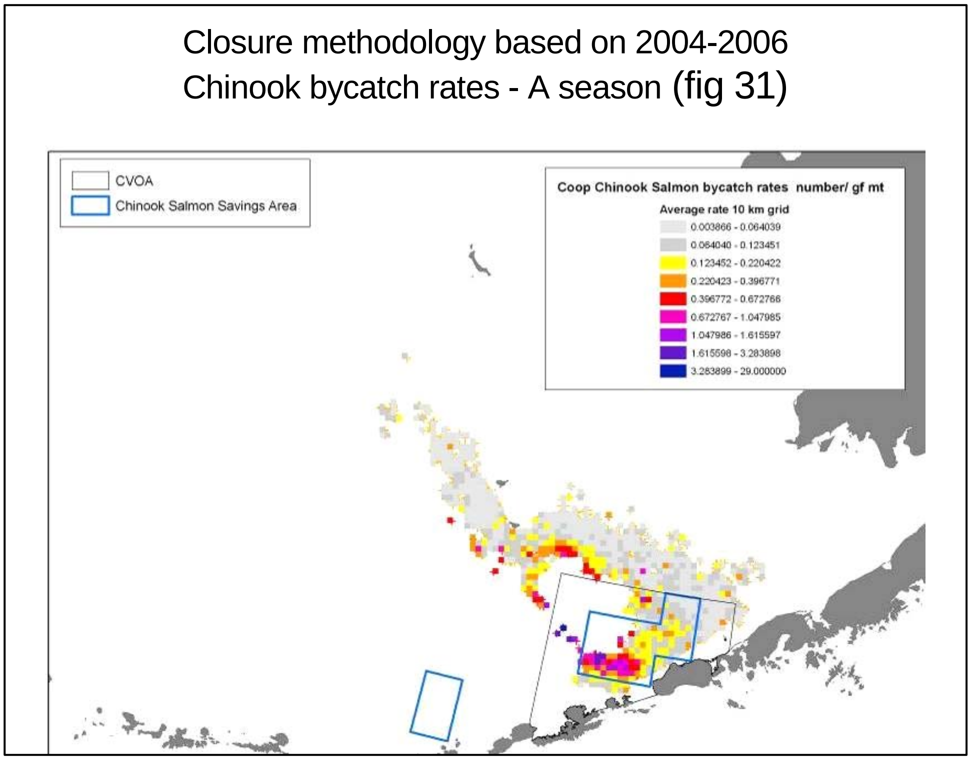


Fig. 2-22 Correspondence between high bycatch areas noted by Council analysts and pre-season closure (above).

Table 2-8 Chinook and chum salmon closure effectiveness, 2007 A season, by Chinook closure

Closure type	Date of closure	"After" closure pollock catch	"After" closure chinook	Estimated closed-area chinook catch	Chinook reduction (estimate - actual)	Std Err chinook	"After" closure chums	Estimated closed area chum	Chum reduction (estimate - actual)	Std Err chum	Number of samples prior to closure	Number of samples after closure
Chinook	01/31/06	13,166	1,582	12,923	11,341	799	100	23	-78	9	35	42
Chinook	01/31/06	6,143	852	1,849	997	399	61	0	-61	0	4	37
Chinook	02/02/06	5,012	742	5,161	4,419	562	196	3	-193	1	14	19
Chinook	02/02/06	7,340	2,773	569	-2,204	97	262	0	-262	0	3	43
Chinook	02/09/06	22,917	4,003	18,666	14,663	3,161	1,616	691	-926	123	30	135
Chinook	02/13/06	3,795	561	1,141	580	378	20	54	35	18	12	25
Chinook	02/16/06	28,936	3,087	8,164	5,077	382	435	1,372	937	69	128	191
Chinook	02/16/06	5,700	1,178	405	-773	150	44	0	-44	0	3	40
Chinook	02/23/06	456	22	180	158	34	0	0	0	0	4	4
Chinook	02/23/06	9,126	800	2,091	1,291	273	152	83	-68	20	22	54
Totals		102,592	15,600	51,150	35,550		2,887	2,226	-661			

Table 2-9 Chinook and chum salmon closure effectiveness, 2007 B season, by Chinook closure

Closure type	Date of closure	"After" closure pollock catch	"After" closure chinook	Estimated closed-area chinook catch	Chinook reduction (estimate - actual)	Std Err chinook	"After" closure chums	Estimated closed area chum	Chum reduction (estimate - actual)	Std Err chum	Number of samples prior to closure	Number of samples after closure
Chinook	08/24/06	4,679	61	392	331	32	3,621	16,327	12,706	2,688	12	23
Chinook	08/24/06	6,788	72	199	127	17	3,875	5,466	1,591	1,132	27	35
Chinook	09/04/06	18,875	729	2,258	1,529	188	7,026	1,600	-5,426	206	43	124
Chinook	09/07/06	4,033	670	321	-350	45	2,080	666	-1,414	141	12	28
Chinook	09/11/06	3,777	508	296	-212	18	295	127	-168	12	12	20
Chinook	09/18/06	1,165	439	893	454	38	328	1,419	1,091	75	9	10
Chinook	09/18/06	2,546	331	466	135	85	413	235	-178	52	18	25
Chinook	09/21/06	1,430	80	148	68	29	168	72	-96	29	5	18
Chinook	09/21/06	3,298	880	1,045	165	182	767	1,465	698	194	29	27
Chinook	09/25/06	821	259	368	109	129	182	334	152	76	10	10
Chinook	09/28/06	816	332	256	-77	20	90	73	-18	8	8	7
Chinook	09/28/06	3,125	373	539	166	97	279	739	461	117	13	29
Chinook	10/02/06	448	145	33	-112	6	20	58	38	17	5	6
Chinook	10/05/06	834	466	353	-113	45	35	82	47	15	3	6
Chinook	10/05/06	7,113	278	2,329	2,051	370	303	1,456	1,152	255	12	61
Chinook	10/09/06	2,343	1,245	1,334	89	42	111	257	146	15	10	15
Chinook	10/12/06	5,405	1,907	5,489	3,582	417	300	227	-73	15	34	35
Chinook	10/12/06	698	359	221	-137	15	109	59	-50	3	15	4
Chinook	10/16/06	1,285	511	1,364	853	122	65	39	-25	3	13	9
Chinook	10/19/06	4,543	955	4,331	3,377	370	229	49	-179	8	16	26
Chinook	10/23/06	443	278	813	536		20	7	-13		1	2
Totals		**74,465**	**10,879**	**23,448**	**12,569**		**20,317**	**30,757**	**10,441**			

Table 2-10 Chinook and chum salmon closure effectiveness, 2007 B season, by chum closure

Closure type	Date of closure	"After" closure pollock catch	"After" closure chinook	Estimated closed-area chinook catch	Chinook reduction (estimate - actual)	Std Err chinook	"After" closure chums	Estimated closed area chum	Chum reduction (estimate - actual)	Std Err chum	Number of samples prior to closure	Number of samples after closure
Chum	07/06/06	8,983	8	87	79	20	60	2,717	2,657	394	19	50
Chum	07/17/06	223	7	2	-5	1	13	34	21	8	5	4
Chum	07/24/06	150	0	0	0		9	5	-4		1	1
Chum	07/24/06	13,089	0	0	0	0	89	3,590	3,501	1,173	20	82
Chum	07/31/06	13,267	0	0	0	0	125	5,428	5,303	546	31	70
Chum	08/03/06	5,584	0	0	0	0	75	1,593	1,518	338	4	28
Chum	08/03/06	507	4	6	2	1	309	329	21	133	5	5
Chum	08/07/06	1,313	1	13	12	2	50	1,072	1,022	41	6	7
Chum	08/10/06	4,965	36	18	-18	3	375	1,407	1,032	162	19	29
Chum	08/14/06	304	1	2	1	1	5	84	79	19	4	3
Chum	08/17/06	19,890	308	741	433	119	7,394	3,612	-3,782	560	62	120
Chum	08/17/06	626	4	0	-4	0	122	83	-39	43	11	8
Chum	08/21/06	268	0	0	0		70	0	-70		1	1
Chum	08/21/06	12,820	153	1,224	1,072	307	3,029	2,429	-600	437	17	96
Chum	08/21/06	5,554	34	315	281	23	1,267	29,156	27,890	4,022	7	25
Chum	08/28/06	2,013	56	67	11	9	746	1,639	893	146	9	14
Chum	08/31/06	1,769	32	64	32	3	467	1,196	729	65	9	10
Chum	08/31/06	5,972	459	103	-356	28	426	12,841	12,415	2,572	11	52
Chum	09/04/06	10,350	491	958	468	259	2,296	25,680	23,384	5,526	6	74
Totals		**107,646**	**1,593**	**3,600**	**2,007**		**16,926**	**92,896**	**75,970**			

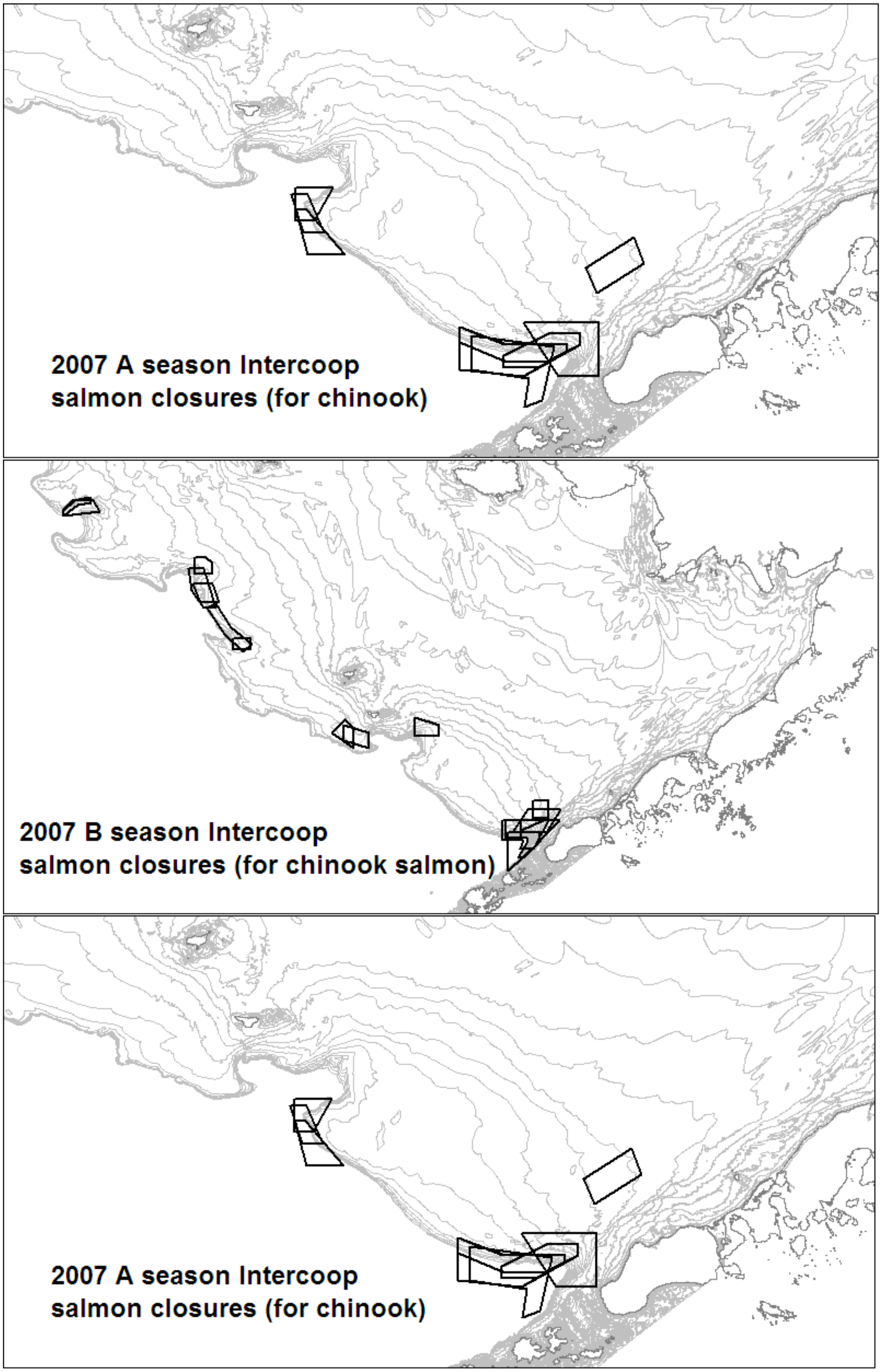


Fig. 2-23 Charts showing closures

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).[4]

Table 2-11 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 2-11 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).

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

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 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.[5] These CDQ entities are non-profit corporations that

[5] 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).

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 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 2-12 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 2-12 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 2-13 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 2-13 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)[6]	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% [7]	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[8]	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

[6] Eric Olson, Larry Cotter, Paul Peyton, and Morgan Crow, Personal communication, July 2009
[7] CBSFA Annual Report 2006 http://www.cbsfa.com/imageuploads/file72.pdf
[8] Larry Cotter, Personal communication, 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 first identifies regions where Chinook salmon fisheries are likely to be affected by the proposed action. It then provides an overview of the management of the Chinook salmon fisheries in Alaska. Third, it provides an overview of the subsistence Chinook 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 Chinook salmon commercial fisheries and a description of the commercial fishery existing conditions by region. Lastly, it provides an overview of potentially affected personal use and sport Chinook salmon fishery and a description of the sport and personal use fishery 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. While some management reports are adopted herein as originally written by ADF&G area management staff, much of the tabular data 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.

Analysis of the stock composition of Chinook salmon incidentally caught in the Bering Sea pollock fishery has shown that the stock structure is dominated by western Alaska stocks. A study completed in 2003, estimated age and stock composition of Chinook salmon in the 1997 through 1999 BSAI groundfish fishery bycatch samples from the NMFS observer program database (Myers et al. 2004). Results indicated that bycatch samples were dominated by younger (age 1.2) fish in summer, and older (age 1.3 and 1.4) fish in winter (Myers et al. 2004). The stock structure was dominated by western Alaskan stocks, with the estimated stock composition of 56 percent western Alaska, 31 percent Central Alaska, 8 percent Southeast Alaska/British Columbia/Pacific Northwest, and 5 percent Russia.

Cook Inlet

After experiencing a significant downturn in the early to mid-1990s, Cook Inlet Northern District Chinook salmon stocks continue to trend sharply upward and most escapement goals are being met or exceeded (see EIS Chapter 5). Chinook salmon is not normally a commercially important species in the Lower Cook Inlet. Thus, formal treatment of Cook Inlet Chinook salmon fisheries is not included here.

Southeast Alaska Stocks

Chinook salmon harvest in Southeast Alaska occurs under the Pacific Salmon Treaty (described further in EIS Chapter 1). Eleven watersheds have been designated to track spawning escapement, and counts of these 11 stocks are used as indicators of relative salmon abundance as part of a coast-wide Chinook model. The Taku, Stikine, and Chilkat rivers together make up over 75 percent of the summed escapement goals in the region. Escapement on the Taku River remains low relative to the 1990-1999 average, but escapement to the Stikine River has increased greatly since 1999 (Pahlke 2007).

The Chinook salmon quota for Southeast Alaska, all gears, in 2006 was 329,400. In addition, a harvest sharing agreement with Canada under the treaty allows harvest in the Stikine River; the US allocation in 2006 was 13,350 fish. There was no directed fishery for Chinook salmon on the Taku River in 2006 due to low forecast returns (Nelson et al 2008).

Southeast Alaska stocks are not individually resolved in the genetics used as the baseline for this impact analysis. Trends in stocks can be evaluated for an aggregate estimate of the impacts of the alternatives to Southeast Alaska stocks (see EIS Chapter 5) but given the number of river systems combined to form these categories results should be interpreted with caution. It is not possible at this time to estimate the individual impact to specific Southeast Alaska river systems of the alternatives. Thus, it is not possible to evaluate potential impact on specific Southeast Alaska Chinook fisheries. For that reason, detailed background information on Southeast Alaska Chinook fisheries is not included here.

Pacific Northwest Stocks

A single grouping represents the aggregate Pacific Northwest stocks including over 200 stocks from British Columbia, Oregon and Washington State. The specific stocks included are listed in EIS Chapter 3. Given the breath of this grouping, it is not possible to identify specific Chinook salmon harvest fisheries, be they commercial, sport, subsistence and/or tribal, that may be affected by Chinook salmon bycatch in the Bering Sea. Further, the 2007 biological opinion concluded that of the 26 ESA-listed salmon stocks, the BSAI groundfish fisheries are not likely to jeopardize the continued existence or adversely modify critical habitat for the Upper Willamette River (UWR) and Lower Columbia River (LCR) ESA-listed Chinook salmon stocks (NMFS 2007a), see EIS Chapter 3 and Table 3.7). Available information indicates that the remaining 24 ESA-listed salmon stocks are not taken in the BSAI groundfish fisheries. Thus, background information on Pacific Northwest Chinook salmon harvest fisheries is not included here, as it is not informative for impact assessment.

3.1 Management of Chinook salmon fishing

The State of Alaska manages sport, commercial, personal use, and State subsistence harvest on lands and waters throughout Alaska. ADF&G is responsible for managing commercial, subsistence, sport, and personal use salmon fisheries. The first priority for management is to meet spawning escapement goals to sustain salmon resources for future generations. The highest priority use is for subsistence under both State and Federal law. Surplus fish beyond escapement needs and subsistence use 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 the various user groups. Yukon River salmon fisheries management includes obligations under an international treaty with Canada. Subsistence fisheries management includes coordination with U.S. government agencies for which Federal rules apply under the Alaska National Interest Lands Conservation Act (ANILCA). The Federal government manages subsistence uses on Federal lands and waters in Alaska, consistent with the subsistence priority for rural Alaska residents as provided by Title VIII of ANILCA.

3.1.1 State Subsistence Management

ADF&G, under the direction of the Alaska BOF, manages subsistence, personal use, and commercial Chinook salmon harvests on waters flowing in state lands. 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 by-products 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 (i.e., the 'Amount Reasonably Necessary for Subsistence Use (ANS)'). Whenever it is necessary to restrict harvests, subsistence fisheries have a preference over other uses of the stock (AS 16.05.258). ADF&G, Division of Commercial Fisheries, manages the subsistence fisheries in the area of potential effect.

Alaska subsistence fishery regulations do not in general permit the sale of resources taken in a subsistence fishery. However, State law recognizes "customary trade" as a potential 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 16.05.940(8)).

For more information on State management of the salmon subsistence fisheries, refer to the Alaska Subsistence Salmon Fisheries 2006 Annual Report, available on the State of Alaska website.[9] This is the most recent report available to the public, published in May 2009 (ADF&G 2009). The Alaska Subsistence Salmon Fisheries 2007 Annual Report is expected to be published later in 2009, but had not been published at the time of the writing of this section. However, unpublished data from the 2007 report has been provided by ADF&G, and incorporated into this Chapter when possible. Subsequent sections of this RIR frequently summarize and incorporate by reference information from both of these reports, when applicable, to focus the analysis on the key issues and eliminate repetitive information. These reports are inclusive of all reported subsistence harvest, regardless of Federal or State jurisdiction. Additional information and analysis on subsistence harvest in Alaska is available on the ADF&G Subsistence Division website.[10]

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.

[9] http://www.subsistence.adfg.state.ak.us/TechPap/TP344.pdf
[10] http://www.subsistence.adfg.state.ak.us/geninfo/publctns/articles.cfm#SUBSISTENCE_2000

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.[11,12]

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.

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 Chinook 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

[11] Refer to Alaska Subsistence Salmon Fisheries, 2006 Annual Report. (p. 1).
[12] The Joint Board has identified five nonsubsistence areas in (5 AAC 99.015): Ketchikan, Juneau, Anchorage-Matsu-Kenai, Fairbanks, and Valdez.

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.[13] 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.

3.1.4 Federal subsistence management

The ANILCA, passed by Congress in 1980, mandates that rural residents of Alaska be given a priority for subsistence uses of fish and wildlife. In 1986, Alaska passed a law mandating a rural subsistence priority to bring it into compliance with ANILCA. However, in 1989, the Alaska Supreme Court ruled that the rural priority in the state's subsistence law violated provisions of the Alaska Constitution. As a result, the Federal government manages subsistence uses on Federal public lands and waters in Alaska—about 230 million acres or 60 percent of the land within the state. To help carry out the responsibility for subsistence management, the Secretaries of the Interior and Agriculture established the Federal Subsistence Management Program (FSMP).

On July 1, 1990, the U.S. Departments of the Interior and of Agriculture assumed responsibility for implementation of Title VIII of ANILCA on public lands. The Departments administer Title VIII by regulations in the Code of Federal Regulations. The Departments established a Federal Subsistence Board and ten Regional Advisory Councils to administer the Federal Subsistence Management Program. The Federal Subsistence Board'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.

Through the Federal Subsistence Board, these agencies participate in the 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 areas. The Regional Advisory Councils provide recommendations and information to the Board; review proposed regulations, policies and management plans; and provide a public forum for subsistence issues. Each Council consists of residents representing subsistence, sport, and commercial fishing and hunting interests.

3.2 Importance of Subsistence Harvests

This section provides a description of the importance of subsistence to Native peoples of Alaska and other rural Alaska residents. As discussed in EIS Chapter 5, analysis of the stock composition of Chinook salmon incidentally caught in the Bering Sea pollock fishery has shown that the stock structure is dominated by western Alaska stocks. Therefore, this section focuses on the importance of subsistence to people who live in western and interior Alaska.

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

Subsistence salmon fisheries are important nutritionally and culturally, as well as greatly contribute to local economies. Many researchers have described the importance of subsistence to individual Alaskan communities and households (Coffing 1991; Krieg et al. 2007; Moncrieff 2007; Magdanz et al. 2005; Walker and Coffing 1993; Walker et al. 1989; Wolfe 1987; Wolfe 2003; Wolfe 2007; Wolfe and Walker 1987). Alaska Native communities in the action area are historically subsistence-based societies. A relatively early report on findings from the Alaska Natives Commission (1994) devoted an entire volume to Alaska Native subsistence.[14] This report notes that during the past 250 years, much of the technology of Native subsistence has changed profoundly, as people often use more modern instruments of harvest, transportation, and storage. On the surface, then, today's subsistence activities may look very different from those prior to the mid-18th century, prior to the arrival of the first non-Natives. However, beneath the visible level, older patterns of behavior and values continue. The report states: "As we try to define what subsistence really is in contemporary Alaska, we must distinguish between form and function. How Native people practice it today has changed profoundly over the centuries, but what they are doing is mainly what they have always done. And what they have always done is very different from the economic organization and personal relationships of contemporary mass culture."

The most recent statewide summary of subsistence harvest and use in Alaska (modeled statewide summary) indicates that on average among rural residents of Alaska, 60 percent of all fish and wildlife resources harvested are fish, and that on average, 78 percent of households in the Arctic region harvest fish, while 96 percent of Arctic households use subsistence caught fish (Wolfe 2000). Similarly, 75 percent of households in the Interior region harvest fish and 92 percent of households use fish; while 98 percent of Yukon-Kuskokwim Delta households harvest fish and 100 percent use fish (Wolfe 2000).[15]

Subsistence salmon harvests in the Arctic-Yukon-Kuskokwim (AYK) region, for example, have cultural and practical significance to many of the approximately 120 communities, representing approximately 14,711 households and approximately 58,596 residents (in 2007) in the AYK region. In addition, more than 57,000 residents in the Fairbanks North Star and Denali Boroughs, many of whom also depend upon AYK salmon stocks for dietary and other cultural needs. There are also Canadian residents who rely on AYK salmon stocks. In Bristol Bay, 18 communities harvest Chinook salmon for subsistence. [16]

Subsistence foods in general are important components of regional diets. The Alaska Subsistence Salmon Fisheries 2007 Annual Report shows that of the estimated 43.7 million pounds of wild foods produced in rural Alaska communities annually, subsistence fisheries contribute about 60 percent from finfish and 2 percent from shellfish (Fig. 3-1). Although producing a major portion of the food supply, subsistence harvests represent a small part of the annual harvest of all wild resources in Alaska (about 2 percent). Commercial fisheries take 97 percent of the wild resource harvest, and sport fisheries and hunts take about 1 percent.

[14]The Alaska Natives Commission (joint Federal-State Commission on Policies and Programs Affecting Alaska Natives) was created by Congress in 1990, to conduct a comprehensive study of the social and economic status of Alaska Natives and the effectiveness of the policies and programs of the U.S. and the State of Alaska that affect Alaska Natives (1994). See the UAA Justice Center link: http://justice.uaa.alaska.edu/rlinks/natives/ak_subsistence.html.
[15]Source: www.subsistence.adfg.state.ak.us/geninfo/publctns/articles.cfm#SUBSISTENCE_2000.
[16]Source: ADF&G Division of Subsistence, February 3, 2009.

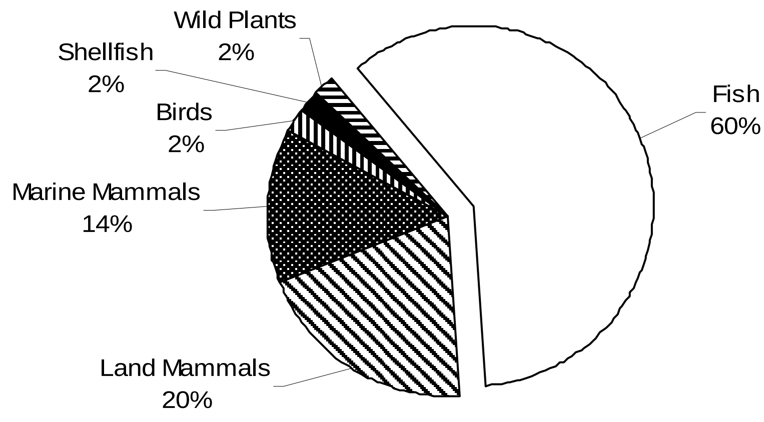


Fig. 3-1 Composition of subsistence harvest by rural Alaska residents
Source: The Alaska Subsistence Salmon Fisheries 2007 Annual Report (unpublished, ADF&G)

Most rural Alaska communities today have mixed subsistence and market-based economies, in which subsistence harvests are a prominent part of the local economy and the mainstay of social welfare of the people (Wolfe and Walker 1987). In 'mixed' economies, small to moderate amounts of cash are provided at different times of the year by limited resources. Subsistence activities provide the material basis that allows these mixed subsistence and market-based economies[17] to continue. For example, in many places, involvement in the cash sector supports subsistence harvests (e.g., making money in order to buy nets or gear then used in subsistence practices). They also provide a context within which the traditional subsistence elements of these cultures can persist. Cultural practices in regional communities will vary between broad ethnic groupings and between smaller groups within these larger groupings. However, each of these subsistence communities was once organized completely around wild resource use, and these communities require access to these resources to support the personal relationships, and ways of thought, that emerged in those earlier times.

During the development of the EIS and RIR, and during public testimony during the Council meeting at which the Council made its final recommendation, many individuals wrote public comment letters to NMFS and testified to the Council on the importance of subsistence harvest to their livelihoods, family, tribe, culture, and community. Public comments received explained that salmon are especially significant to the cultural, spiritual, and nutritional needs of Alaska Native peoples, and that analysis of impacts on subsistence users and subsistence resources must reflect the values obtained from a broad range of uses, not simply the commercial value or monetary replacement costs of these fish. Comments emphasized that strong returns of healthy salmon are critical to the future human and wildlife uses of those fish and to the continuation of the subsistence way of life. These comments are part of the administrative record and are considered during decision making. Enabling the people potentially impacted by an action to explain how

[17] The term is from Wolfe and Walker, 1987.

they are impacted, and the magnitude of the impacts, is a primary role of the public process. For example, public comment from the Bering Sea Elders Advisory Group (pp. 1 – 2) follows:

> *"Our subsistence practices and, specifically, ties to salmon go beyond commercial value or the monetary replacement cost of food. The English language term "subsistence" is not in our Yupik language and does not describe the totality of our ties to salmon.*
>
> *Traditionally, Alaska Native peoples derive their food, nutrition, ethics, and values of stewardship, languages, codes of conduct, stories, songs, dances, ceremonies, rites of passage, history, and sense of place and spirituality from the lands, waters, fish, and wildlife they have depended on for millennia. Many White persons imagine that subsistence is merely the act of an individual going hunting or fishing. Subsistence, in actual fact, is a complicated economic system and it demands the organized labor of practically every man, woman and child in a village. There are countless tasks, such as maintenance of equipment…, preparing the outfit for major hunting and fishing expeditions…dressing thousands of pounds of fish….sharing harvest of meat and fish with other communities.*

While the economic value of the subsistence harvest is significant, subsistence is clearly more than an economic system and cannot solely be measured by harvest levels; it is the social foundation for many rural and Native communities. The Alaska Natives Commission report (1994) referenced subsistence surveys in 98 communities, and emphasized that virtually all of the meat, fish, and poultry annually consumed in half of the surveyed communities came from the harvest of wild resources. The report states that if subsistence resources are denied to subsistence-dependent communities, the result would be the deterioration of nutrition, public health, and social stability, primarily because the cost of buying, transporting, and storing imported replacements would be impossible for local people to bear over time. The long-term consequence would be the gradual erosion and disappearance of many rural communities through out-migration. In this way, subsistence is tied to the survival of human communities and cultures. This point is also made in Wolfe (2007), which states that "Changes in the salmon fisheries, such as decreases in subsistence and commercial harvests can have broad impacts on the local ways of life, including traditional cultures, local economies, personal identities, and societies."

Subsistence activities commonly involve an entire community. According to Wolfe (2007), "in the AYK region, salmon is harvested primarily within family groups…commonly men harvest and women process salmon for subsistence food, consumed within extended families and shared with others in the community." Subsistence Chinook salmon may be consumed directly by the person or family that harvests it, or may be distributed to other persons in the community. Many studies indicate that the traditional wide-scale sharing of subsistence products is a central activity that unifies extended families and communities. With reduced subsistence opportunities come fewer opportunities for young people to learn cultural subsistence practices and techniques, and this knowledge may be lost to them in the future. Wolfe (2007) provides more information on the relationship between salmon and culture in the AYK region.

Subsistence communities also appear to specialize by household, with a relatively small percentage (which researchers have called 'super-households') being extremely productive, harvesting most of their community's annual supplies and distributing them to less productive families. In western Alaska, entire families migrate seasonally to summer fishcamps. These annual migrations, and fishcamp life itself, are important elements of rural and cultural life (Wolfe 1987).

Extensive non-market sharing and exchange take place in communities with mixed subsistence economies. Through sharing, local communities' values are expressed and transmitted across generations. Salmon may be given or shared with other persons without the expectation that something specific will be given in exchange. Fish may be shared with family members or friends, in the region or outside of it. An example from Tanana: "…salmon is given to individual elders, elders' residences and people who do not have access or ability to fish. Almost all the fishermen interviewed stated that the first salmon caught were given away to share the taste of the first fish and bring luck to the fishermen." (Moncrieff, 2007)

Chinook salmon may also be exchanged for other goods. Trade of subsistence goods between communities has a long history in regional Native cultures. As Russians came into increasing contact with Natives on the Asian side of the Bering Straits several centuries ago, there was increasing trade in western manufactured goods and products, and increasing use of monetary sales as goods were exchanged. These processes continue today. An example from Holy Cross notes that Yukon River Chinook: "…is traded for a variety of items. Some people bring salmon or moose when they travel and give it as a gift to the family they stay with. One participant traded fish for pizza from another village: one pizza for one Chinook salmon, each valued at about $12. Others traded their salmon for Kuskokwim River fish, berries from the stores in Anchorage, berries from the other areas, or crafts or services. Trade relationships, active in the precontact era, continue to exist today." (Moncrieff, 2007)

Given the significance of the subsistence harvest in rural Alaska, subsistence use should also be viewed as having substantial economic value. Food costs and living expenses are high in rural Alaska. Materials have to be transported long distances with limited transportation and distribution infrastructures, consequently, these services are expensive. Small populations may not be able to support returns to scale in transportation, distribution, or storage, or support the large numbers of firms that would provide for competitive markets. The Cooperative Extension Service of the University of Alaska Fairbanks routinely surveys communities to gather information on living costs. In December 2007, it found that the cost of a week's worth of food in Bethel was 189 percent that of Anchorage. Food costs in other communities in the action area were also higher than in Anchorage. Costs in Kotzebue were 208 percent, costs in Naknek/King Salmon were 218 percent, and costs in Nome were 171 percent, that of Anchorage (UAF 2007).[18]

It is also important to understand that subsistence harvesting activity is not without cost, and that often a household's subsistence use is 'capitalized' by its cash income, since the efficient harvest of large amounts of fish cannot be accomplished without goods such as fishnets, motors, fuel, etc. So while many view the subsistence and cash economies as inversely related, subsistence is its own economic sector, highly significant to those who practice it, and fully co-existing with cash-market activities. Subsistence salmon harvesters often use the same or similar types of set and/or drift gillnets, boats, and other equipment as commercial harvesters. Some subsistence harvesters also participate in commercial salmon fisheries, and they depend on income earned in the commercial fisheries to help offset the costs, both of acquiring equipment and of operating it, associated with subsistence salmon fishing. While it appears that sufficient opportunities for subsistence harvests have occurred in most areas in many recent years, reductions in the commercial harvest may greatly affect the subsistence fishery, to the extent some households use commercial catch to meet the costs incurred in the subsistence fishery. Thus, if the commercial Chinook fishery is reduced, it can also reduce opportunities in the subsistence Chinook fishery. Wolfe (2003) provides a more complete discussion of the commercial and subsistence relationships.

3.3 Subsistence Harvests by Region

The majority of the information in this section is from the Alaska Subsistence Salmon Fisheries 2006 Annual Report (ADF&G 2009k) and the Alaska Subsistence Salmon Fisheries 2007 Annual Report

[18] http://www.uaf.edu/ces/fcs/2007q4data.pdf

(unpublished, ADF&G[19]), unless otherwise noted. Tables and figures from the most recent 2007 annual report, while unpublished to-date, are cited with permission of the ADF&G Subsistence Division. When available, more recent information on subsistence harvests (by personal communication with ADF&G) is provided. Note that EIS Chapter 5 contains the status of the Chinook salmon stocks through 2008. Additional recent information was provided through public comment on the DEIS and is incorporated in the following sections.

3.3.1 Overview of Regional Subsistence Harvests

The amount of Chinook salmon harvested for subsistence use and the portion of subsistence Chinook salmon harvested relative to other species of salmon varies greatly by region (Fig. 3-2). Fig. 3-3 reports subsistence Chinook harvests in 2007 (157,813 Chinook) by general harvest area. The largest estimated subsistence harvests of Chinook salmon in 2007 occurred in the Kuskokwim area (72,097 salmon; 45 percent), followed by the Yukon (55,292 salmon; 35 percent), Bristol Bay (15,444 salmon; 10 percent), Northwest (3,829 salmon; 2 percent), the Glennallen Subdistrict of the Prince William Sound Area (4,125 salmon; 3 percent), and the Chitina Subdistrict of the Prince William Sound Area (2,811 salmon; 2 percent). See Figure 1-1 of the Alaska Subsistence Salmon Fisheries 2006 Annual Report (p. 5) for a map of the Alaska subsistence areas.

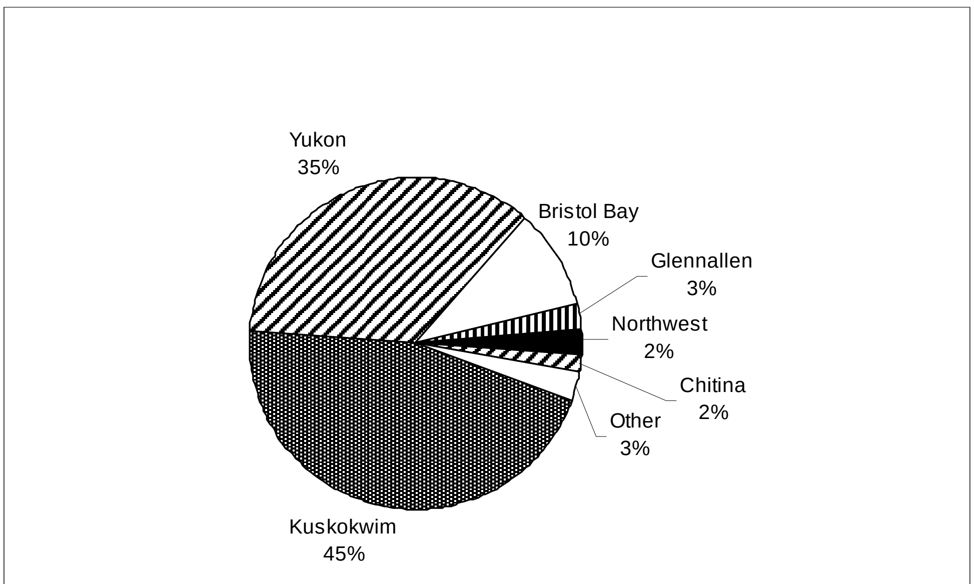


Fig. 3-2 Estimated subsistence Chinook salmon harvest by area, 2007
Source: The Alaska Subsistence Salmon Fisheries 2007 Annual Report (unpublished, ADF&G)

The estimated total subsistence harvest of all salmon in Alaska in 2007, based on annual harvest assessment programs, was 1,066,608 fish.[20] Fig. 3-3 reports subsistence salmon harvests in 2007 by

[19]Fall, J. A., C. Brown, M. F. Turek, N. Braem, J. J. Simon, W. E. Simeone, D. L. Holen, L. Naves, L. Hutchinson-Scarbrough, T. Lemons, V. Ciccone, T. M. Krieg, and D. Koster. (unpublished). Alaska Subsistence Salmon Fisheries 2007 Annual Report. ADF&G, Division of Subsistence, Technical Paper No. 346, Anchorage, AK.
[20] Note that personal use salmon harvests from Southeast Alaska, the Yukon Area, and the Chitina Subdistrict of the Upper Copper River are included in this statistic. Personal use fisheries that take place in nonsubsistence area of the Cook Inlet Management Area are not included. For background, see Chapter 1 of the Alaska Subsistence Salmon Fisheries 2006 Annual Report.

general harvest area. The largest estimated subsistence harvests of all salmon species in 2007 occurred in the Yukon area (271,618 salmon; 28 percent), followed by Kuskokwim (187,502 salmon; 19 percent), the Chitina Subdistrict of the Prince William Sound Area (135,133 salmon; 13 percent), Bristol Bay (124,679 salmon; 12 percent), the Glennallen Subdistrict of the Prince William Sound Area (91,110 salmon; 9 percent), and the Northwest (74,312 salmon; 7 percent).

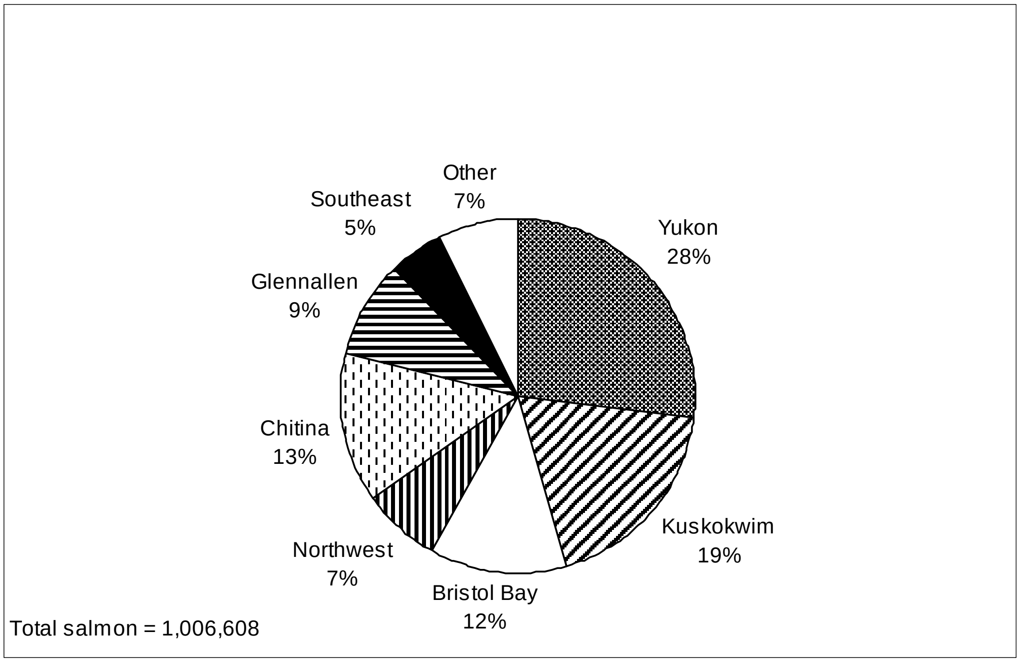


Fig. 3-3 Estimated subsistence salmon harvest by area, 2007
Source: The Alaska Subsistence Salmon Fisheries 2007 Annual Report (unpublished, ADF&G)

See Fig. 3-4 below for the 2007 estimated subsistence salmon harvest by species. The estimated statewide subsistence harvest by species was as follows in 2007: 459,372 sockeye (46 percent), 273,951 chum (27 percent), 157,813 Chinook (16 percent), 80,685 coho (8 percent), and 34,787 pink salmon (4 percent) (ADF&G 2009k).

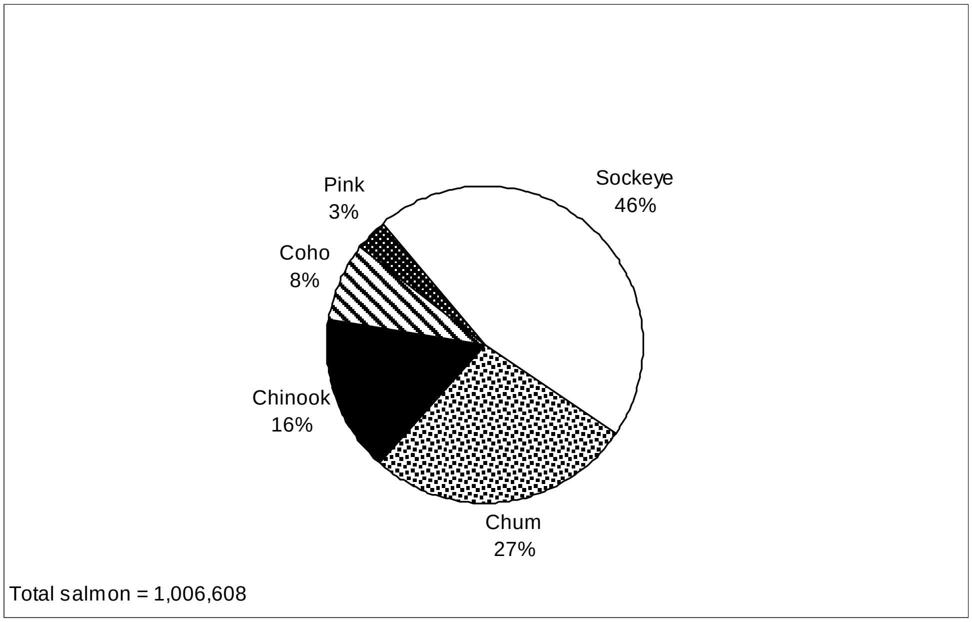


Fig. 3-4 Estimated subsistence salmon harvest by species, 2007
Source: The Alaska Subsistence Salmon Fisheries 2007 Annual Report (unpublished, ADF&G)

Table 2-2 (pp. 10 – 15) of the Alaska Subsistence Salmon Fisheries 2006 Annual Report reports subsistence harvests in 2006 by species and place of residence of participants, including total harvests from all subsistence fisheries combined. The same type of table will be provided (Table 2-2) in the Alaska Subsistence Salmon Fisheries 2007 Annual Report, once the report is published by ADF&G. Note that the 2007 Annual Report's estimates of subsistence takes of Chinook, chum, sockeye, coho, and other salmon, by community, are provided in this document under the sub-section for each region.

The figure below summarizes historical estimates of subsistence harvest of Chinook, chum, and other salmon, by subsistence harvest area for the years in which data are available. The data provided are through 2007, with the exception of the Kotzebue area.[21] In addition, the following list contains some primary points regarding regional significance:

- Chinook salmon appears to be of relatively limited importance in subsistence harvests north of Cape Prince of Wales in Kotzebue Sound and on Alaska's North Slope. Chinook salmon also appears to be of relatively limited importance along the Alaska Peninsula and Aleutians. Chinook did not appear to comprise more than 1 percent of subsistence harvests in Kotzebue between 1994 and 2004, no more than 3 percent on the Alaska Peninsula between 1985 and 2005, and to be almost 0 percent in the Aleutians in the same period. For simplicity, these areas are not included in the figure below.

- The Norton Sound region includes the Port Clarence and Norton Sound Districts. In this region, subsistence salmon harvests are dominated by chum salmon. For the district as a whole, Chinook accounted for between 4 percent and 11 percent of the subsistence salmon harvested between 1994 and 2007. Chinook were more important in the region's more southerly Norton Sound District, where they accounted for between 4 percent and 11 percent of the salmon caught; in the

[21] Information from the Alaska Subsistence Salmon Fisheries 2007 Annual Report (unpublished, ADF&G).

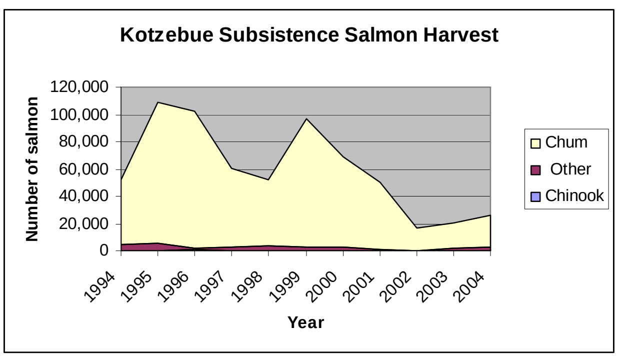
more northerly Port Clarence District they accounted for between 0 percent and 2 percent of the salmon caught.

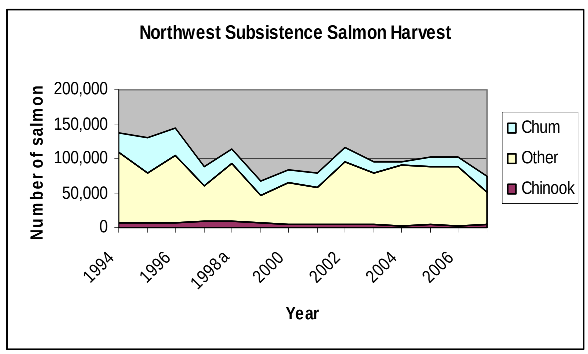
- Chinook salmon are clearly a key species on the Yukon River. More summer and fall chum salmon are harvested, but Chinook currently account for 20 percent to 25 percent of the number of fish harvested. Prior to the large declines in the chum harvests in the early 1990s, Chinook accounted for a significantly smaller proportion of the harvest: from 6 percent to 13 percent. However, the count of each type of salmon does not account for other important considerations, including the relative size, flavor, drying qualities, and social and cultural significance.

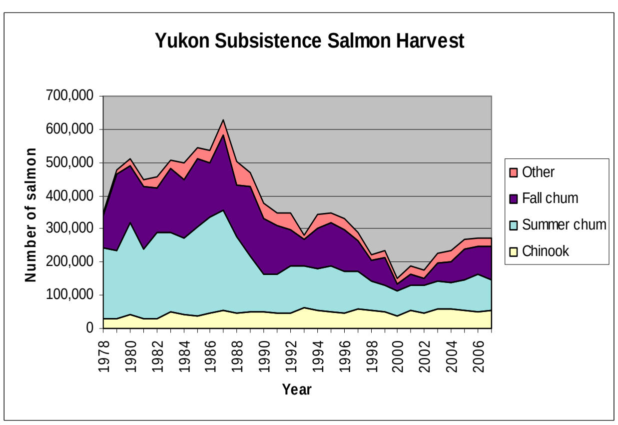
- Chinook salmon are also clearly an important subsistence species in the Kuskokwim River region. Between 1989 and 2007, Chinook accounted for between 26 percent and 43 percent of the annual subsistence salmon harvest.

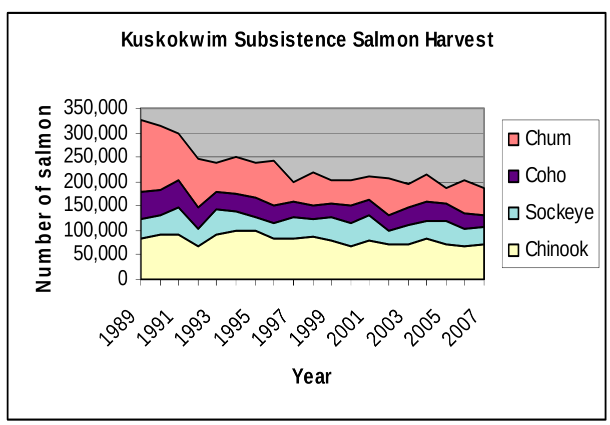
- Chinook salmon are important in the Bristol Bay region, although they represent a lower percentage of the total salmon harvest in the area because such a large portion of the subsistence harvest is sockeye salmon in the Kvichak drainage, where there are no Chinook salmon. In districts where both sockeye and Chinook are available (Togiak, Naknek, and Nushagak), Chinook comprise a higher percentage of the total, and in some years in the Nushagak may exceed sockeye when harvests are measured in pounds (James Fall, ADF&G Subsistence Division, personal communication). Since 1993, Chinook harvests have ranged between 9 percent and 16 percent of subsistence harvests; before that, from 1983 to 1993, they ranged between 5 percent and 9 percent.

- Chinook salmon are the first salmon to arrive in the spring, which is key to their importance for subsistence.









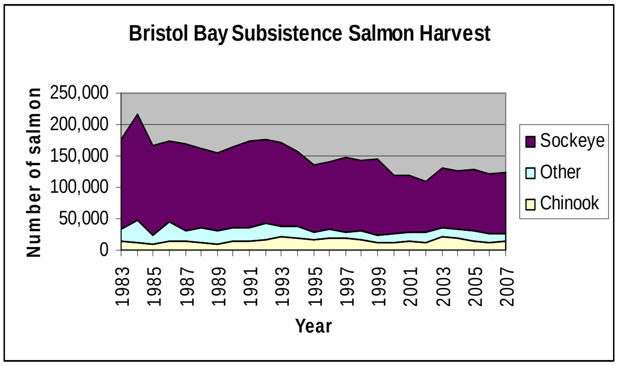


Fig. 3-5 Estimated subsistence harvests of Chinook, chum, and other salmon, by key management regions

Source: The Alaska Subsistence Salmon Fisheries 2007 Annual Report (unpublished, ADF&G)

3.3.2 Northwest (Norton Sound and Port Clarence)

According to the Alaska Subsistence Salmon Fisheries 2006 Annual Report (ADF&G 2009):

Subsistence salmon fishing has been a major feature of life in this region for centuries. Even in the early twenty-first century, most residents in the region continue to participate in a mixed subsistence-cash economy, and to depend on wild foods for cultural and nutritional sustenance. 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 salmon species district wide; Chinook and coho salmon are present throughout, but more common in eastern and southern Norton Sound. Sockeye salmon are found in a few Seward Peninsula streams.

As stated previously, many individuals and organizations provided written comment letters and testified to the Council during the development of the EIS and RIR, on their dependence on Chinook salmon. These comments are part of the administrative record and considered during decision making. One example of public comment received from the Kawerak, Inc. (p. 1) follows

The people of the Bering Strait/Norton Sound region depend on the salmon they harvest and put away each year. Salmon is a healthy, fresh food and teaching the traditional methods for food production is a time honored way to involve our children.[22]

According to ADF&G, Unalakleet River Chinook salmon runs have declined precipitously since 2000. Escapement goals have only been reached once since 2003. Additionally, early closures to the Chinook salmon subsistence fishery have occurred in five of the previous six years. The 2008 escapement and subsistence harvests were the lowest on record. Unalakleet River Chinook salmon were designated a stock of yield concern in 2004 by the Alaska Board of Fisheries (BOF), and the BOF continued this designation in 2007. In an effort to further conserve Chinook salmon and restore the stock to historical yield levels, the BOF adopted a new management plan (5 AAC 04.395) that incorporates a more restrictive subsistence fishing schedule. Prior to 2007, subsistence fishing was open continuously in the

[22] Letter from L. Bullard, President, Kawerak, Inc., to D. Mecum, Acting Administrator, AK Region, NMFS. Comment letter 12, January 30, 2009.

marine waters and in river subsistence fishing was only closed for 36 hours a week. Under the newly adopted plan, subsistence fishing from June 15 to July 15 in the Unalakleet Subdistrict is limited to two 48-hour periods per week in the marine waters, and two 36-hour periods per week in the Unalakleet River. The new management plan also directs ADF&G to close the fishery if it is projected that the lower end of the North River tower-based sustainable escapement goal range (1,200 - 2,600 fish) will not be reached. Prior to 2007, management biologists implemented restrictions and/or early closures based on test fishery catches and tower counts. Since 2007, subsistence fishery catch rates in conjunction with Chinook passage estimates have been used to evaluate run strength inseason. (Scott Kent, ADF&G, personal communication).

Magdanz et al. (2005) reviewed several studies of subsistence consumption for the Norton Sound and Port Clarence areas. Average per capita consumption of subsistence foods was on the order of 600 pounds per year in some communities. Salmon accounted for a significant part of this, with weights ranging from about 100 pounds to 160 pounds per capita, depending on the study. One analysis of dietary sources of meat and fished showed that 75 percent was derived from subsistence sources and 25 percent from store-bought meats (Fig. 3-6). A third of the meat and fish was salmon, and the remainder was from land or marine mammals, or other fish. In the Northwest region, Chinook salmon accounted for 3 percent of meat and fish consumption, while chum salmon accounted for about 6 percent (Magdanz et al. 2005).[23]

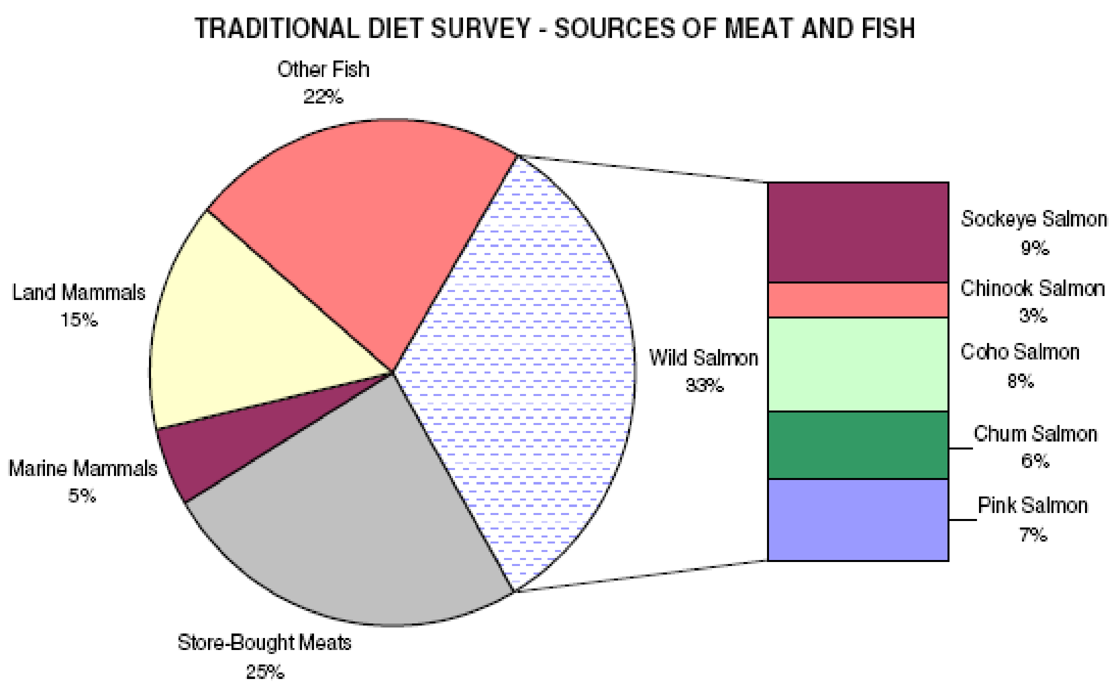


Fig. 3-6 Results of a traditional diet of meat and fish survey in the Norton Sound and Port Clarence Districts

Source: Magdanz et al. 2005, citing Ballew et al. 2004[24]

Estimated subsistence salmon harvests from 1994 through 2003 trended lower by 5.8 percent annually. Most of the declines occurred during the first five years (1994 - 1998), when harvests trended lower by about 8 percent annually. During the latter years (1999 - 2003), harvests trended lower by about 1 percent

[23] http://www.subsistence.adfg.state.ak.us/TechPap/tp294.pdf, p. 25
[24] http://www.subsistence.adfg.state.ak.us/TechPap/tp294.pdf, p. 25

annually across all communities. While harvests appeared to have stabilized in the latter years, it would not be correct to characterize the overall situation as improving, at least through 2003. For half of the study communities, the lowest estimated harvests occurred in 2003.

Despite variation in household harvests, there were harvest patterns that might be used to refine estimation and prediction. Through many different levels of abundance, through a decade of varied weather, with harvests ranging from 67,000 to 140,000 salmon, each year about 23 percent (range varies from 21.8 percent to 24.6 percent) of the households harvested 70 percent of the salmon, by weight. Predictable patterns were also apparent in the harvests by the age and gender of household heads (Magdenz 2005).

Unpublished information from the Alaska Subsistence Salmon Fisheries 2007 Annual Report provides the estimated subsistence salmon harvests by the three districts in Northwest Alaska, from 1994 – 2007 (upon publication, refer to Table 3-2 in that report).[25] Subsistence salmon harvests in 2007, by community and species in the Northwest region, are provided below in Table 3-1.

Table 3-1 Subsistence salmon harvests by community, Northwest Alaska, 2007

	HOUSEHOLDS or PERMITS		ESTIMATED SALMON HARVEST[a]					
Community[b]	Total	Surveyed or returned	Chinook	Sockeye	Coho	Chum	Pink	Total
Shaktoolik	68	60	515	28	1,443	465	2,708	5,158
St Michaels	115	103	452	9	622	2,119	265	3,467
Stebbins	136	117	743	0	2,006	4,980	1,881	9,609
Unalakleet	219	212	1,569	253	4,916	1,117	10,288	18,143
Brevig Mission	45	44	40	2,385	354	1,620	773	5,172
Elim	59	59	260	0	2,271	2,307	1,735	6,573
Fairbanks	2	2	0	0	0	0	0	0
Golovin	41	41	87	158	422	659	1,799	3,125
Nome	329	328	47	6,176	1,618	4,709	1,120	13,670
Teller	54	54	16	1,184	93	2,307	592	4,192
White Mountain	54	53	101	214	524	2,342	2,022	5,203
TOTAL	1,122	1,073	3,829	10,407	14,269	22,624	23,182	74,312

Source: ADF&G Division of Subsistence, ASFDB 2008 (ADF&G 2008).

a. Includes subsistence harvests and commercial harvests retained for home use.

b. Harvest information from residents of non-local communities (e.g. Anchorage) is available only for Norton Sound and Port Clarence permit areas. Non-local residents might subsistence fish in other northwest Alaska areas, but these harvests are not documented in the regional household surveys.

Note: The Kotzebue area is not included in this table because data were not collected.

Source: The Alaska Subsistence Salmon Fisheries 2007 Annual Report (unpublished, ADF&G).

The estimated 2007 subsistence harvest of salmon by study communities in the Norton Sound and Port Clarence Districts was 74,312 salmon, with 3,829 being Chinook. This was down from the 5-year average of over 116,000 salmon and 4,467 Chinook. Chinook harvests have remained at between 3,000 and 4,000 annually for the most recent four years in which data are available (2003 – 2007), but are down from previous years, in which Chinook harvest ranged from a high of over 9,000 in 1997 to a low of 3,431 in 2006. Note that there was a strong coho return in 2005, and above average runs of chum and pinks. The Chinook run was poor (Menard 2005:1). Fig. 3-7 and Fig. 3-8 show the species composition of the total subsistence salmon in 2007 for the Norton Sound and Port Clarence Districts, respectively. Very little of the documented subsistence salmon harvest was taken by residents from outside the district.

[25] Alaska subsistence salmon fisheries 2007 annual report. 2009. Alaska Department of Fish and Game Division of Subsistence Technical Paper No. 346, Anchorage (unpublished).

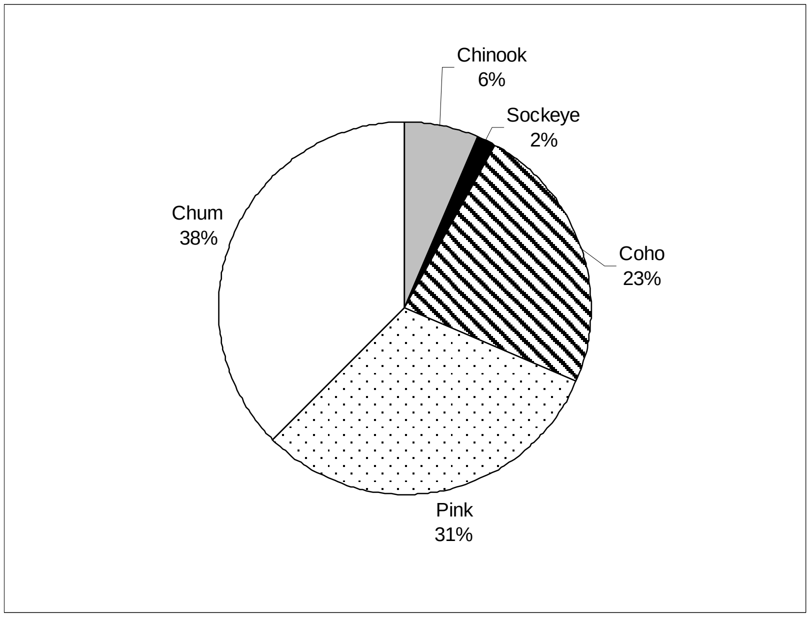


Fig. 3-7 Species composition of 2007 estimated subsistence salmon harvests, Norton Sound District
Source: The Alaska Subsistence Salmon Fisheries 2007 Annual Report (unpublished, ADF&G)

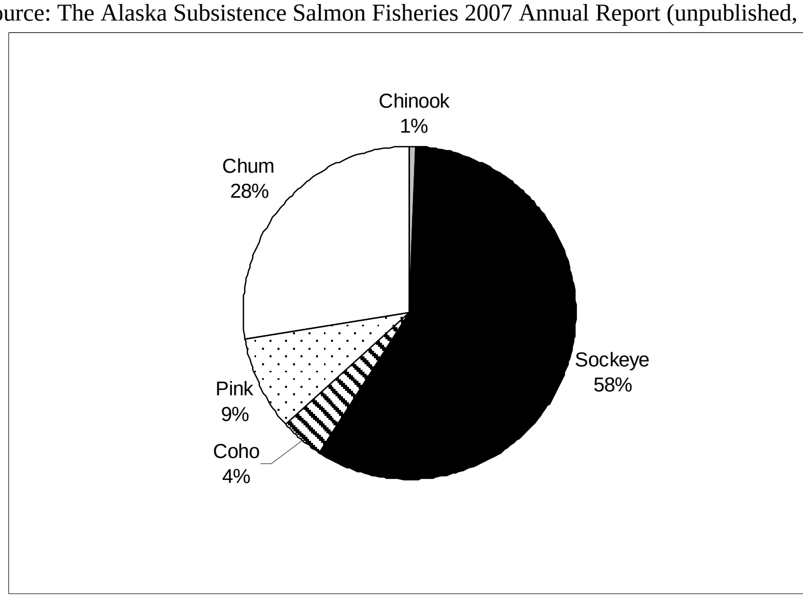


Fig. 3-8 Species composition of 2007 estimated subsistence salmon harvests, Port Clarence District
Source: The Alaska Subsistence Salmon Fisheries 2007 Annual Report (unpublished, ADF&G)

3.3.3 Yukon

According to the Alaska Subsistence Salmon Fisheries 2006 Annual Report (ADF&G 2009k):

> *Residents of the Yukon River drainage have long relied on fish for human food and other subsistence uses. While non-salmon fish species provide an important component of the overall fish harvest (Andersen et al., 2004; Brown et al., 2005a), salmon comprises the bulk of the fish harvested for subsistence. Chinook, summer and fall chum, 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 where commercial harvests predominate, subsistence salmon harvests within the Yukon drainage often exceed commercial, sport, and personal use harvests combined.* (p. 35)

Drift gillnets, set gillnets, and fish wheels are used by Yukon Area fishers to harvest the majority of salmon. Set gillnets are utilized throughout the Yukon Area, 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 18 miles below Galena). Fish wheels are a legal subsistence or non-commercial gear type throughout the Yukon drainage, although due to river conditions and the availability of wood, they are used almost exclusively on the upper Yukon and Tanana rivers.

Depending on the area of the Yukon River drainage and run timing of different salmon species, subsistence fishing occurs from late May through early October. Fishing activities are either based 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 use.

The majority of the subsistence salmon harvest is preserved for later use by freezing, drying, or smoking, while the head, cutting scraps, and viscera are often fed to dogs. Chinook salmon are harvested and processed primarily for human consumption, although those fish deemed not suitable for human consumption due to presence of the fungus *Ichthyophonus hoferi* or some other disease or disfigurement are often fed to dogs. Small (jacks) Chinook salmon or spawned out fish may also be fed to dogs. In addition, while chum and coho salmon are primarily taken for human consumption, relatively large numbers are harvested and processed to feed sled dogs. Fall chum and coho salmon typically arrive in the upper portion of the drainage late in the season, coincident with freezing weather, allowing fish to be “cribbed” for use as dog food. This method involves the natural freezing of whole (un-cut) fish. The practice of keeping sled dogs is much more common in communities along the upper Yukon Area than in the lower river communities.

Walker et al (1989) state the following:

> *Salmon fishing occurs from late May through October, although this varies throughout the drainage. Fishing activities are based either from a fish camp or the home village, however, the degree to which one or the other is more prevalent has varied from community to community. Some people from communities not situated along the Yukon River operated fish camps along it, and these have included Birch Creek, Venetie, and some residents of Chalkyitsik. Subsistence salmon fishing was often undertaken by extended family groups representing two or several households in a community. These groups, as well as members of individual households, cooperated to harvest, cut, dry, smoke, and store salmon for subsistence use. Many people who fished for subsistence also operated as commercial fishermen in districts where commercial fishing has been allowed and families had a member with a Commercial Fisheries Entry Commission (CFEC) permit.* (p. 3.)

In 2007, 1,495 households (53 percent of the total households in Districts 1 - 5) provided harvest data for the Yukon Area subsistence/personal use salmon fishery.[26] A summary of the 2007 subsistence salmon harvest estimates by community is provided in the Alaska Subsistence Salmon Fisheries 2007 Annual

[26]Alaska subsistence salmon fisheries 2007 annual report. 2009. Alaska Department of Fish and Game Division of Subsistence Technical Paper No. 346, Anchorage (unpublished).

Report (Table 4-2, ADF&G, unpublished). As with the other regions, these are the most recent data available. This table is provided below as Table 3-2.

As stated previously, many individuals and organizations provided written comment letters and testified to the Council during the development of the EIS, both on their dependence on Chinook salmon and the relative declines they are experiencing in the Yukon River drainage area. Again, these comments are part of the administrative record and considered during decision making. One example of public comment received from the Yukon River Drainage Fisheries Association (p. 2) follows:

> *The weak Chinook salmon run of 2008 has already created problems of crisis proportions along the Yukon River. While subsistence restrictions limited the amount of food available for the winter, the lack of a commercial Chinook fishery cut off one of the only sources of income for many Yukon River residents. Cold winter temperatures and high fuel prices have made the lack of commercial fishery income even more drastic this season. The promise of the same or worse Chinook salmon return in 2009 is no comfort.*

Another example from public comment from the Alakanuk Tribal Council (pg. 1) explains the existing conditions of subsistence on the Yukon River as follows:

> *The high salmon bycatch numbers of recent years in the pollock fishery threaten our salmon and our way of life. Salmon serves an important cultural and economic role in my community and throughout western Alaska. Salmon provides a primary source of food for us, and the commercial salmon harvest provides the only means of income for many who live in the remote villages of the Yukon River. Salmon is an irreplaceable resource that must be protected by all means. Once again the lower Yukon River villages will be carrying the burden of conservation, even though the cause of salmon decline is not the result of subsistence users along the river. To our understanding, there may not be enough Chinook salmon for subsistence users this coming summer.*[27]

The estimated 2007 subsistence/personal use salmon harvest for the entire Yukon Area broken down by species includes: 55,292 Chinook (20 percent), 93,075 summer chum (34 percent), 99,120 fall chum (37 percent), 22,013 coho (8 percent), and 2,118 pink (1 percent), for a total estimate of 271,618 salmon (Fig. 3-9). (The Alaska Subsistence Salmon Fisheries 2007 Annual Report notes that 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 use, and fish distributed from ADF&G test fisheries.)

[27]Letter from B. Phillip, President, Alakanuk Tribal Council to R. Mecum, Acting Administrator, AK Region, NMFS. Comment letter 5, January 23, 2009.

Table 3-2 Estimated subsistence salmon harvests by community, Yukon area, 2007

	HOUSEHOLDS or PERMITS		ESTIMATED SALMON HARVEST[a]					
Community	Total	Surveyed or returned	Chinook	Summer chum	Fall chum	Coho	Pink	Total
Alakanuk	125	54	1,257	7,611	1,348	857	32	11,105
Alatna	10	6	0	11	7	0	0	18
Allakaket	38	36	53	3,451	939	66	0	4,509
Anvik	34	29	1,321	5,250	429	807	0	7,807
Beaver	29	19	1,244	41	354	354	0	1,993
Bettles	24	11	0	0	0	0	0	0
Birch Creek	18	6	113	0	0	0	0	113
Central	10	10	334	0	0	0	0	334
Chalkyitsik	30	22	0	0	213	0	0	213
Circle	12	11	1,057	200	1,286	0	0	2,543
Eagle	37	36	1,999	15	18,676	0	0	20,690
Emmonak	156	89	2,326	9,256	2,360	1,032	51	15,025
Fairbanks	280	260	3,031	958	5,606	770	0	10,365
Fort Yukon	150	53	4,076	2,365	6,010	2,821	0	15,272
Galena	148	44	2,511	571	1,471	425	0	4,978
Grayling	48	14	1,500	641	317	271	0	2,729
Healy	9	8	0	0	1,090	1,463	0	2,553
Holy Cross	60	36	2,902	320	248	213	0	3,683
Hooper Bay	196	63	430	12,234	64	26	113	12,867
Hughes	29	18	8	1,213	0	100	0	1,321
Huslia	69	30	146	3,243	272	592	0	4,253
Kaltag	60	19	1,456	109	910	204	0	2,679
Kotlik	98	43	1,569	5,017	530	284	129	7,529
Koyukuk	35	23	811	995	927	189	0	2,922
Manley Hot Springs	14	14	333	140	3,419	1,126	0	5,018
Marshall	71	30	2,555	3,070	789	922	0	7,336
Minto	39	36	82	82	155	155	0	474
Mountain Village	146	60	2,077	8,104	1,073	1,027	87	12,368
Nenana	36	35	899	1,429	21,863	4,487	0	28,678
Nulato	86	30	2,431	356	1,345	130	0	4,262
Nunam Iqua (Sheldon Point)	35	25	907	2,325	152	92	170	3,646
Pilot Station	102	45	2,028	3,711	741	263	0	6,743
Pitka's Point	27	19	320	515	44	38	66	983
Rampart	4	2	250	25	250	50	0	575
Ruby	57	22	1,594	416	1,959	168	0	4,137
Russian Mission	57	19	1,301	759	530	259	3	2,852
Saint Marys	127	59	3,573	8,107	825	97	32	12,634
Scammon Bay	74	31	768	3,887	170	84	1,435	6,344
Shageluk	41	18	448	977	147	267	0	1,839
Stevens Village	31	25	610	254	199	0	0	1,063
Tanana	99	48	5,498	5,229	21,596	2,369	0	34,692
Venetie	49	19	1,002	107	721	0	0	1,830
Other Communities	19	18	472	81	85	5	0	643
TOTAL	2,819	1,495	55,292	93,075	99,120	22,013	2,118	271,618

Source ADF&G Division of Commercial Fisheries Regional Information Report: Subsistence and Personal Use Salmon Harvests in the Alaska Portion of the Yukon River Drainage, 2007, Tables 1, 3, 7, and 11. Preliminary results as of February 27, 2009.

a. Includes subsistence harvests, personal use harvests, commercial harvests retained for home use, and fish distributed from ADF&G test fisheries.

Source: The Alaska Subsistence Salmon Fisheries 2007 Annual Report (unpublished, ADF&G).

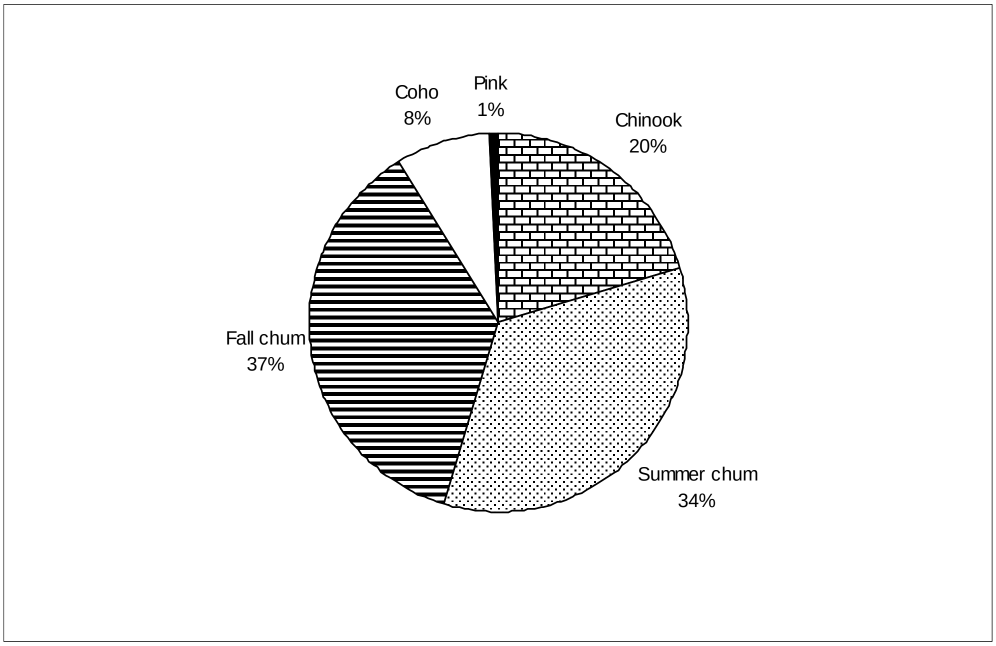


Fig. 3-9 Species composition of 2007 estimated subsistence salmon harvests, Yukon District
Source: The Alaska Subsistence Salmon Fisheries 2007 Annual Report (unpublished, ADF&G)

According to ADF&G, as a result of production rates below expectations of Chinook salmon returning to the Yukon River, the BOF classified the Yukon River Chinook salmon stock as a yield concern. With that, the Board modified the Chinook salmon management plan to a more conservative approach early in the season when run assessment is less certain. Management is still based on inseason assessment, but subsistence fishing opportunity was restricted to fishing windowed periods to spread harvest and reduce risk until the run progresses further, when it can be better assessed. The subsistence fishery would then be regulated as appropriate based on the assessed strength of the run inseason with less reliance on the preseason projection.

In 2001, significant subsistence fishing time reductions were implemented, with no directed commercial Chinook fishing. Since then, subsistence fishing windows have been in place early in the season and were eventually removed when available surpluses were substantiated by in-river assessment. In some instances, actual subsistence fishing time was increased when inclement weather and fishing conditions hindered fishing efforts. In 2008, the subsistence fishery began the season on the windowed fishing scheduled. Assessment indicated the king run was low and dictated management to take actions to further conserve the stock. Subsistence fishing times were reduced to 50 percent throughout the drainage during the peak of the run and gillnet mesh size was restricted to a maximum of 6 inches in the lower river subsistence fishery to provide an opportunity to target summer chum while conserving additional king salmon. Management is still escapement goal based, but the resulting management actions have become more conservative due to the observed decline in Yukon River Chinook salmon production rates, which has resulted in more structured and restricted subsistence fishing opportunity in recent years.[28]

The windowed schedule is intended to fulfill several goals: 1) increase the quality of escapement, 2) distribute subsistence opportunity among users during years with no commercial fishing, and 3) reduce the impact of harvest on any one stock by spreading the harvest throughout the run, thereby providing

[28]Fredrick Bue, ADF&G, personal communication, 2009.

windows of time that salmon may migrate upriver with reduced exploitation. The schedule is based on past fishing schedules and is initiated each year based on the historical average run timing entry into the Yukon River for Chinook salmon. Once initiated, the schedule is implemented chronologically upriver. ADF&G administers the schedule, with the intent to provide reasonable opportunity for subsistence users to achieve their harvest goals when salmon runs are below average.[29]

Since the extremely low harvest levels in 2000 (152,300 total salmon), subsistence Chinook and coho salmon harvests have unsteadily increased while fall chum salmon harvests have rebounded significantly. The 2007 harvest estimates registered above the recent 5-year and 10-year averages for all species, except coho and pink salmon (the coho salmon harvest estimate was 796 fish below the 5-year average). Nonetheless, while summer chum and fall chum salmon estimated harvests are increasing, they continue to show considerable declines compared to harvests averaged for the last two decades. Note, however, that the ADF&G Alaska Subsistence Salmon Fisheries Annual Report, which provides these statistics, is only available through 2007.

Finally, note that in 1993, the BOF made a positive finding for Customary and Traditional Use for all salmon in the Yukon-Northern Area. The ‘Amount Reasonably Necessary for Subsistence Use’ determination (ANS) was established at 348,000 - 503,000 salmon for all species combined. Since 1990, the overall total subsistence salmon harvest in the Yukon Area has declined by approximately 30 percent. Under this regime, 1992 marked the last year when total subsistence salmon harvests fell within the combined ANS range. In 2001, the BOF broke this figure down by species. A species-specific ANS range provides one index for measuring the extent to which reasonable opportunity was provided in the subsistence fishery. Harvests below the lower bound of the ANS range may indicate, with other evidence such as poor runs and fishing restrictions, that there was not a reasonable opportunity for subsistence uses during the previous season. Harvests consistently lower than the lower bound of the ANS are an indication to the BOF to consider whether additional management actions are necessary to provide reasonable subsistence opportunities (ADF&G 2009k). In the years 1998, and 2000 to 2003, reduced fishing times or fishery closures were implemented during summer or fall or both seasons due poor or weak runs. Hence, opportunity was reduced to allow for escapement.[30] As stated previously, further restrictions were implemented in 2008, and additional restrictions in 2009.

According to ADF&G, the following management measures were implemented:

- 1998 – Subsistence schedule reduce on upper Yukon and Tanana rivers fall season, Personal Use was closed
- 2000 – Subsistence schedule initially reduced, Personal Use closed, then subsistence closed for fall season drainage-wide. WF gear restriction 4 inch mesh or less gillnets
- 2001 – Subsistence schedule reduced then closed late summer season, early fall season, then opened in all districts. Personal Use closed part of summer and all of fall season.
- 2002 – Subsistence closures early portion and then reduced schedule during fall season in all districts. Personal use closures most of fall season.
- 2003 – Subsistence reduced schedule early portion of fall season on Yukon except Tanana River
- 2008 – Windowed subsistence fishing schedule, due to indications that run was low. Subsistence fishing times were reduced to 50 percent throughout the drainage during the peak of the run and gillnet mesh size was restricted to a maximum of 6 inches in the lower river subsistence fishery.
- 2009 – Summer season subsistence schedule reduced: subsistence fishing windows cut in half and complete closure on first pulse of Chinook salmon for entire river; reduction to 6-inch mesh for Y-1, Y-2, and Y-3.

[29]Caroline Brown, ADF&G, personal communication, 7/8/09.
[30]William H. Busher, ADF&G, personal communication, 2009.

See Table 3-3 for a comparison of ANS ranges and recent years' subsistence salmon harvests.[31] Note that 2005 marked the first year that the harvests of all species were within their respective ANS ranges. In 2006, both fall chum and coho salmon fell below their ANS ranges. All species were above their ANS ranges again in 2007.

Table 3-3 Comparison of amounts necessary for subsistence (ANS) and estimated subsistence salmon harvests, Yukon Area, 1998 - 2007

	Chinook	Summer Chum	Fall Chum	Coho
ANS Range	45,500-66,704	83,500-142,192	89,500-167,900	20,500-51,980
Year	Estimated Number of Subsistence Salmon Harvested[a]			
1998	52,910	**81,858**	**59,603**	**16,606**
1999	50,711	**79,348**	**84,203**	**20,122**
2000	**33,896**	**72,807**	**15,152**	**11,853**
2001	53,462	**68,544**	**32,135**	21,977
2002	**42,117**	**79,066**	**17,908**	**15,619**
2003	55,221	**78,664**	**53,829**	22,838
2004	55,102	**74,532**	**61,895**	24,190
2005	53,409	93,259	91,534	27,250
2006	48,593	115,093	**83,987**	**19,706**
2007	55,156	92,891	98,947	21,878

Source: ADF&G Division of Commercial Fisheries Regional Information Report: Subsistence and Personal Use Salmon Harvests in the Alaska Portion of the Yukon River Drainage, 2007, Appendices B1-B4. Preliminary results as of February 27, 2009.

a. Estimates for 1998-2004 do not include personal use harvests, ADF&G test fishery distributions, or salmon removed from commercial harvests. Estimates for 2005-2007 include test fishery distributions because the amounts necessary for subsistence (ANS) are based on harvests from 1990-1999 and included test fishery distribution. **Bold underlined** cells indicate harvest amounts are below the minimum ANS.

Table Source: Alaska Subsistence Salmon Fisheries 2007 Annual Report (unpublished, ADF&G).

3.3.4 Kuskokwim

According to the Alaska Subsistence Salmon Fisheries 2006 Annual Report (ADF&G 2009k):

> *The Kuskokwim area subsistence salmon fishery is one of the largest in the state. From June through August, the daily activities of many Kuskokwim area households revolve around harvesting, processing, and preserving salmon 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. Division of Subsistence studies in the region indicate that fish contribute as much as 85 percent of the total wild resource harvest (in pounds) in a community, and salmon contribute as much as 53 percent of the total annual fish harvest (Coffing 1991). The per capita harvest of salmon for subsistence uses is up to 650 lbs in some Kuskokwim River communities. (p. 49)*

Walker and Coffing (Subsistence Salmon Harvests in the Kuskokwim Area During 1989)[32] state the following:

> *The harvest of salmon in the Kuskokwim Area has been and continues to be important both in the subsistence economy and also in the market economy. Subsistence and commercial*

[31] Alaska Subsistence Salmon Fisheries 2007 Annual Report (unpublished, ADF&G).
[32] http://www.subsistence.adfg.state.ak.us/TechPap/tp189.pdf

> *fishermen, often the same individuals, share a real interest in the maintenance of the sustained yield of salmon stocks in the Kuskokwim Area.*
>
> *Communities which depend upon the harvest of salmon for subsistence are situated throughout the Kuskokwim River drainage, along Kuskokwim Bay, and along the Bering Sea coast. In 1989, there were over 3,400 households in these communities, most of which use salmon for subsistence. Although not all households actively participated in harvesting salmon, many were directly involved in cutting and processing the fish and in distributing the finished products to other households.* (p. 58)

For the 15-year period from 1989 through 2003, an estimated annual average of 1,443 households participated in the Kuskokwim area subsistence salmon fishery (Simon et al. 2007). In 2006, approximately 920 Kuskokwim area households participated in subsistence salmon fishing. Many households not directly involved in catching salmon assist family and friends with cutting, drying, smoking, and associated preservation activities (salting, canning, and freezing). Annual subsistence surveys are aimed at gathering harvest data on Chinook, chum, sockeye, and coho salmon.

There are 38 communities consisting of approximately 4,657 households within the Kuskokwim area in 2006. The majority (76 percent) of the households are situated within the Kuskokwim River drainage. Bethel is the largest community in the region, consisting of approximately 1,768 households in 2006. The north Kuskokwim Bay communities of Kwigillingok, Kongiganak, and Kipnuk are comprised of about 362 households. North Kuskokwim Bay subsistence fishers harvest salmon in the Kuskokwim River as well as from areas closer to their communities. Residents of Quinhagak, Goodnews Bay, and Platinum, located along the south shore of Kuskokwim Bay (approximately 230 households), harvest salmon primarily from the Kanektok, Arolik, and Goodnews river drainages. The Bering Sea coast communities of Mekoryuk (on Nunivak Island), Newtok, Tununak, Toksook Bay, Nightmute, and Chefornak are composed of approximately 505 households. Subsistence users from these communities harvest salmon from coastal waters as well as area tributaries (ADF&G 2009k).

A summary of the 2007 subsistence salmon harvest estimates by community, fishing area, and species is provided in the Alaska Subsistence Salmon Fisheries 2007 Annual Report (Table 5-2, ADF&G, unpublished). As with the other regions, these are the most recent data available. This table is provided below as Table 3-4.

Table 3-4 Subsistence salmon harvests by community, Kuskokwim Area, 2007[1]

	Households							Total
	Total	Contacted	Chinook	Chum	Sockeye	Coho	Pink	Salmon
Kipnuk[3]	175	0	--	--	--	--	--	--
Kwigillingok[3]	95	0	--	--	--	--	--	--
Kongiganak[3]	92	0	--	--	--	--	--	--
N. KUSKOKWIM BAY	362	0	--	--	--	--	--	
Tuntutuliak	87	45	3295	2421	1374	443	7	7540
Eek	78	2	110	130	16	0	0	256
Kasigluk[3]	129	0	--	--	--	--	--	--
Nunapitchuk	112	65	4664	6588	2124	1765	11	15152
Atmautluak[3]	63	36	1364	1802	828	361	16	4372
Napakiak	100	53	2318	2537	1152	906	0	6913
Napaskiak	90	47	4965	2489	1346	521	0	9320
Oscarville	16	10	1048	725	537	134	0	2444
Bethel	1768	444	29548	15836	13556	12787	383	72110
Kwethluk	167	97	4924	4517	2630	1186	63	13320
Akiachak	139	86	7021	4407	2896	2167	672	17164
Akiak	79	48	3463	3435	3107	1089	16	11109
Tuluksak[3]	88	0	--	--	--	--	--	--
LOWER KUSKOKWIM	2916	933	62721	44887	29567	21359	1168	159701
Lower Kalskag	83	57	1043	1461	531	337	0	3372
Kalskag (Upper)	30	11	407	95	128	107	0	737
Aniak	161	126	2737	3391	953	2435	20	9537
Chuathbaluk	36	2	147	123	41	47	0	358
MIDDLE KUSKOKWIM	310	196	4334	5070	1653	2927	20	14004
Crooked Creek	30	1	12	0	0	0	0	12
Red Devil	13	10	284	160	299	181	0	924
Sleetmute	32	24	903	860	1350	365	34	3512
Stony River[3]	16	0	--	--	--	--	--	--
Lime Village[3]	15	0	--	--	--	--	--	--
McGrath	134	87	392	315	365	275	0	1346
Takotna	20	3	0	0	0	0	0	0
Nikolai	34	1	0	16	0	0	0	16
Telida[3]	2	0	--	--	--	--	--	--
UPPER KUSKOKWIM	296	126	1590	1351	2014	821	34	5811
KUSKOKWIM RIVER	3884	1255	68645	51308	33234	25107	1222	179516
Quinhagak	152	97	3412	1725	1303	1143	33	7615
Goodnews Bay	61	2	24	7	36	20	0	87
Platinum[3]	16	0	--	--	--	--	--	--
S. KUSKOKWIM BAY	229	99	3436	1732	1339	1163	33	7702
Mekoryuk	79	1	0	134	0	0	0	134
Newtok[3]	79	0	--	--	--	--	--	--
Nightmute[3]	46	0	--	--	--	--	--	--
Toksook Bay	106	1	16	125	5	0	4	150
Tununak[3]	104	0	--	--	--	--	--	--
Chefornak[3]	91	0	--	--	--	--	--	--
BERING SEA COAST	505	2	16	259	5	0	4	284
TOTALS	4,618	1,356	72,097	53,298	34,578	26,270	1,259	187,502

[1] Includes harvests using rod and reel and the removal of salmon from commercial harvests as well as subsistence nets.
[2] If less than 30 or 50% of households in a stratum in a community were contacted, then reported harvest is used for estimated harvest.
[3] Communities were not contacted during the 2007 study period.

Table source: Alaska Subsistence Salmon Fisheries 2007 Annual Report (unpublished, ADF&G), Table 5-2.

In 2007, subsistence salmon harvest estimates for communities contacted in the Kuskokwim Area totaled 72,097 Chinook (39 percent), 53,298 chum (28 percent), 34,578 sockeye (18 percent), 26,270 coho (14 percent), and 1,259 pink (1 percent), for a total estimate of 187,502 salmon (see Fig. 3-10). The Alaska Subsistence Salmon Fisheries 2007 Annual Report notes in the sampling summary section that these are minimum estimates because no households were contacted in some communities. In other communities, too few households were contacted to produce an expanded community estimate.

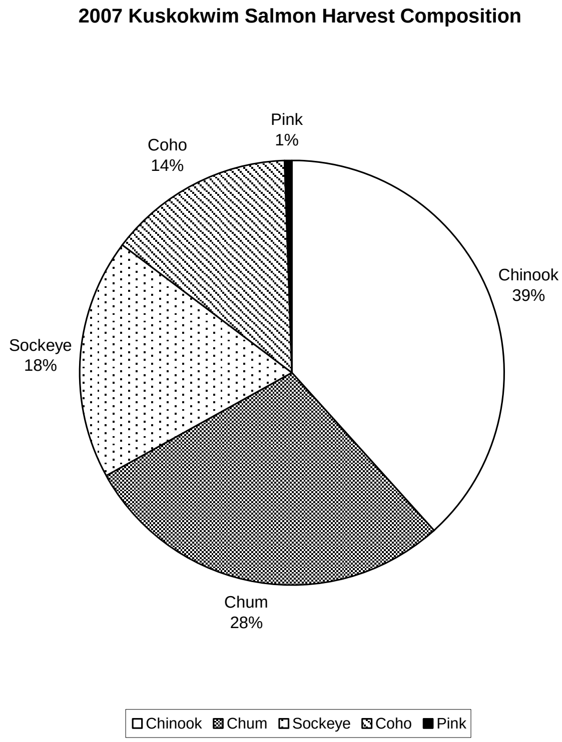


Fig. 3-10 Species composition of 2007 estimated subsistence salmon harvests, Kuskokwim Area
Source: The Alaska Subsistence Salmon Fisheries 2007 Annual Report (unpublished, ADF&G)

Lower Kuskokwim River area communities accounted for 85 percent of the 2007 subsistence salmon harvests in the Kuskokwim Area and 87 percent of the entire Chinook subsistence catch. Residents of Bethel accounted for 38 percent of the Kuskokwim Area subsistence harvests and 41 percent of all subsistence caught Chinook. Subsistence salmon harvests in the Kuskokwim Area in 2007 varied from previous years, with all harvests below recent averages. The estimated 2007 Chinook and chum salmon subsistence harvests were each 2 percent below the 5-year average, and the sockeye subsistence harvest was 5 percent below the 5-year average. Coho salmon were almost 28 percent below the 5-year average. Subsistence harvests of all salmon species were also each slightly below the 10-year average. With the exception of Chinook, estimated subsistence harvests of all salmon species in 2007 declined compared to 2006. The Chinook estimated harvest increased from 68,041 in 2006 to 72,097 in 2007.[33]

[33]Alaska Subsistence Salmon Fisheries 2007 Annual Report (unpublished, ADF&G).

3.3.5 Bristol Bay

According to the Alaska Subsistence Salmon Fisheries 2006 Annual Report (ADF&G 2009k):

> *In spite of numerous social, economic, and technological changes, Bristol Bay residents continue to depend on salmon and other fish species as an important source of food. Residents have relied on fish to provide nourishment and sustenance for thousands of years. Subsistence harvests still provide important nutritional, economic, social, and cultural benefits to most Bristol Bay households. The 5 species of salmon 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, and fish are also frozen, canned, salted, pickled, fermented, and eaten fresh. (p. 65)*

As stated previously, many individuals and organizations provided written comment letters and testified to the Council during the development of the EIS and RIR. The Bristol Bay Alaska Subsistence Regional Advisory Council (BBRAC), which represents 31 Bristol Bay subsistence communities, provided the Council with a letter and resolution approved in October 2008 relative to the proposed action.[34] These comments are part of the administrative record and considered during decision making. Excerpts from that resolution are provided here:

> *The BBRAC requests the North Pacific Fisheries Management Council (NPFMC) and NOAA to note that in the 2007 and 2008 seasons, several Bristol Bay rivers did not achieve the Chinook salmon escapements forecasted by the Alaska Department of Fish and Game (ADF&G)...Poor or reduced escapements of Chinook salmon into Bristol Bay rivers can have significant effects on the Region's subsistence, commercial and sport fisheries.* (p.2)

A recent ADF&G report of surveys and interviews in five Bristol Bay communities revealed that most subsistence resources in Bristol Bay are distributed through sharing, with no immediate exchange and no expectation of any return in the future (Krieg et al, 2007). In the five study communities (Dillingham, Naknek, Togiak, King Salmon and Nondalton), 27 households (21 percent) had a history of involvement in cash trade of subsistence-caught fish, and 16 households (13 percent) engaged in cash trade in the 2004 study year. Cash trade most often involved value-added products such as smoked sockeye or Chinook salmon, resembling a form of craft production rather than commercial manufacture. Of 40 cash trade transactions, 28 involved less than $100. In the five study communities, 54 households (42 percent) had a history of involvement in barter of subsistence-caught fish, and 48 households (38 percent) bartered fish for other goods or services in 2004. Surveyed households described 143 barter transactions in 2004 that included the exchange of 386 items or services; Chinook salmon (24 percent of all items bartered) and sockeye salmon (18 percent) were most often involved in barter. Market goods (17 percent of the items bartered) and services (7 percent) were also part of barter transactions for subsistence-caught fish.

This same report notes that exchanges of resources between residents of contemporary Bristol Bay communities, and with residents of communities outside the area, are common. It states:

> *For example, in Manokotak, a Central Yup'ik community east of Togiak, Schichnes and Chythlook (1988:77-78) identified 18 other communities from which community residents received subsistence foods and 15 to which Manokotak residents sent subsistence foods. The*

[34]Letter and resolution from R. Alvarez, Chair, Bristol Bay Alaska Subsistence Regional Advisory Council to E. Olson, Chair, NPFMC, regarding Chinook salmon bycatch in the Bering Sea pollock fisheries (10/28/08).

> *authors speculated that this sharing involved "gifts" (trade was not mentioned) to relatives in Anchorage and Dillingham who could not obtain their customary "Native foods" in those locations.*
>
> *An important point of view expressed by Bristol Bay Yup'ik elders from western Bristol Bay communities during this study and others conducted by the Division of Subsistence was that in the past, they primarily harvested and processed meat, fish, berries, and greens for survival and not with the intent of exchange for cash or other exchange value. They stated that they preferred to give subsistence foods to someone in need, rather than trade the resources for cash. For the most-senior generation of elders, those 80 or more years of age, subsistence foods were never associated with money. Elders stated that if a family was needy, they simply gave subsistence foods to them, and expected nothing back.* (p. 14)

The report also states that there is evidence that younger generations in Bristol Bay communities have become more accustomed to the practice of trading subsistence foods for cash rather than for other subsistence products. The report summarizes that the trade or barter in subsistence products has occurred and continues to occur in the Bristol Bay area, and that the role of cash in these types of exchanges has increased with the move toward a 'mixed economy.'

The estimated total Bristol Bay subsistence salmon harvest in 2007 was 124,679 fish. This number was in the range of estimates from 2003 - 2006, but much higher than the 2002 estimate (109,587). The 2007 harvest was about 1 percent above the recent 5-year average of 123,699 salmon, and almost 4 percent below the 10-year average of 129,317. In 2007, as over the last several decades, most of the Bristol Bay Area subsistence harvest was taken in the Naknek/Kvichak (58 percent) and the Nushagak (36 percent) districts. [35]

Note that the area-wide Chinook harvest of 15,444 salmon in 2007 was up from the estimate of 12,617 Chinook for 2006, and similar to both the recent 5-year average (16,002 Chinook) and 10-year average (15,367 Chinook). It was also slightly above the 25-year average (14,899 Chinook).

In 2007, the Bristol Bay subsistence salmon harvest was composed of: 80 percent sockeye; 12 percent Chinook; 4 percent coho; 3 percent chum; and 1 percent pink salmon (Fig. 3-11).[36]

Of the entire Bristol Bay Area subsistence salmon harvest in 2007, residents of Bristol Bay communities harvested 113,727 salmon (91 percent), and other Alaska residents harvested 10,952 salmon (9 percent). A summary of the 2007 subsistence salmon harvest estimates by community and species is provided in the Alaska Subsistence Salmon Fisheries 2007 Annual Report (Table 6-3, ADF&G, unpublished). As with the other regions, these are the most recent data available. This table is provided below as Table 3-5.

[35] Alaska Subsistence Salmon Fisheries 2007 Annual Report (unpublished, ADF&G).
[36] Alaska Subsistence Salmon Fisheries 2007 Annual Report (unpublished, ADF&G).

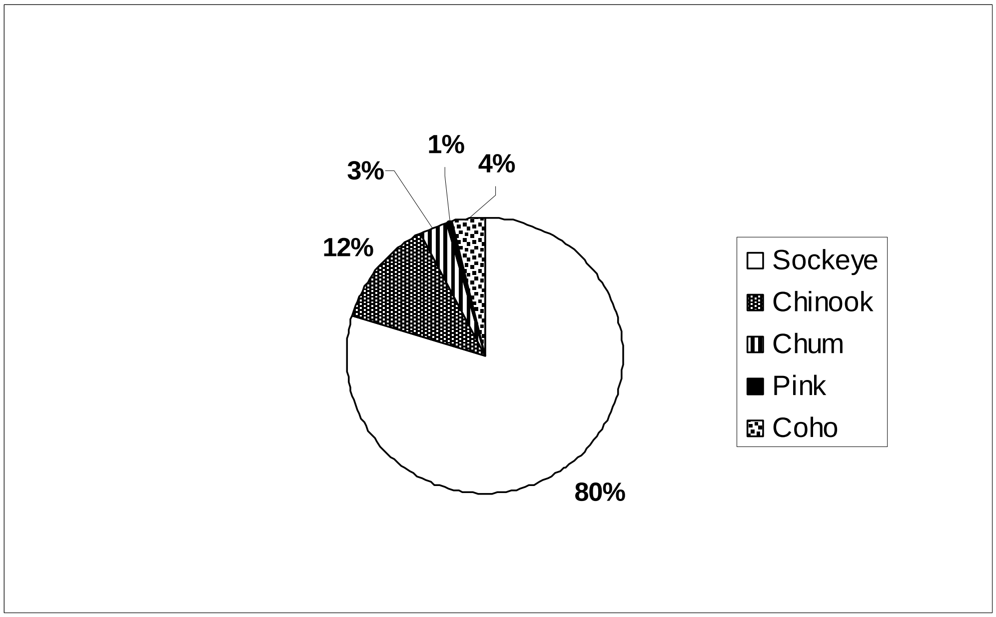


Fig. 3-11 Species composition of 2007 estimated subsistence salmon harvests, Bristol Bay Area
Source: The Alaska Subsistence Salmon Fisheries 2007 Annual Report (unpublished, ADF&G)

Table 3-5 Estimated subsistence salmon harvests by community, Bristol Bay Area, 2007

	PERMITS		ESTIMATED SALMON HARVEST					
Community	Issued	Returned	Chinook	Sockeye	Coho	Chum	Pink	Total
Aleknagik	21	15	284	1,021	94	8	0	1,407
Clarks Point	10	10	120	264	79	74	10	547
Dillingham	315	265	6,988	14,552	1,736	1,272	199	24,747
Egegik	7	7	118	198	260	57	25	658
Ekwok	19	18	647	322	226	72	0	1,267
Igiugig	7	6	1	1,828	0	2	0	1,831
Iliamna	35	34	1	5,388	0	0	0	5,389
King Salmon	93	81	131	5,182	270	91	42	5,715
Kokhanok	29	20	6	15,705	26	22	1	15,760
Koliganek	14	14	1,054	1,216	194	600	16	3,080
Levelock	1	1	1	102	0	6	0	109
Manokotak	21	20	440	1,915	32	51	6	2,444
Naknek	94	86	249	10,682	408	114	82	11,535
New Stuyahok	46	35	3,098	3,597	612	781	197	8,285
Newhalen	20	20	0	6,362	0	0	0	6,362
Nondalton	29	26	0	7,902	0	0	0	7,903
Pedro Bay	19	15	0	5,487	0	0	0	5,487
Pilot Point	7	6	13	349	76	13	4	454
Port Alsworth	31	29	0	3,238	0	0	0	3,238
Portage Creek	1	1	37	4	0	6	0	47
South Naknek	26	22	171	1,967	287	117	134	2,676
Togiak	45	33	1,227	2,521	110	420	19	4,298
Twins Hills	1	1	6	1	0	0	0	7
Ugashik	7	7	21	306	155	0	0	482
Subtotal, Bristol Bay	898	772	14,613	90,107	4,565	3,706	736	113,727

	PERMITS		ESTIMATED SALMON HARVEST					
Community	Issued	Returned	Chinook	Sockeye	Coho	Chum	Pink	Total
Anchor Point	1	1	0	15	0	0	0	15
Anchorage	65	61	175	4,632	86	140	77	5,110
Chugiak	4	4	3	359	12	11	0	385
Copper Center	1	1	0	0	0	0	0	0
Cordova	1	1	0	109	0	0	0	109
Craig	1	1	0	0	0	0	0	0
Dutch Harbor	1	1	0	0	0	0	0	0
Eagle River	6	4	5	537	0	9	0	551
Fairbanks	6	5	0	269	0	2	0	271
Girdwood	2	2	0	48	0	0	0	48
Homer	9	6	90	567	0	9	0	666
Juneau	2	2	8	316	0	0	0	324
	PERMITS		ESTIMATED SALMON HARVEST					
Community	Issued	Returned	Chinook	Sockeye	Coho	Chum	Pink	Total
Kasilof	5	5	5	107	0	0	0	112
Kenai	4	4	8	68	11	0	0	87
King Cove	1	0	0	0	0	0	0	0
Kodiak (city)	6	5	11	202	0	7	0	220
Kotzebue	1	1	0	0	0	0	0	0
Moose Pass	1	1	0	60	0	0	0	60
Nikiski	4	4	62	399	55	15	2	533
Nikolaevsk	2	1	0	0	0	0	0	0
North Pole	1	1	0	23	0	0	0	23
Palmer	13	11	118	463	20	31	0	632
Salcha	1	1	43	32	0	14	0	89
Sand Point	1	1	0	0	0	0	0	0
Sitka	1	1	0	0	0	0	0	0
Soldotna	4	3	0	127	0	0	0	127
Sterling	1	1	0	0	0	0	0	0
Wasilla	19	15	304	1,079	131	43	0	1,557
Willow	1	1	0	30	0	4	0	34
Subtotal, other Alaska	165	145	831	9,441	315	286	79	10,952
TOTAL	1,063	917	15,444	99,549	4,880	3,991	815	124,679

Source: ADF&G Division of Subsistence, ASFDB 2008 (ADF&G 2008).
Source: The Alaska Subsistence Salmon Fisheries 2007 Annual Report (unpublished, ADF&G)

3.4 Commercial Chinook Salmon Fisheries By Region

This section provides extensive background information on the commercial Chinook salmon fisheries in western Alaska river systems likely most affected by Chinook 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 Chinook salmon (See EIS Chapter 5 for a complete discussion of affected stock determination).

As pointed out in public comments[37] on the draft EIS, the available commercial catch data does not differentiate between Chinook taken in a directed fishery versus incidentally in a directed fishery for another salmon species. As a result, the available data may understate the commercial value of Chinook salmon if they were all taken in a directed Chinook salmon fishery. This would be a fundamental problem if the analysis relied on the average price to value potential increases in commercial harvest of Chinook salmon. However, available genetic information does not allow estimation of Adult Equivalent (AEQ) Chinook salmon savings at the natal stream level of resolution. Thus, presently available scientific information does not allow estimation of potential increases in numbers of Chinook salmon that may be made available for harvest in commercial fisheries, much less whether they would be taken in a directed fishery or incidental to another fishery. As a result, it is not possible to estimate effects on commercial revenue. Thus, underestimation of potential value is not a problem in the analysis; however, it is noted here as a limitation of the available data.

3.4.1 Kotzebue

The Kotzebue 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, and data supplied by ADF&G.

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 2007 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 above average. 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.

[37] Comment 10-36 in EIS Chapter 9, the Comment Analysis Report

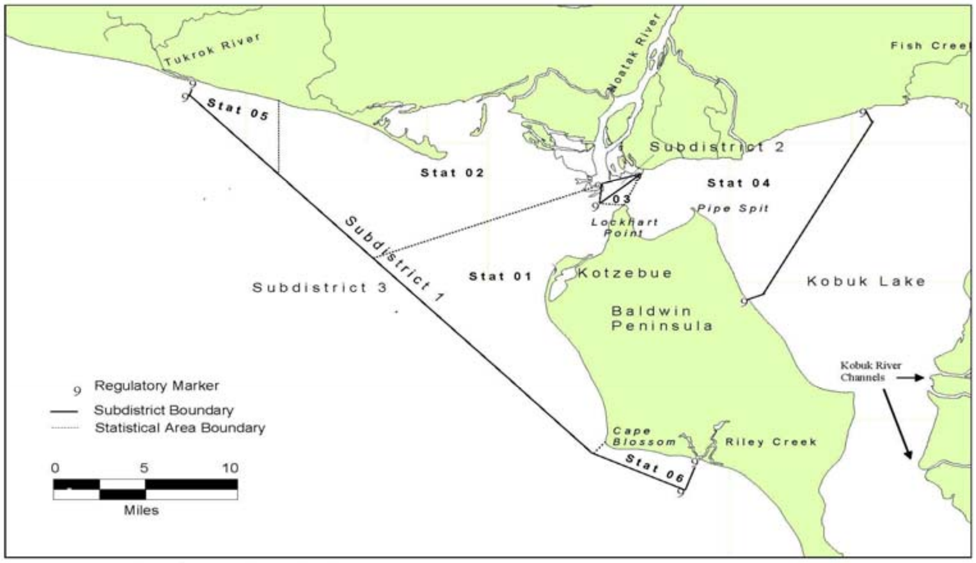


Fig. 3-12 Kotzebue Fishery Management Area

Commercial Fishery Situation and Outlook

During most of the 2000s, the Kotzebue commercial fishery has been limited by buyer capacity. In 2002 and 2003, there was no onsite buyer. In 2004 and 2005, one onsite buyer was present and fish were processed locally. Beginning in 2006, the new buyer shipped the catch in the round to Anchorage for processing.

As in recent years, ADF&G opened the commercial fishery continuously and allowed the buyer to set the fishing time for their fleet. There were 46 permit holders who sold fish to the buyer, including one catcher-seller who sold fish to the buyer and also sold some of his catch from his boat to Kotzebue area residents. The number of permit holders that fished has been in the low 40s in the past three years, and is less than half the permit holders that fished in the 1990s, and well below the nearly 200 permit holders that fished in the early 1980s (Table 3-6).

In the Kotzebue fishery gear is limited to set nets with an aggregate of no more than 150 fathoms per participant. Nets are generally set with one end on, or near, shore and with all three shackles connected. Nets are also set in deeper channels on the mud flats further out from shore. Most gear used in the district is 5-7/8 in (14.9 cm) or 6 in (15.2 cm) stretch mesh gillnet.

The overall chum salmon run to Kotzebue Sound in 2007 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 above average. The commercial harvest consisted of 147,085 chum salmon.

Table 3-6 Kotzebue district chum salmon catch and dollar value 1963-2007.

Year		Total Catch	Number of Permits [a]	Season Catch per Permit Holder	Gross Value of Catch to Permit Holders [b]	
1963		54,445	61	893	$9,140	
1964		76,449	52	1,470	$34,660	
1965		40,025	45	889	$18,000	
1966		30,764	44	699	$25,000	
1967		29,400	30	980	$28,700	
1968		30,212	59	512	$46,000	
1969		59,335	52	1,141	$71,000	
1970		159,664	82	1,947	$186,000	
1971		154,956	91	1,703	$200,000	
1972		169,664	104	1,631	$260,000	
1973		375,432	148	2,537	$925,000	
1974		627,912	185	3,394	$1,822,784	
1975		563,345	267	2,110	$1,365,648	
1976		159,796	220	726	$580,375	
1977		195,895	224	875	$1,033,950	
1978		111,494	208	536	$575,260	
1979		141,623	181	782	$990,263	
1980		367,284	176	2,087	$1,446,633	
1981		677,239	187	3,622	$3,246,793	
1982		417,790	199	2,099	$1,961,518	
1983		175,762	189	930	$420,736	
1984		320,206	181	1,769	$1,148,884	
1985		521,406	189	2,759	$2,137,368	
1986		261,436	187	1,398	$931,241	
1987		109,467	160	684	$515,000	
1988		352,915	193	1,829	$2,581,333	
1989		254,617	165	1,543	$613,823	
1990		163,263	153	1,067	$438,044	
1991		239,923	142	1,690	$437,948	
1992		289,184	149	1,941	$533,731	
1993	c	73,071	114	641	$235,061	
1994	d	153,452	109	1,408	$233,512	
1995		290,730	92	3,160	$316,031	
1996	e	82,110	55	1,493	$56,310	
1997		142,720	68	2,099	$187,978	
1998		55,907	45	1,242	$70,587	
1999		138,605	60	2,310	$179,781	
2000		159,802	64	2,497	$246,786	
2001	f	211,672	66	3,207	$322,650	
2002		8,390	3	2,797	$7,572	
2003		25,763	4	6,441	$26,377	
2004		51,077	43	1,188	$64,420	
2005		75,971	41	1,853	$124,820	h
2006		138,660	42	3,301	$216,654	
Average		197,084	116	1,809	$597,286	
2007		147,087	46	3,198	$243,149	

Source: Data provided to NMFS by ADF&G, in 2007, in response to a special data request.

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

[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.

[d] Includes 4,000 chum salmon commercially caught but not sold.

[e] Includes 2,200 chum salmon commercially caught but not sold.

[f] Includes 10 chum salmon commercially caught but not sold.

[g] Includes 340 chum salmon commercially caught, but not sold.

[h] Value for chum sales was $124,423; value of other species sales was $397.

3.4.2 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, and ADF&G supplied data).

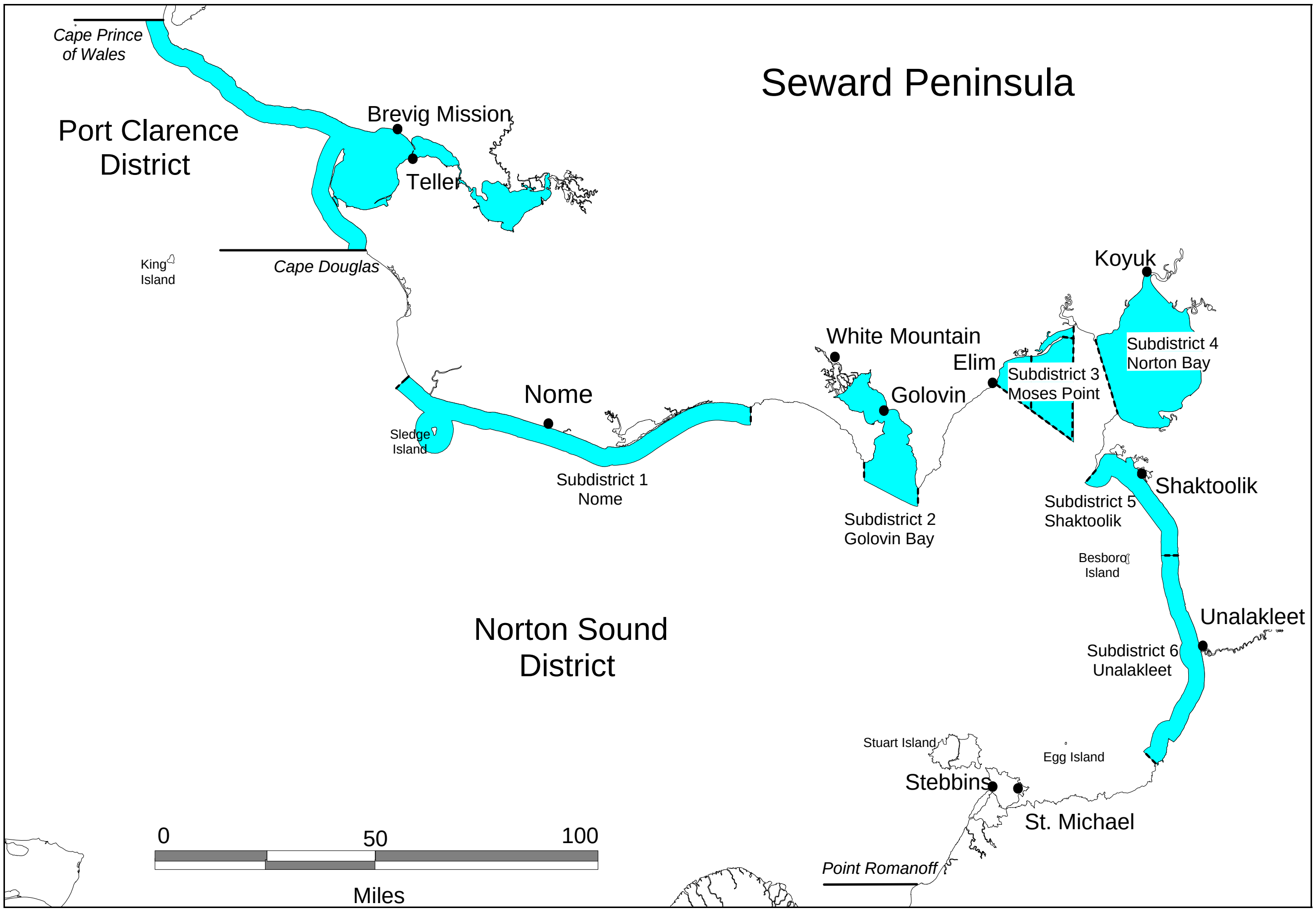


Fig. 3-13 Norton Sound fishing district map

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 3-7 provides historic Chinook salmon catches in the Norton Sound District from 1961 through 2007. Commercial Chinook catches trended downward in the late 1990s and early 2000s. As recently at 1997, more than 12,000 Chinook were commercially harvested in the region; however, by 2000 the harvest had declined to 752 fish. By 2004, no commercial Chinook harvest was allowed. This trend in Norton Sound commercial Chinook harvests is depicted graphically in Fig. 3-14.

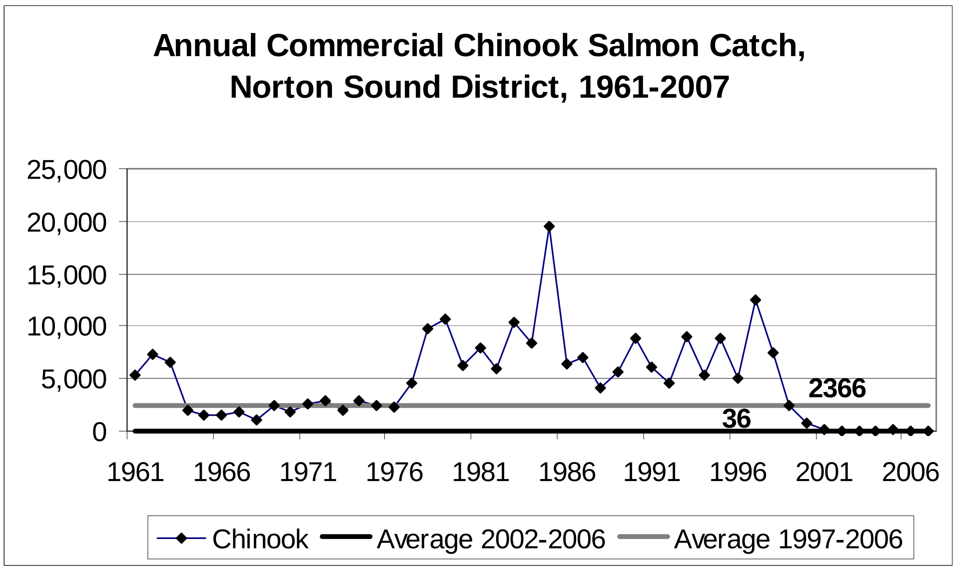


Fig. 3-14 Norton Sound commercial Chinook salmon catch, 1961-2007
Source: Data provided to NMFS by ADF&G, in 2007, in response to a special data request.

The catch data also document a longer 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, in the past two years, the commercial chum harvest has improved, as has the coho harvest and these two species are making up larger proportions of total fishery value than in the past.

Salmon outlooks and harvest projections for the 2008 salmon season are based on qualitative assessments of parent year escapements, subjective determinations of freshwater overwintering and ocean survival, and in the case of the commercial fishery, the projections of local market conditions. The Chinook salmon run is expected to be below average and no commercial fishing targeting Chinook salmon is expected.

Chum salmon runs are expected to be average in 2008, but limited commercial fishing targeting chum salmon is expected. There is some buyer interest in chum salmon this year and the harvest could be 40,000 to 50,000 fish, if there is a buyer. Although there may be limited buyer interest this year, there have been no commercial pink salmon sales since 2000, except for 2007. If there is a buyer the harvest could be 500,000 pink salmon in 2008. The coho salmon run in 2008 is expected to be above average based on good ocean survival conditions in recent years and the near record and record runs in recent years in southern Norton Sound. The commercial harvest is expected to be 80,000 to 100,000 fish and no subsistence fishing restrictions are expected, except for catch limits in the Nome Subdistrict. Based on excellent runs of sockeye salmon in recent years ADF&G expects 10,000 sockeye salmon to be harvested if there is sufficient fishing effort in the Port Clarence District.

Table 3-7 Commercial salmon catch by species, Norton Sound District, 1961-2007.

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
Average 2002-2006	**36**	**68**	**55,379**	**0**	**4,896**	**60,379**
Average 1997-2006	**2,366**	**57**	**41,537**	**75,458**	**10,004**	**129,421**

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.

Table 3-8 provides the real, inflation adjusted using the Gross Domestic Product (GDP) deflator to 2007 prices, value of commercial Chinook salmon harvest compared to total real value of Norton Sound commercial salmon harvest from 1967 through 2007. The decline in catch, combined with declining salmon prices since the late 1970s, have depressed overall fishery value, from a peaks of over $2 million in the late 1970s to a period low of just $3,378 in 2002. Over this time, Chinook real value peaked in 1979 at just under a half a million dollars. Chinook real value has fluctuated since the 1980s, and rose to $282,356 in 1997 when it was nearly 62 percent of the overall value. During the 2000s, Chinook value declined as the run has declined and has been restricted to incidental catch value since 2004. In 2007, no value was earned from Chinook target fisheries, and just $113 was earned from incidental Chinook catch in other salmon fisheries.

Table 3-8 Real historical value of commercial Chinook catch, Norton Sound, 1967-2007 (inflation adjusted to 2007 value using the GDP deflator)

Year	Chinook Value	Reported Total Value	Chinook Value % of Total
1967	$41,924	$220,557	19.01%
1968	$27,564	$305,969	9.01%
1969	$51,789	$436,102	11.88%
1970	$41,399	$430,341	9.62%
1971	$44,611	$418,044	10.67%
1972	$61,773	$405,511	15.23%
1973	$58,515	$1,160,007	5.04%
1974	$75,031	$1,506,360	4.98%
1975	$32,703	$1,301,293	2.51%
1976	$50,751	$849,291	5.98%
1977	$186,196	$1,528,297	12.18%
1978	$379,030	$2,372,855	15.97%
1979	$493,044	$2,122,382	23.23%
1980	$222,261	$1,266,820	17.54%
1981	$415,405	$1,541,688	26.94%
1982	$231,920	$2,040,738	11.36%
1983	$372,575	$1,736,469	21.46%
1984	$358,921	$1,305,442	27.49%
1985	$777,375	$1,404,935	55.33%
1986	$196,806	$917,763	21.44%
1987	$256,766	$846,676	30.33%
1988	$133,754	$1,202,491	11.12%
1989	$116,570	$486,676	23.95%
1990	$249,965	$695,286	35.95%
1991	$132,583	$585,933	22.63%
1992	$52,635	$621,135	8.47%
1993	$147,693	$436,132	33.86%
1994	$133,191	$1,144,232	11.64%
1995	$149,861	$462,728	32.39%
1996	$65,956	$433,952	15.20%
1997	$282,356	$456,397	61.87%
1998	$117,336	$445,282	26.35%
1999	$48,548	$93,977	51.66%
2000	$17,485	$179,385	9.75%
2001	$4,444	$66,518	6.68%
2002	$22	$3,378	0.66%
2003	$98	$72,508	0.14%
2004	$0	$133,923	0.00%
2005	$3,244	$313,619	1.03%
2006	$255	$400,061	0.06%
2007	$113	$572,195	0.02%

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

Real historic Chinook salmon value, real total value, and the percentage of real Chinook value in real total value is displayed in Fig. 3-15. Both Chinook value and total value are displayed with respect to the left vertical axis and Chinook percent of total value is displayed on the right vertical axis. From this figure it is easy to see the divergence of Chinook and total value during the 2000s as commercial Chinook harvests in Norton Sound have been halted.

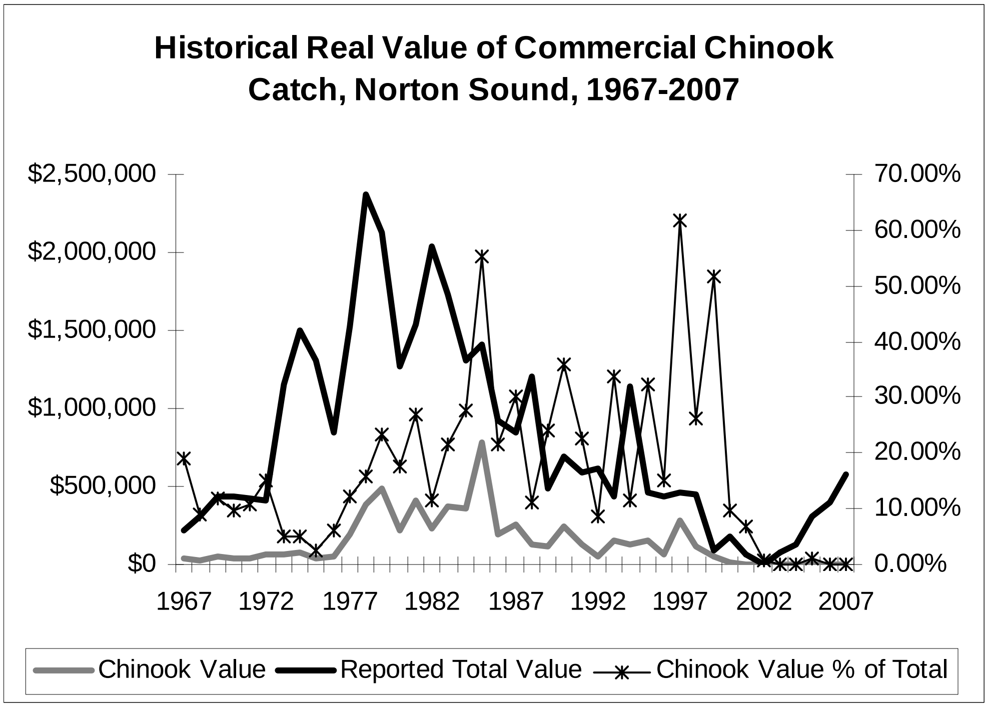


Fig. 3-15 Norton Sound commercial real Chinook value, total value, and percent Chinook value in total value, 1967-2007 (values are inflation adjusted to 2007 values using the GDP deflator)
Source: Derived from data provided to NMFS by ADF&G in response to a special data request

Table 3-9 shows that commercial fishery participation declined to 12 permit holders in 2002. Since 2002, the overall value of the fishery has improved due to strong coho returns, improving chum returns, and market improvements. As a result, participation increased to 71 permit holders by 2007. However, the commercial Chinook fishery remains closed.

Table 3-9 Number of commercial salmon permits fished, Norton Sound, 1970–2007

Year	SUBDISTRICT						Total [a]
	1	2	3	4	5	6	
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
Average 2002-2006	**0**	**0**	**0**	**0**	**12**	**24**	**36**
Average 1997-2006	**0**	**4**	**6**	**1**	**16**	**35**	**55**

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.

Similar to subsistence Chinook catch, the impact of declines in commercial Chinook catch have been felt most in the Shaktoolik and Unalakleet districts. Table 3-10 provides Commercial Chinook Salmon Catch, by year for the Shaktoolik and Unalakleet subdistricts. Historically, these two subdistricts have produced nearly all of the commercial Chinook harvest in the Norton Sound District. Thus, the declines in overall commercial Chinook catch, discussed previously, are the result of declines in the Unalakleet and Shaktoolik subdistricts. These trends are shown graphically in Fig. 3-16 and Fig. 3-17.

Table 3-10 Commercial Chinook salmon catch, by year for the Shaktoolik and Unalakleet Subdistricts, 1961-2007

Year	Shaktoolik	Unalakleet
1961	140	5,160
1962	1,738	5,089
1963	480	5,941
1964	631	1,273
1965	127	1,321
1966	310	1,208
1967	43	1,751
1968	61	960
1969	33	2,276
1970	197	1,604
1971	284	2,166
1972	419	2,235
1973	289	1,397
1974	583	2,100
1975	651	1,638
1976	892	1,211
1977	1,521	2,691
1978	1,339	7,525
1979	2,377	6,354
1980	1,086	4,339
1981	1,484	6,157
1982	1,677	3,768
1983	2,742	7,022
1984	1,613	6,804
1985	5,312	12,621
1986	1,075	4,494
1987	2,214	3,246
1988	671	2,218
1989	1,241	4,402
1990	2,644	5,998
1991	1,324	4,534
1992	1,098	3,409
1993	2,756	5,944
1994	885	4,400
1995	1,239	7,617
1996	1,340	3,644
1997	2,449	9,067
1998	910	6,413
1999	581	1,927
2000	160	582
2001	90	116
2002	1	4
2003	2	10
2004	0	0
2005	50	101
2006	0	11
2007	5	13
2002-2006 avg.	11	25
1997-2006 avg.	424	1,823

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

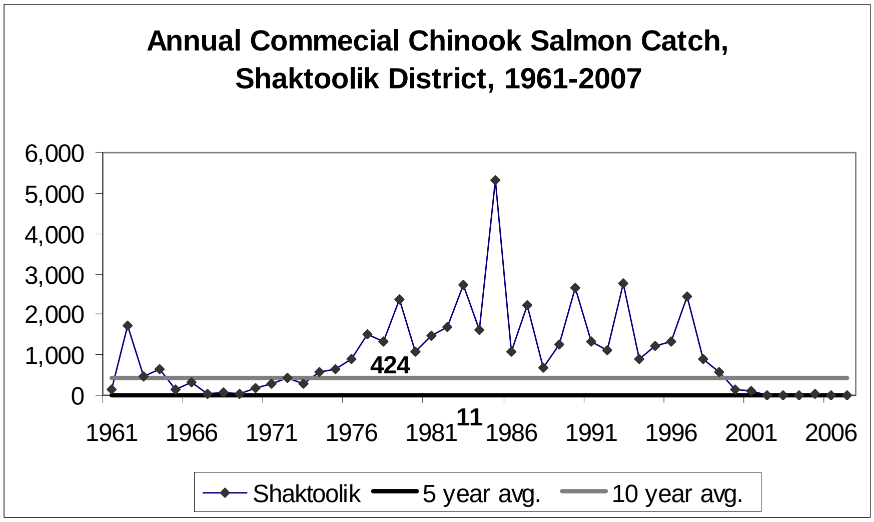


Fig. 3-16 Shaktoolik commercial Chinook salmon catch, 1961-2007.
Source: Derived from data provided to NMFS by ADF&G in response to a special data request

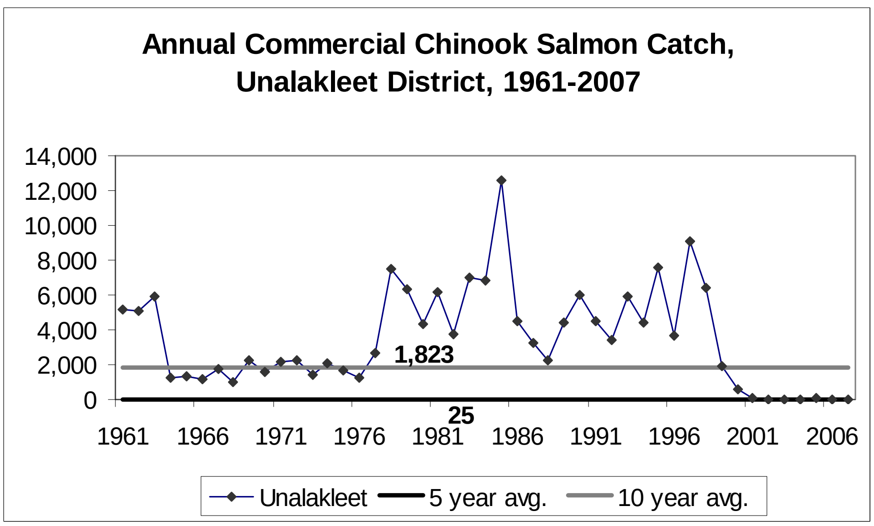


Fig. 3-17 Unalakleet commercial Chinook salmon catch, 1961-2007
Source: Derived from data provided to NMFS by ADF&G in response to a special data request

3.4.3 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. 3-18). 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 and data supplied by ADF&G)

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.

From the beginning of the 2007 season there was a good showing of Chinook, chum, and sockeye salmon throughout the Kuskokwim Area; however, run timing for these species was approximately 5 to 7 days late compared to average. Chinook salmon abundance was characterized as average to above average while sockeye and chum salmon abundance was characterized as above average. Coho salmon abundance was characterized as average to below average with overall early run timing. Amounts necessary for subsistence use are expected to have been achieved throughout the area.

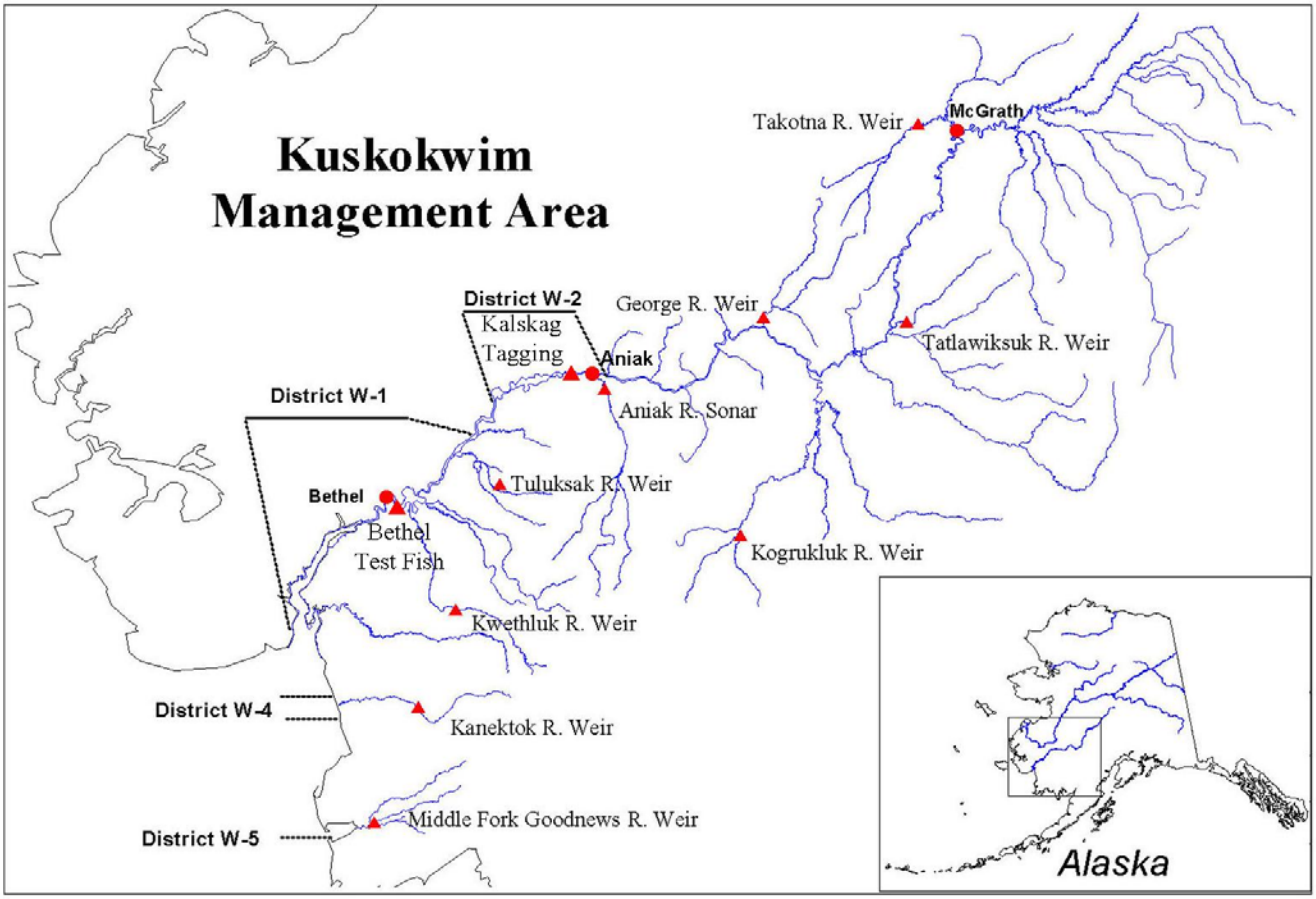


Fig. 3-18 Kuskokwim Management Area and salmon run assessment projects

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

In 2007, a lack of processing capacity and commercial interest, and continued poor chum salmon market conditions resulted in no commercial openings in June and July during the bulk of the Chinook, sockeye, and chum salmon runs. The 2007 Kuskokwim River commercial fishing season was opened on August 1 with management directed towards coho salmon. Twelve coho salmon directed commercial fishing periods occurred from August 1 through August 24. Coho salmon harvests and catch rates were above average at the beginning of the season and transitioned to below average through the last period on August 24. Average weight per fish of the District 1 coho salmon commercial harvest was approximately average, in contrast to the below average weights observed in 2006.

Table 3-11 Chinook harvests, Kuskokwim River Area, 1960–2007

Year	Commercial[a]	Subsistence[b,c]	Test-Fish	Sport Fish	Total
1960	5,969	18,887			24,856
1961	18,918	28,934			47,852
1962	15,341	13,582			28,923
1963	12,016	34,482			46,498
1964	17,149	29,017			46,166
1965	21,989	24,697			46,686
1966	25,545	49,325	285		75,155
1967	29,986	59,913	766		90,665
1968	34,278	32,942	608		67,828
1969	43,997	40,617	833		85,447
1970	39,290	69,612	857		109,759
1971	40,274	43,242	756		84,272
1972	39,454	40,396	756		80,606
1973	32,838	39,093	577		72,508
1974	18,664	27,139	1,236		47,039
1975	22,135	48,448	704		71,287
1976	30,735	58,606	1,206		90,547
1977	35,830	56,580	1,264	33	93,707
1978	45,641	36,270	1,445	116	83,472
1979	38,966	56,283	979	74	96,302
1980	35,881	59,892	1,033	162	96,968
1981	47,663	61,329	1,218	189	110,399
1982	48,234	58,018	542	207	107,001
1983	33,174	47,412	1,139	420	82,145
1984	31,742	56,930	231	273	89,176
1985	37,889	43,874	79	85	81,927
1986	19,414	51,019	130	49	70,612
1987	36,179	67,325	384	355	104,243
1988	55,716	70,943	576	528	127,763
1989	43,217	81,175	543	1,218	126,153
1990	53,504	85,976	512	394	140,386
1991	37,778	85,556	117	401	123,852
1992	46,872	64,794	1,380	367	113,413
1993	8,735	87,513	2,483	587	99,318
1994	16,211	93,243	1,937	1,139	112,530
1995	30,846	96,435	1,421	541	129,243
1996	7,419	78,062	247	1,432	87,160
1997	10,441	81,577	332	1,227	93,577
1998[d]	17,359	81,264	210	1,434	100,267
1999	4,705	73,194	98	252	78,249
2000	444	64,893	64	105	65,506
2001	90	73,610	86	290	74,076
2002	72	66,807	288	300	67,467
2003	158	67,788	409	401	68,756
2004[e]	2,300	80,065	691	857	83,913
2005[e]	4,784	70,393	608	1092	76,877
2006	2,777	63,177	352	572	66,878
2007[f]	179	72,097	503	2,543	75,289
2002-2006 avg.	**2,018**	**69,646**	**470**	**644**	**72,778**
1997-2006 avg.	**4,313**	**72,277**	**314**	**653**	**77,557**

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

[a] Districts 1 and 2; also includes harvests in District 3 from 1960 to 1965.
[b] Estimated subsistence harvest expanded from villages surveyed.
[c] Discrepancies in subsistence harvest numbers by area may be attributable changes in geographic area definitions over time.
[d] Beginning in 1988, estimates are based on a new formula so data since 1988 is not comparable with previous years
[e] Preliminary estimate of subsistence in 2005 and sport in 2004 and 2005.
[f] All data not yet available.

Table 3-12 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. 3-19, below, provides a graphical representation of this declining trend.

Table 3-12 Chinook salmon harvests, Kuskokwim River Area, 1960–2007

Year	Kuskokwim Chinook Value	Total Real Value	Chinook Percent of Total Value
1989	$538,052	$5,177,130	10%
1990	$452,430	$4,894,579	9%
1991	$323,682	$3,961,266	8%
1992	$414,536	$4,636,465	9%
1993	$77,445	$4,288,365	2%
1994	$128,975	$5,140,607	3%
1995	$320,181	$4,209,582	8%
1996	$30,284	$2,885,375	1%
1997	$47,360	$2,910,754	2%
1998	$66,554	$1,636,153	4%
1999	$23,337	$551,664	4%
2000	$2,701	$1,195,865	0%
2001	$648	$751,272	0%
2002	$350	$322,677	0%
2003	$752	$893,027	0%
2004	$9,741	$1,485,277	1%
2005	$25,902	$1,155,113	2%
2006	$14,675	$1,143,806	1%
2007	$879	$1,265,035	0%
2002-2006 Average	$10,284	$1,204,661	1%
1997-2006 Average	$19,202	$3,090,869	1%

Notes: Real value, relative to 2007, is calculated using the GDP deflator.
Source: Calculated from data provided to NMFS by ADF&G in response to a special data request

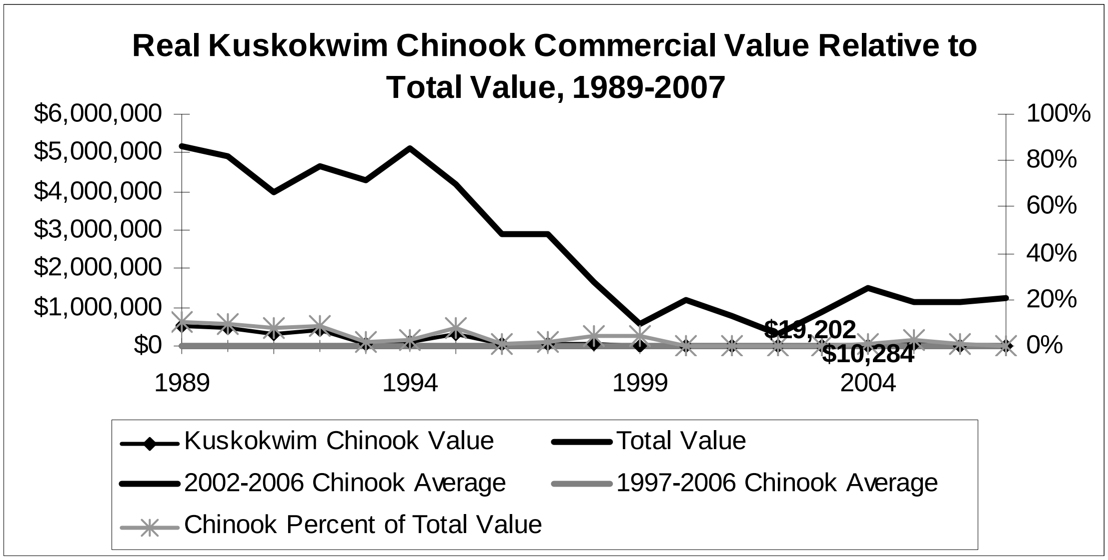


Fig. 3-19 Real Kuskokwim Chinook commercial value relative to total value, 1989-2007.
Source: Derived from data provided to NMFS by ADF&G in response to a special data request

Kuskokwim Bay

In 2007, the District 4 commercial salmon fishing season opened June 14 with management directed towards Chinook salmon harvest, and the District 5 season opened on June 19. Each district was initially placed on a 2 day per week commercial fishing schedule on Tuesdays and Thursdays. A schedule of commercial openings every other day was initiated in Districts 4 and 5 on July 2 when management transitioned to sockeye salmon directed harvest. From late June through mid- July, the single buyer imposed limits on the number of fish that could be delivered by District 4 and 5 fishermen because of limited processing capacity. Chinook salmon harvest per period was average to below average and catch rates were approximately average in 2007. Sockeye salmon harvest and catch rates per period were above average throughout the season. Chum salmon harvest and catch rates per period ranged from below average at the beginning of the season to above average towards the end of season when limits were lifted in mid-July.

Management of Kuskokwim Bay commercial fisheries was re-directed towards the harvest of coho salmon on July 31 when a commercial fishing schedule of three 12-hour periods per week was initiated in Districts 4 and 5. Coho salmon harvests and catch rates per period ranged from above average to below average in District 4 and 5 throughout the coho salmon season. Similar to District 1, average weight per fish of the District 4 and 5 coho salmon commercial harvest was approximately average in 2007, in contrast to the below average weights observed in 2006. A total of 125 individual permit holders recorded landings in District 4 during the 2007 season. This level of fishing effort was 27 percent below the recent 10-year average of 172 fishermen.

A total of 125 individual permit holders recorded landings in District 4 during the 2007 season. This level of fishing effort was 27 percent below the recent 10-year average of 172 fishermen. The 2007 District 4 commercial harvest was 19,573 Chinook, 109,343 sockeye, 34,710 coho, and 61,228 chum salmon from 33 periods. District 4 sockeye salmon harvest was at a record high for the second consecutive year and was 53 percent above the recent 10-year average. Chum salmon harvest was above average over all years and was 50 percent above the recent 10-year average. Chinook salmon harvest was below average compared to historical harvests but was similar to the recent 10-year average. Coho salmon harvest was below average compared to historical harvests and was approximately 14 percent below the recent 10-year average. The total ex-vessel value of the District 4 fishery was $660,865, approximately 40 percent above the recent 10-year average value.

A total of 28 individual permit holders recorded landings in District 5 during the 2007 season. This level of fishing effort was a slight increase compared to 2006, but was 30 percent below the recent 10-year average of 40 fishermen. The 2007 District 5 commercial harvest was 3,112 Chinook, 43,716 sockeye, 13,689 coho, and 7,519 chum salmon from 33 periods (Table 3-11). Chinook, sockeye, and coho salmon harvest was approximately 25 percent, 42 percent and 16 percent above the recent 10-year average respectively, and chum salmon harvest was approximately 4 percent below the recent 10-year average. The 2007 District 5 sockeye salmon harvest was the third highest on record since 1981. The total ex-vessel value of the District 5 fishery was $223,329, 42 percent above the recent 10-year average value.

3.4.4 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, and data supplied by ADF&G)

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. 3-20). 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.

Table 3-13 and Table 3-14 provide historic Alaska Yukon and Canadian Yukon Catch statistics for all catch sectors. These data will be discussed in more detail in the discussion and graphics in the sections on subsistence, commercial and sport fisheries that appear below.

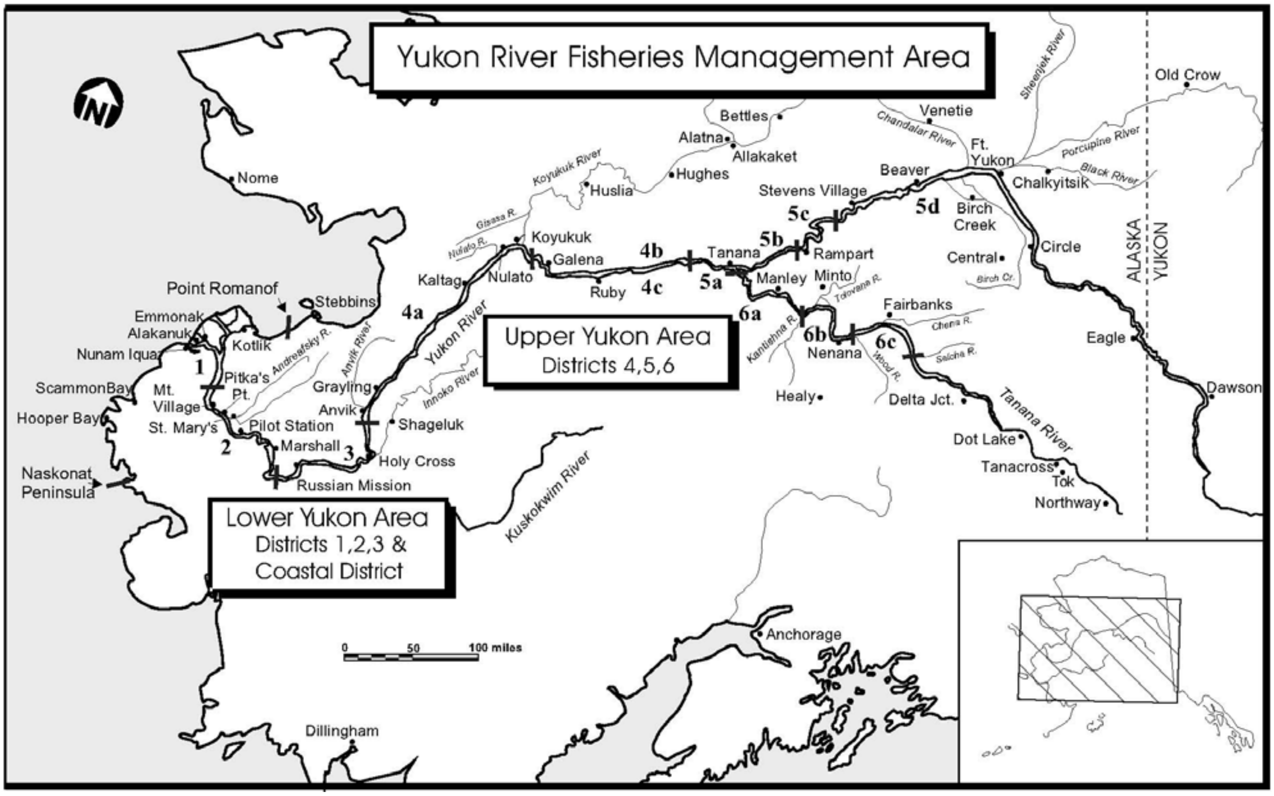


Fig. 3-20 Yukon River fisheries management areas.

Table 3-13 Alaska Yukon Area Chinook salmon catch totals, 1961-2007

Year	Subsistence [a]	Commercial [b,c]	Roe Sales[f]	Personal Use[d]	Test Fish	Sport[g]	Total
1961	21,488	119,664	0				141,152
1962	11,110	94,734	0				105,844
1963	24,862	117,048	0				141,910
1964	16,231	93,587	0				109,818
1965	16,608	118,098	0				134,706
1966	11,572	93,315	0				104,887
1967	16,448	129,656	0				146,104
1968	12,106	106,526	0				118,632
1969	14,000	91,027	0				105,027
1970	13,874	79,145	0				93,019
1971	25,684	110,507	0				136,191
1972	20,258	92,840	0				113,098
1973	24,317	75,353	0				99,670
1974	19,964	98,089	0				118,053
1975	13,045	63,838	0				76,883
1976	17,806	87,776	0				105,582
1977	17,581	96,757	0			156	114,494
1978	30,297	99,168	0			523	129,988
1979	31,005	127,673	0			554	159,232
1980	42,724	153,985	0			956	197,665
1981	29,690	158,018	0			769	188,477
1982	28,158	123,644	0			1,006	152,808
1983	49,478	147,910	0			1,048	198,436
1984	42,428	119,904	0			351	162,683
1985	39,771	146,188	0			1,368	187,327
1986	45,238	99,970	0			796	146,004
1987	51,418	134,760	0	1,706		502	188,386
1988	43,907	100,364	0	2,125	1,081	944	148,421
1989	48,400	104,198	0	2,616	1,293	1,063	157,616
1990	48,587	95,247	413	2,594	2,048	544	149,433
1991	46,773	104,878	1,538	0	689	773	154,651
1992	45,626	120,245	927	0	962	431	168,191
1993	62,486	93,550	560	426	1,572	1,695	160,289
1994	53,077	113,137	703	0	1,631	2,281	170,829
1995	48,535	122,728	1,324	399	2,152	2,525	177,663
1996	43,306	89,671	521	215	1,698	3,151	138,562
1997	55,978	112,841	769	313	2,811	1,913	174,625
1998	53,733	43,618	81	357	926	654	99,369
1999	52,194	69,275	288	331	1,205	1,023	124,316
2000	35,841	8,518	0	75	597	276	45,307
2001	53,059	0	0	122	0	679	53,860
2002	42,620	24,128	0	126	528	486	67,888
2003	55,109	40,438	0	204	680	2,719	99,150
2004	53,675	56,151	0	201	792	1,513	112,332
2005	52,561	32,029	0	138	296	483	85,507
2006	47,710	45,829	0	89	817	739	95,184
2007	59,242	33,634					92,876
2002-06 Avg.	50,335	39,715	0	152	623	1,188	92,012
1997-06 Avg.	50,248	43,283	114	196	865	1,049	95,754

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

[a] Subsistence harvest not available by district until 1978. Test Fish Sales is the number of fish sold by ADF&G test fisheries. Does not include coastal subsistence harvest in Hooper Bay and Scammon Bay. All data from the most recent year is preliminary.

[b] Includes estimates of illegal sales.

[c] Includes ADF&G test fish sales prior to 1988.

[d] After 1991 the regulation did not provide for a Personal Use fishery in Districts 1, 3 and 5.

[f] The estimated harvest of female Chinook salmon to produce roe sold.

[g] Estimated sport fish harvest for Alaskan portion of the Yukon River drainage. The majority of sport fish harvest occurs in the Tanana River drainage (District 6).

Table 3-14 Canadian Yukon Area Chinook salmon catch totals, 1961-2007

Year	Mainstem Yukon						Porcupine Aboriginal	Total Canadian
	Domestic	Aboriginal	Sport [h]	Test fish[j]	Commercial	Subtotal		
1961		9,300			3,446	12,746	500	13,246
1962		9,300			4,037	13,337	600	13,937
1963		7,750			2,283	10,033	44	10,077
1964		4,124			3,208	7,332	76	7,408
1965		3,021			2,265	5,286	94	5,380
1966		2,445			1,942	4,387	65	4,452
1967		2,920			2,187	5,107	43	5,150
1968		2,800			2,212	5,012	30	5,042
1969		957			1,640	2,597	27	2,624
1970		2,044			2,611	4,655	8	4,663
1971		3,260			3,178	6,438	9	6,447
1972		3,960			1,769	5,729		5,729
1973		2,319			2,199	4,518	4	4,522
1974	406	3,342			1,808	5,556	75	5,631
1975	400	2,500			3,000	5,900	100	6,000
1976	500	1,000			3,500	5,000	25	5,025
1977	531	2,247			4,720	7,498	29	7,527
1978	421	2,485			2,975	5,881		5,881
1979	1,200	3,000			6,175	10,375		10,375
1980	3,500	7,546	300		9,500	20,846	2,000	22,846
1981	237	8,879	300		8,593	18,009	100	18,109
1982	435	7,433	300		8,640	16,808	400	17,208
1983	400	5,025	300		13,027	18,752	200	18,952
1984	260	5,850	300		9,885	16,295	500	16,795
1985	478	5,800	300		12,573	19,151	150	19,301
1986	342	8,625	300		10,797	20,064	300	20,364
1987	330	6,069	300		10,864	17,563	51	17,614
1988	282	7,178	650		13,217	21,327	100	21,427
1989	400	6,930	300		9,789	17,419	525	17,944
1990	247	7,109	300		11,324	18,980	247	19,227
1991	227	9,011	300		10,906	20,444	163	20,607
1992	277	6,349	300		10,877	17,803	100	17,903
1993	243	5,576	300		10,350	16,469	142	16,611
1994	373	8,089	300		12,028	20,790	428	21,218
1995	300	7,945	700		11,146	20,091	796	20,887
1996	141	8,451	790		10,164	19,546	66	19,612
1997	288	8,888	1,230		5,311	15,717	811	16,528
1998	24	5,424	0	737	390	6,575	99	6,674
1999	213	8,804	177		3,160	12,354	114	12,468
2000	0	4,829	0	761	0	5,590	50	5,640
2001	89	8,188	98	767	1,351	10,493	370	10,863
2002	59	7,138	128	1,036	708	9,069	188	9,257
2003	115	6,121	275	263	2,672	9,446	173	9,619
2004	88	6,483	423	167	3,785	10,946	292	11,238
2005	99	6,376	436	0	4,066	10,977	394	11,371
2006	63	5,757	606	0	2,332	8,758	314	9,072
2007	0	5,000	2	615	0	5,617	300	5,917
2002-06 Avg.	85	6,375	374	293	2,713	9,839	272	10,111
1997-06 Avg.	104	6,801	337	466	2,378	9,993	281	10,273

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

[h] Canadian sport fish harvest unknown prior to 1980.

[j] Canadian Chinook test fishery is conducted for management purposes, the fish harvested are retained and given to Aboriginal or Domestic users, but are not reported under those categories.

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

In 2002–2005, preseason management strategies were developed to not allow commercial fishing until near the midpoint of the Chinook salmon run. This interim strategy was designed to pass fish upstream for escapement, cross-border commitments to Canada, and subsistence uses in the event of a very poor run as occurred in 2000. However, a drawback to this approach is the harvest is not spread out over the entire run and commercial fishing is concentrated on only those stocks migrating during the latter half of the run. Furthermore, if the run is strong, delaying commercial fishing can result in forgone commercial harvest opportunities. The preferred strategy for managing commercial fisheries is to spread the harvest over the middle 50 percent of the run, starting near the first quarter point of the run. This strategy was in place before the decline in 1998. Additional harvest after the third quarter point can occur late in the season based on information from escapement projects. In 2007, based on the preseason projections, a short commercial fishing period was scheduled on the historic first quarter point (June 15) to target Chinook salmon, while the majority of the commercial harvest was spread over the middle 50 percent of the run. Lower Yukon Test Fishery (LYTF) indices, subsistence harvest reports, and Pilot Station sonar passage estimates provide information ADF&G uses to assess the inseason salmon run. As the run progresses upriver, other projects provide additional run assessment information.

Assuming an approximately normal return of 5-year-old and 6-year-old fish, the 2007 run was expected to be average to below average and similar in abundance to the 2006 run. It was anticipated the run would provide for escapements, support a normal subsistence harvest, and a below average commercial harvest. Therefore, ADF&G developed a conservative preseason management strategy in 2007 with a potential harvest ranging from 30,000 to 60,000 Chinook salmon.

Ice breakup in the lower river occurred on May 18, 4 days earlier than the historic average of May 22 (1979–2004). River conditions in the lower river early in the season were characterized as having lower than normal water levels. The first subsistence catch of Chinook salmon was reported on June 2 near Emmonak. ADF&G's LYTF recorded the first Chinook salmon catch on June 3. The subsistence salmon fishing schedule was initiated on May 28 in District 1 and implemented upriver chronologically consistent with migratory timing as the run progressed upstream.

Early run assessment indicated the Chinook and summer chum salmon runs were of adequate strength to allow subsistence salmon fishing to continue on the regulatory fishing schedule. Further assessment indicated that a surplus of Chinook and summer chum salmon was available for other uses. Once it is projected that there is a surplus beyond escapement requirements and subsistence uses, the schedule typically reverts to the pre-2001 BOF subsistence fishing regulations and the commercial season is opened. However, despite a short commercial opening on June 15 in District 2 occurring earlier in the run, the subsistence schedule was not terminated until June 19, 4 days after the opening of the commercial season in that district and on June 18 in District 1. The schedule was relaxed in Districts 3–5 in the same manner it was instituted, chronologically upriver based on run timing, to afford similar protection to the early run fish as in the lower river.

According to the LYTF CPUE data, approximately 50 percent (the midpoint) of the Chinook salmon run had entered the lower river by June 21, 1 day later than the average date for the midpoint. The Pilot Station sonar preliminary passage estimate was approximately 125,553 Chinook salmon. The first quarter point, midpoint, and third quarter point were on June 19, June 24, and July 1, respectively. The cumulative LYTF CPUE in 2007 was 19.21. Compared to previous years, this CPUE was below the 1989–2006 average of 22.99, and below the 1989–1997 (before the run decline) and 2003–2004 average of 25.74. The first quarter point, midpoint, and third quarter point were on June 16, June 22, and June 28 respectively.

Similar to the management strategy utilized in 2006, ADF&G scheduled a short, early commercial fishing period based on the preseason projection. The opening was intended to foster early commercial interest. The first commercial fishing period in the lower river occurred in District 2 on Friday, June 15 for 3 hours with unrestricted mesh size gillnets; this was the second shortest commercial opening targeting Chinook salmon on record. The commercial harvest was 2,081 Chinook and 142 chum salmon.

The LYTF nets observed the first and largest pulse of Chinook salmon from June 14 through June 17. Based on this pulse, the Chinook salmon run was estimated to be slightly later than average.

ADF&G delayed opening the next commercial period targeting Chinook salmon until June 18, 2 days after the first quarter point of the Chinook salmon run at the LYTF in District 1. During the second pulse from June 20 to June 24, it appeared that Chinook salmon were entering the river at a slow, steady rate rather than the more typical pulse-like entry pattern, and the run was not as strong overall as anticipated. A strong first pulse followed by a weaker second pulse is unusual. During the poor runs of 1998 and 2000, the LYTF CPUE and Pilot Station sonar estimates were lower than average throughout the run. As the 2007 run progressed, it became clear that the Chinook salmon run was not developing as expected and was weaker than the run observed in 2006.

The border passage estimate from the Eagle sonar project was approximately 41,200 Chinook salmon. However, the escapement target into Canada, which is based on the Canadian fish wheel mark–recapture border passage estimate, and is currently being managed at the rebuilt escapement level of 33,000–43,000 Chinook salmon, was not met in 2007. The border passage estimate provided by the Canadian assessment project was approximately 17,000 fish. However, the escapement target had been achieved consistently from 2001–2005. In summary, the 2007 Chinook salmon run was weaker than the run of 2006, and below the recent 10-year average of 210,000 Chinook salmon.
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Table 3-15 provides historic commercial Chinook catch numbers in the lower Yukon River. Lower Yukon Chinook harvests have trended downwards since the mid 1990s when nearly 120,000 Chinook were harvested. By 2001, there were no commercial Chinook openings in the Yukon River. Since 2001, the Chinook run has improved enough to allow for commercial openings with a peak harvest during that period of 52,548 in 2004. Since 2004, however, runs have weakened and catch has fallen steadily.

The 2007 lower Yukon Chinook catches were well below the five year and ten year averages in Districts one and 2 as well as overall. In District 3, the 2007 and 2007 Chinook catches were the first recorded since 1999. Historically, however, District 3 has had commercial Chinook harvests numbering more than 5,000. These data are depicted graphically in Fig. 3-21, which clearly shows that recent averages are well below historic harvest levels. Also shown clearly is the decline of commercial harvests in the 1990s, an improvement in the early 2000s, and the recent declines to harvest levels that are both below recent averages, but also considerably below historic commercial Chinook harvests in the lower Yukon.

The Upper Yukon River has historically accounting for a much smaller proportion of the total commercial Chinook catch (Table 3-16). District 4, has historically had commercial catches as high as 3,582 fish but there has been no commercial harvest in District 4 in recent years. Overall, upper Yukon commercial Chinook harvests have been well below historic levels during the 2000s, and the 2007 harvests were below 5 year and 10 year averages in all parts of the Upper Yukon. These trends are shown graphically in Fig. 3-22.

Table 3-15 Commercial Chinook salmon catch, by year, Lower Yukon Subdistricts, 1961-2007

Year	District 1	District 2	District 3	Lower Yukon Total
1961	84,466	29,026	4,368	117,860
1962	67,099	22,224	4,687	94,010
1963	85,004	24,221	7,020	116,245
1964	67,555	20,246	4,705	92,506
1965	89,268	23,763	3,204	116,235
1966	70,788	16,927	3,612	91,327
1967	104,350	20,239	3,618	128,207
1968	79,465	21,392	4,543	105,400
1969	71,688	14,756	3,595	90,039
1970	56,648	17,141	3,705	77,494
1971	86,042	19,226	3,490	108,758
1972	70,052	17,855	3,841	91,748
1973	56,981	13,859	3,204	74,044
1974	71,840	17,948	3,480	93,268
1975	44,585	11,315	4,177	60,077
1976	62,410	16,556	4,148	83,114
1977	69,915	16,722	3,965	90,602
1978	59,006	32,924	2,916	94,846
1979	75,007	41,498	5,018	121,523
1980	90,382	50,004	5,240	145,626
1981	99,506	45,781	4,023	149,310
1982	74,450	39,132	2,609	116,191
1983	95,457	43,229	4,106	142,792
1984	74,671	36,697	3,039	114,407
1985	90,011	48,365	2,588	140,964
1986	53,035	41,849	901	95,785
1987	76,643	47,458	2,039	126,140
1988	56,120	35,120	1,767	93,007
1989	61,570	33,166	1,645	96,381
1990	51,199	33,061	2,341	86,601
1991	56,332	39,260	2,344	97,936
1992	74,212	38,139	1,819	114,170
1993	49,286	37,293	1,501	88,080
1994	62,241	41,692	1,114	105,047
1995	76,106	41,458	0	117,564
1996	56,642	30,209	0	86,851
1997	66,384	39,363	0	105,747
1998	25,413	16,806	0	42,219
1999	37,161	27,133	538	64,832
2000	4,735	3,783	0	8,518
2001	0	0	0	0
2002	11,087	11,434	0	22,521
2003	22,709	14,220	0	36,929
2004	28,403	24,145	0	52,548
2005	16,694	13,413	0	30,107
2006	23,748	19,843	315	43,906
2007	18,616	13,306	190	32,112
5 year avg.	**20,528**	**16,611**	**63**	**37,202**
10 year avg.	**23,633**	**17,014**	**85**	**40,733**

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

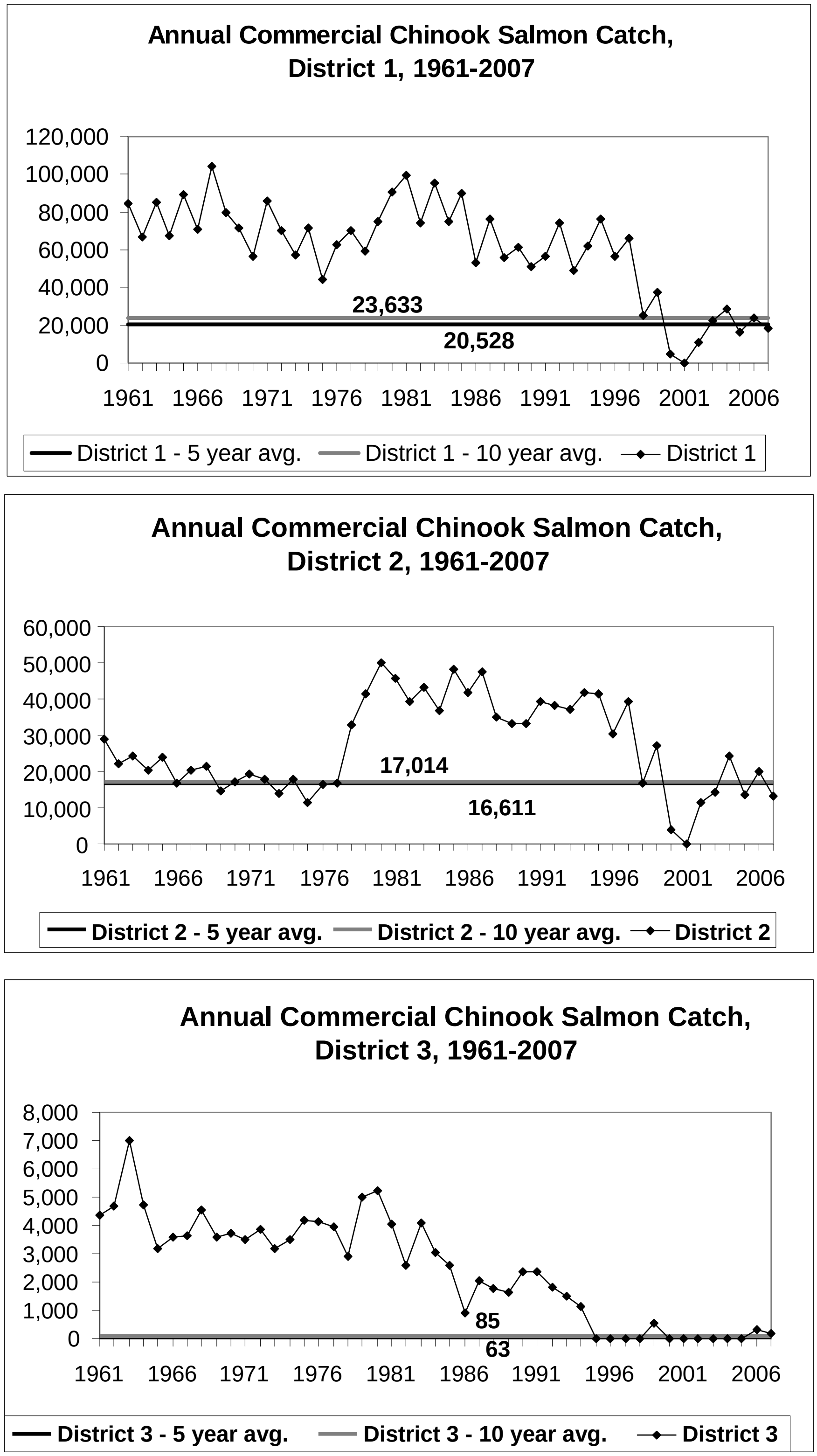


Fig. 3-21 Lower Yukon annual commercial Chinook catch by district, 1961-2007
Source: Derived from data provided to NMFS by ADF&G in response to a special data request

Table 3-16 Commercial Chinook salmon catch by year, Upper Yukon Subdistricts, 1974–2007

Year	District 4	District 5	District 6	Upper Yukon Total
1962	-	-	-	1,804
1963	-	-	-	724
1964	-	-	-	803
1965	-	-	-	1,081
1966	-	-	-	1,863
1967	-	-	-	1,988
1968	-	-	-	1,449
1969	-	-	-	1,126
1970	-	-	-	988
1971	-	-	-	1,651
1972	-	-	-	1,749
1973	-	-	-	1,092
1974	685	2,663	1,473	1,309
1975	389	2,872	500	4,821
1976	409	3,151	1,102	3,761
1977	985	4,162	1,008	4,662
1978	608	3,079	635	6,155
1979	1,989	3,389	772	4,322
1980	1,521	4,891	1,947	6,150
1981	1,347	6,374	987	8,359
1982	1,087	5,385	981	8,708
1983	601	3,606	911	7,453
1984	961	3,669	867	5,118
1985	664	3,418	1,142	5,497
1986	502	2,733	950	5,224
1987	1,524	3,758	3,338	4,185
1988	3,159	3,436	762	8,620
1989	2,790	3,286	1,741	7,357
1990	3,538	3,365	2,156	7,817
1991	3,582	3,826	1,072	9,059
1992	2,394	3,855	753	8,480
1993	1,577	3,008	1,445	7,002
1994	2,443	3,744	2,606	6,030
1995	499	3,242	2,747	8,793
1996	137	2,757	447	6,488
1997	1,457	3,678	2,728	3,341
1998	0	517	963	7,863
1999	1,437	2,604	690	1,480
2000	0	0	0	4,731
2001	0	0	0	0
2002	0	771	836	0
2003	562	1,134	1,813	1,607
2004	0	1,546	2,057	3,509
2005	0	1,469	453	3,603
2006	0	1,839	84	1,922
2007	0	1,241	281	1,923
5 year avg.	**112**	**1,352**	**1,049**	**2,128**
10 year avg.	**346**	**1,356**	**962**	**2,806**

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

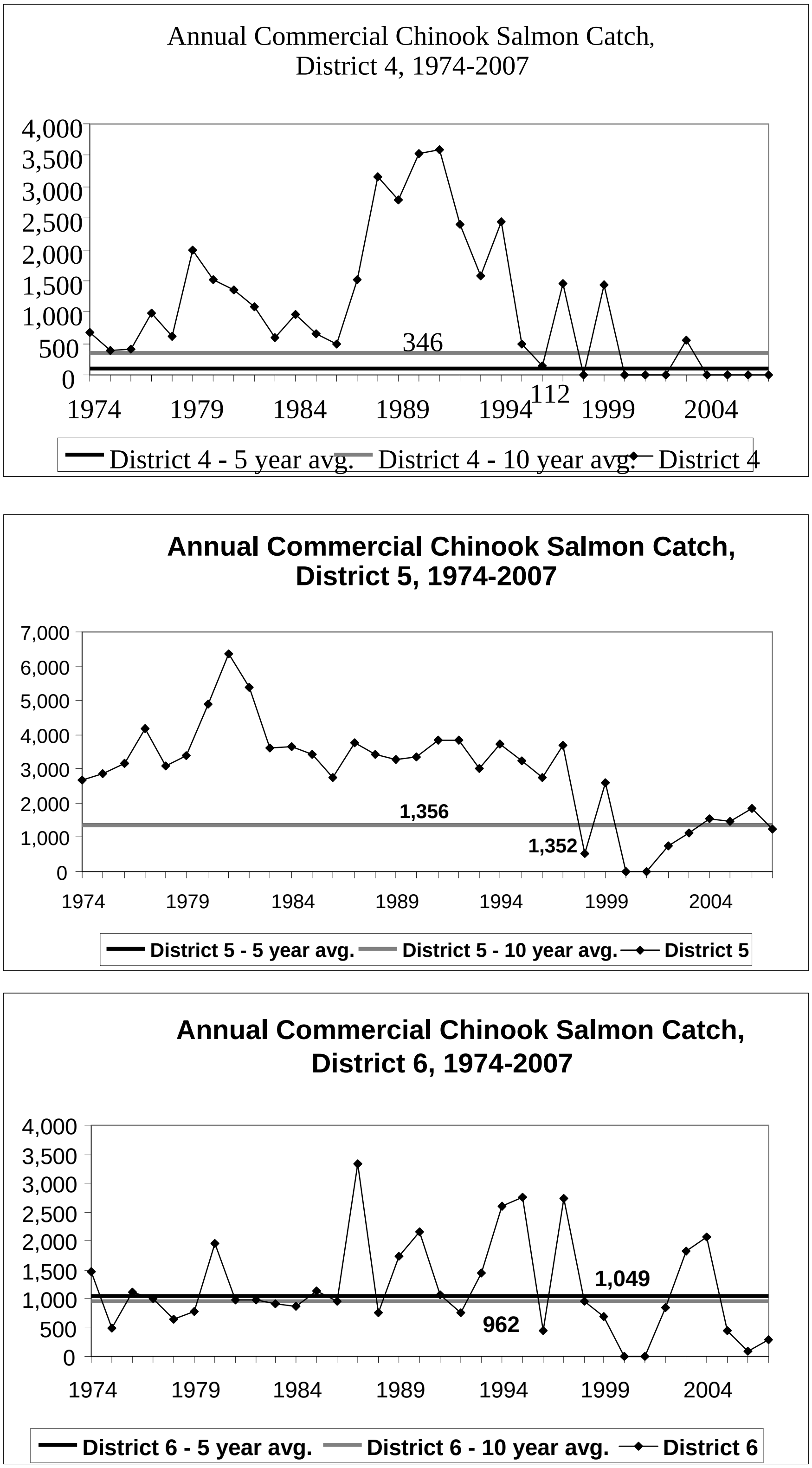


Fig. 3-22 Upper Yukon annual commercial Chinook catch by district, 1961-2007
Source: Derived from data provided to NMFS by ADF&G in response to a special data request

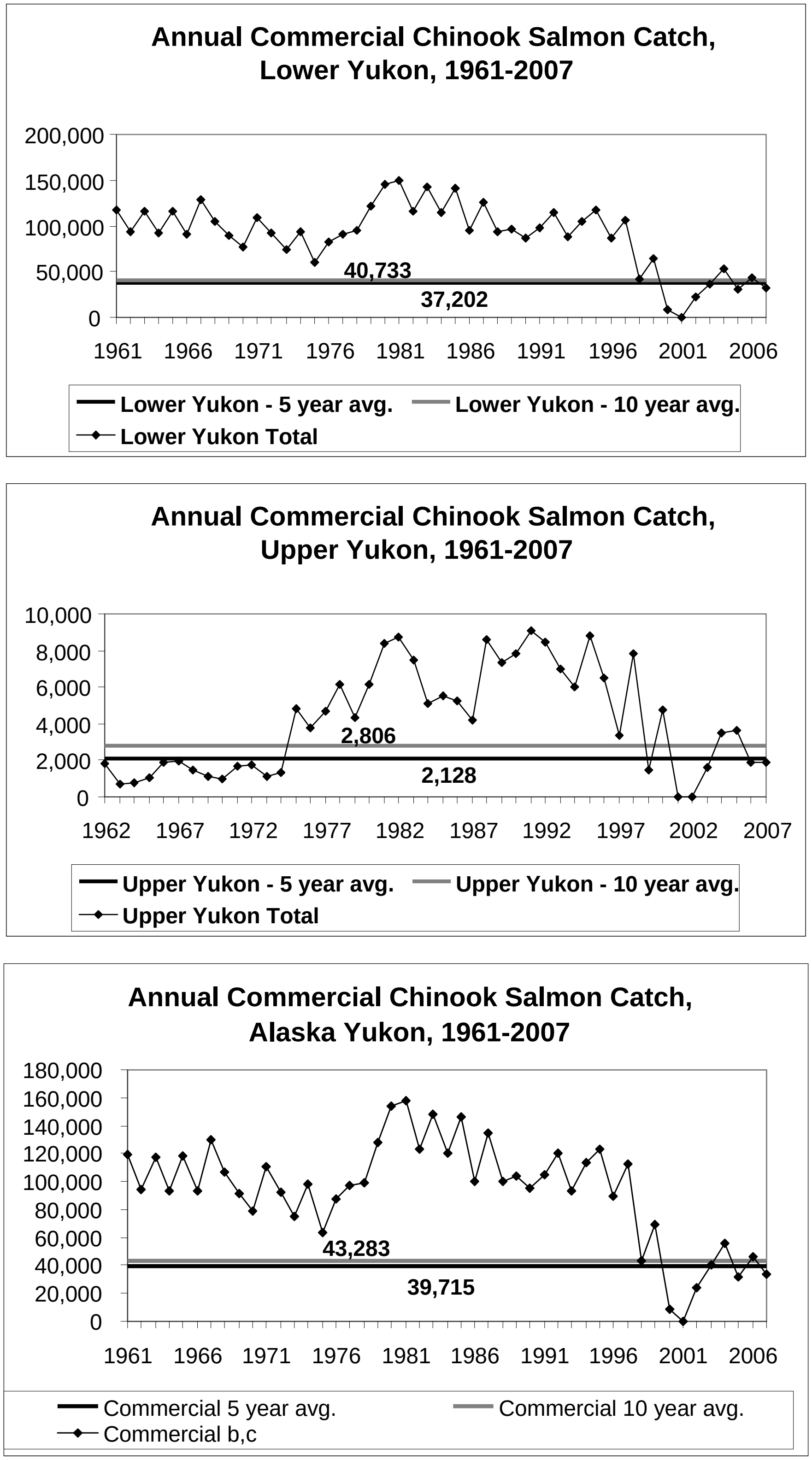


Fig. 3-23 Lower, Upper, and Alaska Yukon total annual commercial Chinook salmon catch, 1961-2007.
Source: Derived from data provided to NMFS by ADF&G in response to a special data request

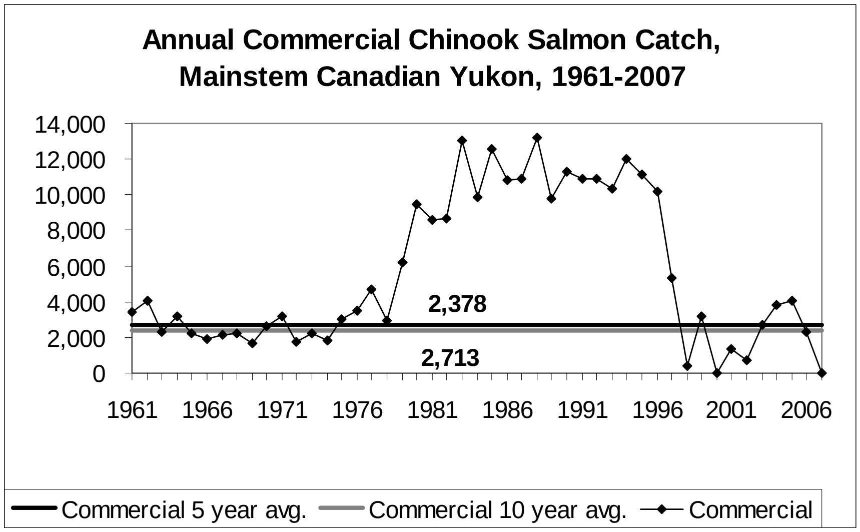


Fig. 3-24 Annual commercial Chinook salmon catch, mainstem Canadian Yukon, 1961-2007
Source: Derived from data provided to NMFS by ADF&G in response to a special data request

Fig. 3-24 displays annual commercial Chinook salmon catch for the mainstem of the Yukon River in Canada from 1961-2007. The underlying data for this figure is displayed in Table 3-14 at the beginning of this section. Canadian Yukon commercial harvest has historically been much lower than the commercial Chinook harvests in the U.S. portion of the Yukon River. Similar to the Alaska Yukon, peak harvests occurred in the 1980s and into the middle 1990s before declining rapidly in the late 1990s. Some improvement occurred in the early 2000s; however, Canadian Yukon commercial harvest fell precipitously from 2005 to 2007, when no commercial Chinook harvest was allowed in Canada.

Table 3-17 (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 2007 harvest was worth just under $2 million. A review of the summer chum data shows that the value of the summer chum fishery has fallen precipitously since the late 1980s, when the fishery was worth about $6.2 million. 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 3-18 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 and the value of these fisheries now exceeds five and ten year averages. Total value remains well below historic highs, as reflected in 2007 as seen in Chinook and summer chum values.

Table 3-17 Real gross ex-vessel revenue from commercial salmon fishing to Yukon Area fishermen, summer season, 1977-2007. (Values are inflation adjusted to 2007 value using the GDP deflator)

	Yukon Chinook			Yukon Summer Chum				
Year	Lower Value	Upper Value	Subtotal	Lower Value	Upper Value	Subtotal	Total Season	Total Value
1977	$5,153,101	$416,400	$5,569,501	$2,819,404	$857,849	$3,677,252	$9,246,753	$11,944,752
1978	$5,357,705	$173,838	$5,531,543	$5,417,227	$1,714,890	$7,132,118	$12,663,661	$15,011,784
1979	$6,674,002	$300,029	$6,974,031	$5,416,045	$1,074,542	$6,490,586	$13,464,618	$17,320,016
1980	$7,548,566	$251,675	$7,800,240	$2,275,655	$1,388,878	$3,664,533	$11,464,774	$12,819,882
1981	$8,947,968	$417,738	$9,365,706	$5,548,476	$1,416,634	$6,965,109	$16,330,815	$20,282,915
1982	$7,188,514	$310,385	$7,498,899	$2,361,259	$863,889	$3,225,148	$10,724,047	$12,735,484
1983	$7,512,261	$193,761	$7,706,022	$3,182,629	$517,295	$3,699,924	$11,405,946	$12,780,338
1984	$6,209,905	$181,037	$6,390,942	$1,639,483	$677,031	$2,316,513	$8,707,455	$10,028,082
1985	$7,371,493	$141,860	$7,513,354	$1,772,654	$1,019,273	$2,791,927	$10,305,281	$12,048,912
1986	$5,315,732	$123,213	$5,438,945	$2,933,162	$1,064,952	$3,998,114	$9,437,059	$10,515,510
1987	$8,875,455	$222,659	$9,098,115	$2,147,560	$529,053	$2,676,613	$11,774,728	$11,774,728
1988	$8,637,675	$224,936	$8,862,610	$7,906,196	$1,919,188	$9,825,384	$18,687,995	$21,151,840
1989	$7,893,260	$164,787	$8,058,047	$3,378,212	$2,097,756	$5,475,969	$13,534,016	$15,506,158
1990	$7,070,514	$154,431	$7,224,945	$729,763	$743,021	$1,472,784	$8,697,729	$9,559,325
1991	$10,101,380	$137,655	$10,239,035	$1,108,583	$888,761	$1,997,343	$12,236,378	$13,537,087
1992	$13,792,842	$234,104	$14,026,947	$840,808	$727,534	$1,568,342	$15,595,288	$15,697,367
1993	$6,612,781	$153,291	$6,766,072	$307,039	$275,885	$582,924	$7,348,997	$7,348,997
1994	$5,527,554	$164,755	$5,692,310	$105,010	$525,919	$630,929	$6,323,239	$6,346,116
1995	$6,908,500	$113,107	$7,021,607	$313,884	$1,377,569	$1,691,453	$8,713,060	$9,289,797
1996	$4,451,867	$60,286	$4,512,153	$113,503	$1,232,031	$1,345,534	$5,857,687	$6,117,579
1997	$6,835,691	$138,851	$6,974,542	$70,904	$121,410	$192,313	$7,166,856	$7,386,098
1998	$2,370,866	$21,440	$2,392,306	$32,765	$1,018	$33,784	$2,426,090	$2,426,090
1999	$6,053,044	$91,061	$6,144,105	$24,071	$2,103	$26,175	$6,170,279	$6,219,353
2000	$868,289	$0	$868,289	$10,331	$0	$10,331	$878,620	$878,620
2001 [a]	$0	$0	$0	$0	$0	$0	$0	$0
2002	$1,942,319	$23,826	$1,966,145	$4,987	$7,093	$12,080	$1,978,225	$1,978,225
2003	$2,104,390	$46,061	$2,150,451	$1,783	$7,736	$9,519	$2,159,970	$2,196,693
2004	$3,349,205	$41,859	$3,391,063	$9,712	$10,544	$20,256	$3,411,319	$3,423,476
2005	$2,067,232	$25,855	$2,093,086	$11,653	$14,274	$25,927	$2,119,013	$2,614,435
2006	$3,377,787	$33,498	$3,411,285	$24,496	$44,130	$68,626	$3,479,911	$3,785,704
2007 [b]	$1,939,114	$27,190	$1,966,304	$220,715	$34,421	$255,136	$2,221,440	$2,511,840
2002-2006 Average	$2,568,186	$34,220	$2,602,406	$10,526	$16,756	$27,282	$2,629,688	$2,799,707
1997-2006 Average	$2,896,882	$42,245	$2,939,127	$19,070	$20,831	$39,901	$2,979,028	$3,090,869

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.

Fig. 3-25, below, depicts the comparison between Yukon Chinook commercial value and total commercial value from all salmon fisheries from 1977-2007. 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 has improved since 2001, so has Chinook value and total value; however, with the decline in Chinook catch and value in 2007, it is not clear that the improvements since 2001 will be sustained as a continuing upward trend. The 2008 outlook for the commercial Chinook fishery (see below) does not alleviate this concern.

Table 3-18 Real gross ex-vessel revenue from commercial salmon fishing to Yukon Area fishermen, fall season, 1977-2007. (Values are inflation adjusted to 2007 value using the GDP Deflator)

	Yukon Fall Chum			Yukon Coho			
Year	**Lower Value**	**Upper Value**	**Subtotal**	**Lower Value**	**Upper Value**	**Subtotal**	**Total Season**
1977	$2,011,300	$285,977	$2,297,276	$394,422	$6,301	$400,723	$2,697,999
1978	$1,809,341	$269,604	$2,078,945	$253,212	$15,966	$269,178	$2,348,123
1979	$2,797,872	$840,010	$3,637,882	$201,580	$15,937	$217,517	$3,855,399
1980	$872,768	$438,614	$1,311,382	$38,470	$5,257	$43,727	$1,355,109
1981	$3,043,760	$722,216	$3,765,976	$176,878	$9,246	$186,124	$3,952,100
1982	$1,614,875	$101,602	$1,716,476	$259,123	$35,839	$294,961	$2,011,437
1983	$1,084,588	$236,641	$1,321,230	$32,109	$21,053	$53,162	$1,374,392
1984	$662,143	$182,918	$845,061	$452,885	$22,681	$475,566	$1,320,627
1985	$1,089,333	$305,756	$1,395,089	$302,544	$45,998	$348,542	$1,743,631
1986	$670,658	$50,904	$721,561	$355,955	$934	$356,889	$1,078,451
1987	$0	$0	$0	$0	$0	$0	$0
1988	$1,009,715	$239,189	$1,248,904	$1,161,007	$53,934	$1,214,940	$2,463,845
1989	$1,086,719	$341,212	$1,427,931	$492,481	$51,730	$544,211	$1,972,142
1990	$349,305	$256,612	$605,917	$201,374	$54,304	$255,678	$861,595
1991	$621,121	$223,659	$844,780	$425,382	$30,547	$455,929	$1,300,709
1992	$0	$75,026	$75,026	$0	$27,052	$27,052	$102,078
1993	$0	$0	$0	$0	$0	$0	$0
1994	$0	$11,292	$11,292	$0	$11,586	$11,586	$22,878
1995	$240,399	$217,708	$458,107	$103,961	$14,671	$118,631	$576,738
1996	$61,940	$57,935	$119,874	$123,416	$16,601	$140,017	$259,892
1997	$108,517	$9,095	$117,612	$100,299	$1,332	$101,630	$219,243
1998	$0	$0	$0	$0	$0	$0	$0
1999	$43,576	$1,071	$44,647	$4,426	$0	$4,426	$49,073
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	$6,740	$3,821	$10,561	$20,432	$5,730	$26,162	$36,723
2004	$1,231	$927	$2,158	$3,033	$6,966	$9,998	$12,156
2005	$335,375	$50,999	$386,374	$88,735	$20,313	$109,048	$495,422
2006	$208,021	$34,704	$242,725	$51,635	$11,433	$63,068	$305,793
2007 [b]	$144,256	$16,907	$161,163	$127,869	$1,368	$129,237	$290,400
2002-2006 Average	$110,273	$18,090	$128,364	$32,767	$8,888	$41,655	$170,019
1997-2006 Average	$70,346	$10,062	$80,408	$26,856	$4,577	$31,433	$111,841

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.

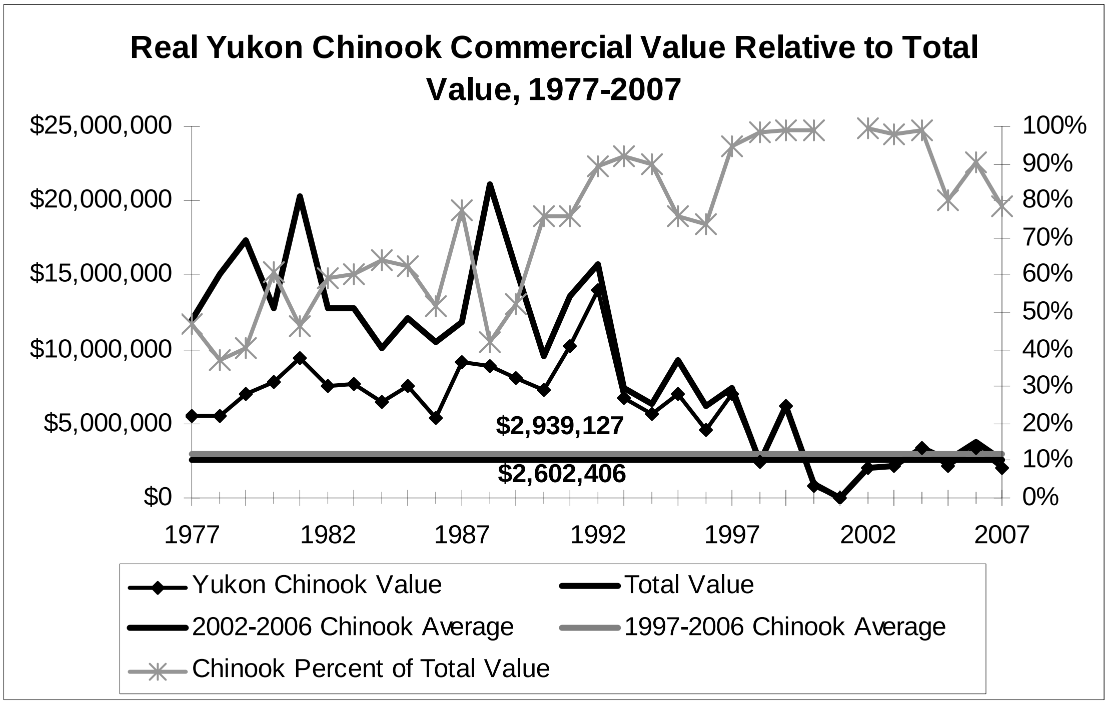


Fig. 3-25 Real Yukon Chinook commercial value relative to total value, 1977-2007. (Values are inflation adjusted to 2007 value using the GDP deflator)
Source: Derived from data provided to NMFS by ADF&G in response to a special data request

3.4.5 Bristol Bay

The Bristol Bay management area includes all coastal and inland waters east of a line from Cape Newenham to Cape Menshikof (Fig. 5-40). 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 Dye and Schwanke 2006, Fall and Krieg 2006, Sands et.al 2008, and data supplied by ADF&G).

Overview of Bristol Bay Salmon Fisheries

The five 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 (1987–2006) average over 24 million sockeye salmon, 67,000 Chinook, 937,000 chum, 98,000 coho, and 231,000 (even-years only) pink salmon. Since 1987, the value of the commercial salmon harvest in Bristol Bay has averaged $126 million, with sockeye salmon being the most valuable, worth an average $123 million. Subsistence catches are comprised primarily of sockeye salmon and average approximately 145,000 salmon. Sport fisheries harvest all species of salmon, with most effort directed toward Chinook and coho stocks. Approximately 40,000 salmon are harvested annually by sport fishermen in Bristol Bay.

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 BOF passed a regulation in 2003 allowing for two 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 were the most numerous at 1,862 in Bristol Bay (Area T), of those 1,621 fished in 2007. There were a total of 983 set gillnet permits in Bristol Bay, of those 836 made deliveries in 2007

Status of Runs and Conservation Concerns

Chinook salmon escapement into the Nushagak River was 60,000, 80 percent of the 75,000 inriver goal. Harvest was 51,000 Chinook in the Nushagak District. Peak Chinook salmon production in the early 1980's resulted in record commercial harvests and growth of the sport fishery. Declining run sizes and the question of how to share the burden of conservation among users precipitated the development of a management plan for Nushagak Chinook salmon. Since the plan was adopted in 1992, the Nushagak-Mulchatna Chinook Salmon Management Plan (NMCSMP) has governed management of the Nushagak Chinook salmon fisheries (5 AAC 06.361). The plan was amended in 1995, 1997, and 2003.

The purpose of this management plan is to ensure an adequate spawning escapement of Chinook salmon into the Nushagak River system. The plan 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, depending on the severity of the conservation concern. Management decisions are heavily dependent upon the estimates of inriver Chinook salmon escapement provided by the sonar project located near Portage Creek on the lower Nushagak River.

Trends in age composition of Chinook spawning escapements in 1995 and 1996 raised concerns about the quality of Chinook escapements in the Nushagak River. The proportion of large (age-5 through age-7) fish was less than desired, and the age composition of the escapement during the first half of the run differed substantially from that of the escapement during the second half of the run. In the early portion of the run, male Chinook salmon of the younger age classes comprised the majority of the run, while the older age classes became prevalent in the latter portion of the run. Differences in age composition between escapement and total run, and between early and late-season escapement can result from size-selective harvests. To address this concern, ADF&G adopted a strategy of allowing unfished pulses of Chinook into the Nushagak River before opening a commercial period. Allowing untargeted fish into the river was intended to lessen the effects of selectivity in the commercial fishery while allowing fish with a natural age distribution to enter the river. In November 1997, additional language directing ADF&G to allow pulses of Chinook salmon into the Nushagak River that were not exposed to commercial fishing gear, was added to the NMCSMP.

ADF&G adjusts commercial fishing time and area to harvest Chinook salmon surplus to the inriver goal. Management decisions are based on the preseason forecast and inseason indicators of run strength, including commercial harvest performance, subsistence harvest rates and inriver passage rates estimated by the sonar project. During the last 4 years, managers have used directed Chinook openings early in June to harvest fish when a surplus appears to be available. Because these openings usually occur during the first third of the run, harvest can be directed toward more segments of the run at a low level. However, this strategy also has the potential for complicating management if the second half of the run is significantly weaker than the first half. When a surplus is forecasted, early commercial openings provide for more time between openings allowing unfished pulses of fish to move through the district, better quality of fish in the harvest, and harvest spread over a larger portion of the run.

The 2007 Nushagak District Chinook salmon forecast was 215,000 fish. With an inriver goal of 75,000 fish, and average sport and subsistence harvest of 6,000 fish below the counting station, 134,000 Chinook would potentially be available for commercial harvest. In 2003, a new strategy was adopted to address concerns about incidental Nushagak sockeye catch in directed Chinook openings. This strategy focused on having directed Chinook openings as early and as often as escapement and the management plan would allow. In 2007, managers worked with the Nushagak Advisory Committee and other stakeholders to decide on the fishing schedule prior to the season. The preset schedule allowed stakeholders to plan ahead and provided more certainty for marketing purposes. The schedule could be suspended if escapement was less than expected. The preseason schedule allowed for five openings based on the preseason forecast and subsequent openings based on escapement.

A formal forecast is not issued for Chinook salmon in the Togiak District. Recently, Chinook run strengths district-wide have declined from a high of almost 52,000 in 1985, to a low of less than 18,000 in 2002. Chinook escapements in the Togiak River drainage fell short of the escapement goal (10,000) from 1986 through 1992. The Chinook escapement goal was reached from 1993 to 1995 with extensive commercial fishing closures and mesh size restrictions. In 1996, with only minor reductions in the weekly fishing schedule, Chinook escapement again fell short of the goal. The Chinook escapement goal in the Togiak River has been achieved consistently since that time. Reducing the weekly schedule to 48 hours per week in late June seems to provide a good balance between commercial fishing time and closures that allow Chinook escapement to be achieved.

Commercial Fishery Situation and Outlook

The runs of Chinook salmon to Bristol Bay are many; however, the Nushagak River is the only system large enough to justify producing a forecast. ADF&G does not forecast Chinook salmon for systems in the Naknek/Kvichak District, where the commercial harvest of Chinook salmon has remained relatively insignificant due to the current mesh size restrictions that have been implemented since the early 1990s and how the NRSHA is managed. Mesh restrictions are set by “Emergency Order” (E.O.) that prohibit gillnets with mesh size larger than 5.5 inches until July 21. In addition to mesh restrictions when commercial fishing in the NRSHA, the fishery is also regulated by scheduling commercial periods through part of the flood and into the ebb tide. This results in a portion of each tide with no fishing so all species of fish have an opportunity to pass through the fishery unmolested. Please see the Bristol Bay Annual Management Report for 2007 (Sands, 2008) for a complete treatment of the commercial fishery in the Bristol Bay region.

The reported 2007 Chinook salmon harvest in the Egegik District was 541 fish, 66 percent below the 20-year average of 1,195(

Table 3-19). The Ugashik District harvest of 1,445 Chinook salmon was 16 percent below the recent 20-year average of 1,705. Total Chinook harvest for the Togiak 7,755 fish, which was 92 percent of the 10-year average. Overall, Chinook salmon harvests in 2007 were below the recent 20-year averages in all districts. The 2007 bay-wide commercial harvest of 62,670 Chinook was below the 20-year average of 66,607. The main factor here was the unexpected shortfall in the Nushagak District where the harvest was only 51,350. This was well below the expected harvest of 140,000.

Chinook harvests generally trended downwards from the late 1990’s to mid-2000’s, with total harvest well below 20-year and 10-year averages. However, Chinook harvests improved considerably in 2004 and 2006, only to fall well short of expected catch in 2007. Fig. 3-26 shows the historic trend in Bristol Bay commercial Chinook catches from 1987 through 2007, and Fig. 3-27 provides a District level view.

Table 3-20 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 the Chinook fishery in terms of total value. Also evident is a significant decline in Chinook value since the mid-1990s. Chinook value fell from a peak of $2.1 million in 1994 to $154,000 in 2001. Since 2001, Chinook value has improved and the 2006 value of $1.365 million was greater than the 5, and 20 year averages.

Fig. 3-28 depicts the historical trends in commercial Chinook value as well as the percent of total value (right vertical axis) that Chinook value represents. Historically, Chinook value has never exceeded 2 percent of the total commercial value in Bristol Bay, and in 2007 it represented only about a half a percent.

Table 3-19 Chinook salmon commercial catch by district, in numbers of Fish, Bristol Bay, 1987-2007

Year	Naknek-Kvichak	Egegik	Ugashik	Nushagak	Togiak	Total
1987	5,175	2,959	4,065	45,983	17,217	75,399
1988	6,538	3,103	3,444	16,648	15,614	45,347
1989	6,611	2,034	2,112	17,637	11,366	39,760
1990	5,068	1,144	1,839	14,812	11,130	33,993
1991	3,584	510	589	19,718	6,039	30,440
1992	5,724	694	2,146	47,563	12,640	68,767
1993	7,468	1,464	2,811	62,971	10,851	85,565
1994	6,015	1,243	3,685	119,478	10,484	140,905
1995	5,084	760	1,551	79,942	11,981	99,318
1996	4,195	980	588	72,011	8,602	86,376
1997	3,128	2,143	1,096	64,160	6,066	76,593
1998	2,449	760	346	117,065	14,131	134,751
1999	1,295	712	1,638	10,893	11,919	26,457
2000	1,027	1,061	893	12,055	7,858	22,894
2001	904	950	989	11,568	9,937	24,348
2002	969	268	612	39,473	2,801	44,123
2003	567	131	409	42,615	3,231	46,953
2004	1,360	1,589	863	96,534	9,310	114,280[a]
2005	1,377	485	1,815	62,308	10,605	76,590
2006	2,333	915	2,608	84,881	16,225	106,962
20-Year Ave.	3,544	1,195	1,705	51,916	10,400	66,607
1987-96 Ave.	5,546	1,489	2,283	49,676	11,592	70,587
1997-06 Ave.	1,541	901	1,127	54,155	9,208	62,186
2007	1,579	541	1,445	51,350	7,755	62,670

a Total includes General District catch of 4,624.
* from 2007 season
Source: Data provided to NMFS by ADF&G in response to a special data request

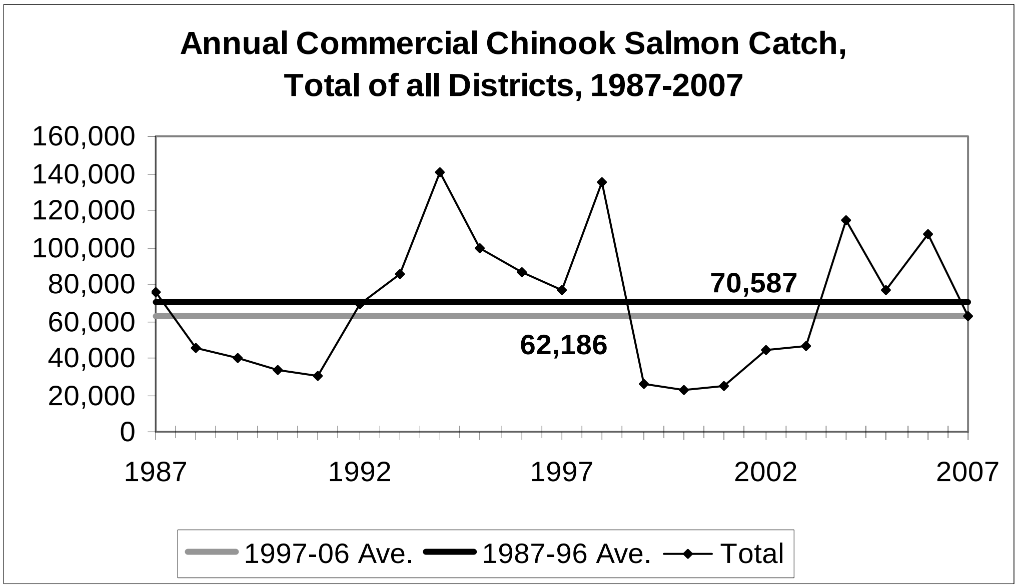


Fig. 3-26 Bristol Bay annual commercial Chinook catch, total all districts, 1987-2007
Source: Derived from data provided to NMFS by ADF&G in response to a special data request

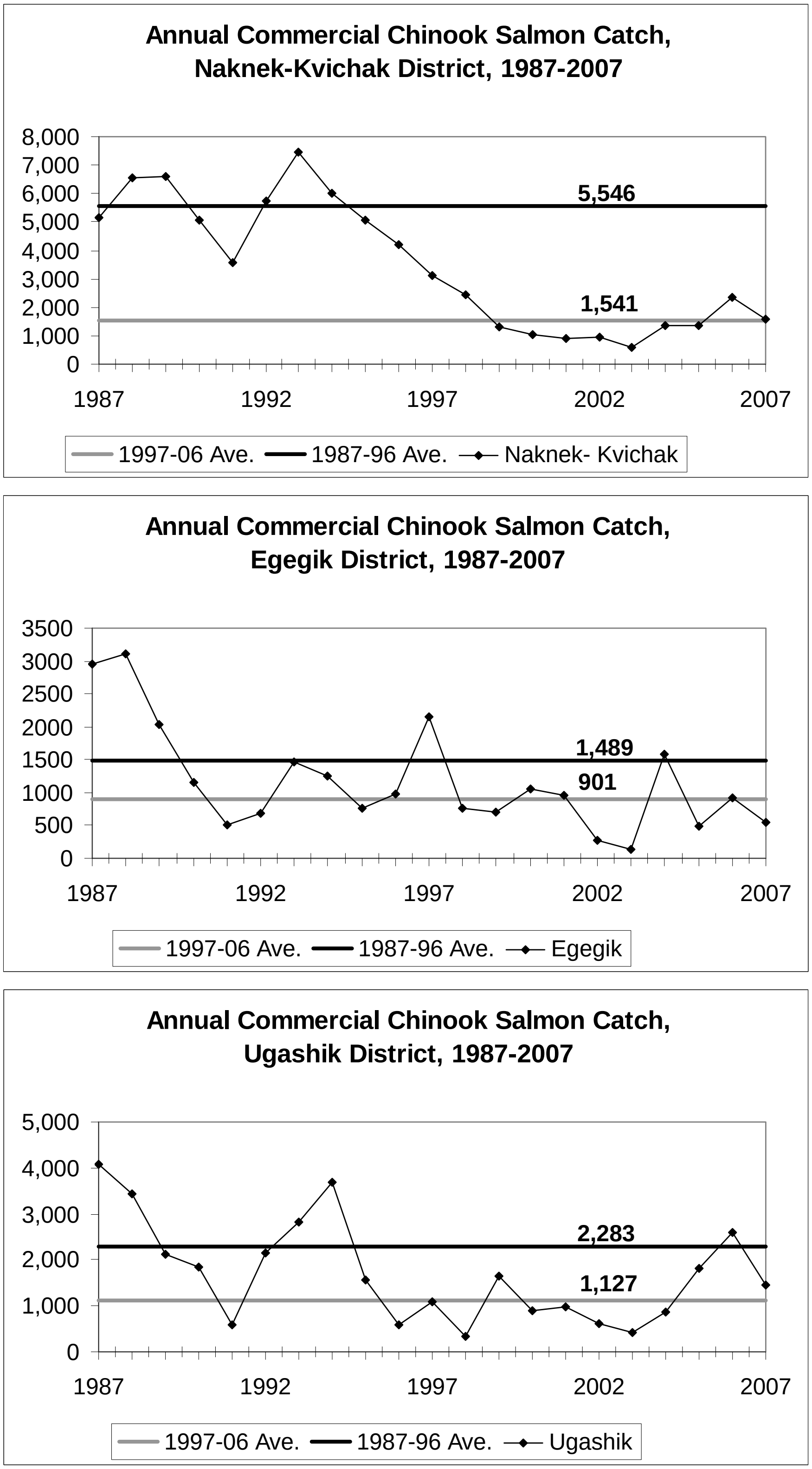
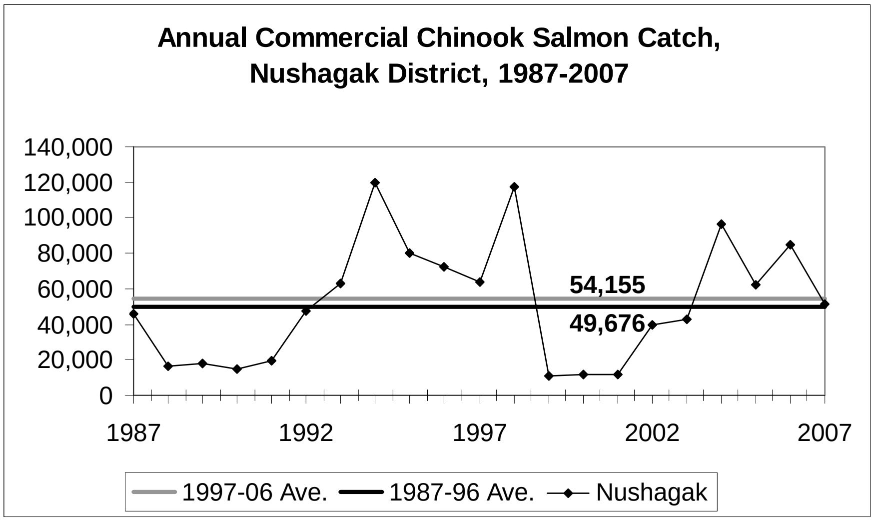


Fig. 3-27 Bristol Bay annual commercial Chinook catch by district, 1987-2007
Source: Derived from data provided to NMFS by ADF&G in response to a special data request



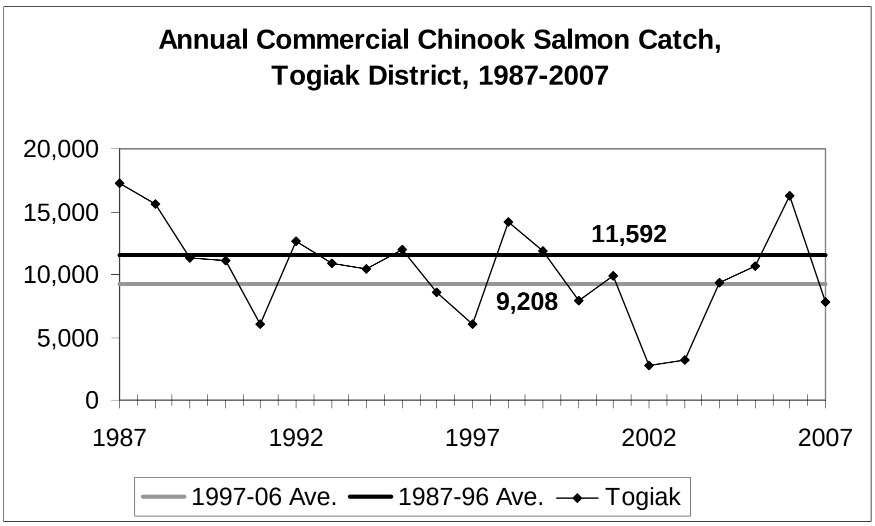


Fig. 3-27. (continued) Bristol Bay annual commercial Chinook catch by district, 1987-2007
Source: Derived from data provided to NMFS by ADF&G in response to a special data request

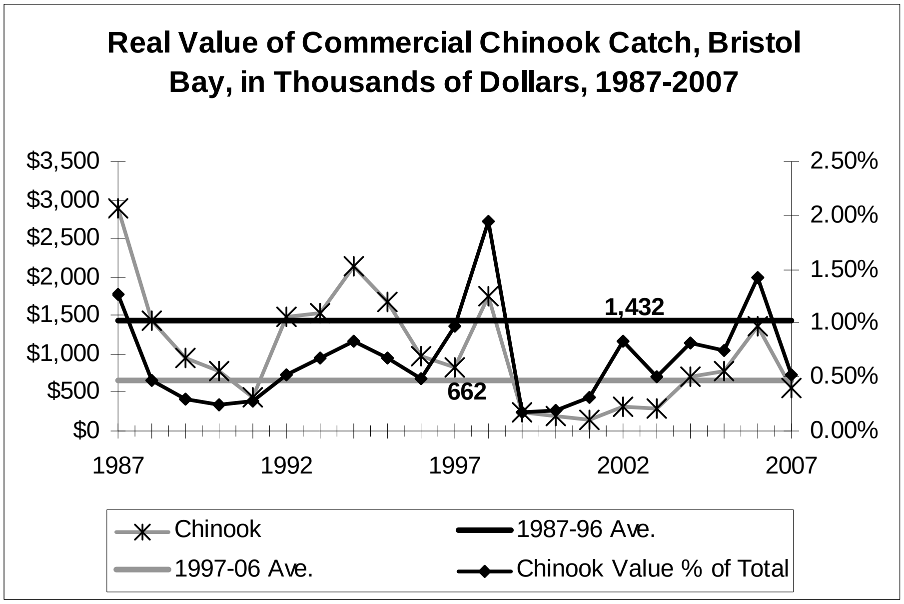


Fig. 3-28 Historical real value of commercial Chinook catch, Bristol Bay, 1987-2007
Source: Derived from data provided to NMFS by ADF&G in response to a special data request

Table 3-20 Estimated real ex-vessel revenue of the commercial salmon catch by species, in thousands of dollars, Bristol Bay, 1987-2007 (Inflation adjusted to 2007 value using the GDP deflator)

Year	Sockeye	Chinook	Chum	Pink[a]	Coho	Total
1987	$219,362	$2,900	$4,885		$533	$227,680
1988	$292,707	$1,437	$7,612	$1,905	$3,333	$306,993
1989	$313,272	$955	$3,089		$1,924	$319,242
1990	$308,080	$769	$2,552	$811	$827	$313,040
1991	$158,875	$448	$2,491		$697	$162,511
1992	$283,426	$1,486	$2,114	$348	$1,097	$288,469
1993	$220,815	$1,534	$1,617		$356	$224,322
1994	$250,465	$2,142	$1,592	$54	$1,351	$255,606
1995	$244,071	$1,682	$1,640		$184	$247,578
1996	$192,489	$961	$773	$9	$428	$194,660
1997	$82,452	$818	$248		$230	$83,749
1998	$87,484	$1,754	$290	$9	$624	$90,162
1999	$140,005	$253	$498		$119	$140,874
2000	$100,446	$197	$278	$19	$482	$101,422
2001	$47,206	$154	$793		$47	$48,200
2002	$36,638	$312	$333		$22	$37,304
2003	$53,974	$280	$542		$87	$54,883
2004	$85,157	$707	$435	$21	$173	$86,493
2005	$102,350	$782	$1,019		$163	$104,312
2006	$92,630	$1,365	$1,386	$20	$183	$95,584
2007	$103,192	$549	$1,288	$0	$127	$105,156
20 Year Ave.	$165,595	$1,047	$1,709	$355	$643	$169,154
1987-96 Ave.	$248,356	$1,432	$2,836	$625	$1,073	$254,010
1997-06 Ave.	$82,834	$662	$582	$17	$213	$84,298

Source: Derived from data provided to NMFS by ADF&G in response to a special data request. Note: Gross revenue paid to fishermen, derived from price per pound times commercial catch. Blank cells represent no data.

a: Included even-years only.

3.5 Sport and Personal Use Fisheries by Region

Based upon the best available scientific information, NMFS has asserted that the bycatch of Chinook salmon in the pollock fishery 'may' be affecting stocks of western Alaska Chinook and associated subsistence, commercial, and sport fisheries. Our knowledge of these complex ecological, biological, and economic relationships remains incomplete at this time. That being said, these data deficiencies do not remove NMFS's obligation to use the "best available scientific information" to evaluate, in this case, Chinook bycatch reduction alternative actions in the Bering Sea pollock fishery, and their potential to benefit those with historical Chinook salmon allocation rights, including sport fishermen[38]. This section provides background information on trends in Chinook salmon harvest in sport and personal use fisheries in the action area.

3.5.1 Kotzebue Sport Fishery Situation and Outlook

The Kotzebue/Chukchi Sea sub-area includes all waters and drainages of the Selawik, Kobuk, Noatak, Wulik, Kivalina and Kukpuk rivers. The Noatak and Kobuk rivers each drain approximately 12,000 sq mi (31,000 km^2) of the western Brooks Range. The Kobuk River is 360 mi (576 km) in length while the Noatak is 400 mi (640 km). The area's third largest drainage is that of the Selawik River, with an approximate drainage area of 4,600 sq mi (11,700 km2). The Noatak River is a National Wild and Scenic River and most of the drainage is included in the Noatak National Park Preserve. The extreme upper headwaters of both the Noatak and Kobuk rivers are included in the Gates of the Arctic National Park. A portion of the lower Kobuk Valley between Kiana and Ambler is included in the Kobuk Valley National Park, and the Salmon River tributary, as well as the upper main stem of the Kobuk River are National Wild and Scenic Rivers as is the Selawik River. Much of the Selawik River valley is part of the Selawik National Preserve.

These three large river systems contain abundant fisheries resources. The Noatak River produces a large run of chum salmon that maintains a Kotzebue-based commercial fishery. Many thousands of anadromous Dolly Varden overwinter in the lower 300 km of the river and spawn in some of the river's tributary streams. This system is known for the large size of its Dolly Varden, and the current state record 8.9 kg (19.75 lbs.) was taken in 1991 from the Noatak River. Whitefish, Arctic grayling, burbot, and northern pike are resident in the Noatak River. Sheefish use the lower reaches of the river for feeding during the spring of the year, but are not known to spawn there. Both the Selawik and Kobuk rivers support spawning populations of sheefish in their upper reaches. Hotham Inlet, Selawik Lake, and the delta systems at the river mouths serve as winter feeding areas for juvenile and adult sheefish. Sheefish in these populations are slower growing, but attain a larger size than those in other areas of Alaska. The Alaska state record sheefish, 24 kg (53 lbs), was taken in 1986 from the upper Kobuk River. Abundant whitefish utilize the rivers, including Selawik Lake and Hotham Inlet and provide a food base for sheefish, northern pike and burbot. Dolly Varden, northern pike, Arctic grayling, burbot, lake trout, and Arctic char inhabit various parts of the Kobuk watershed.

The Wulik and Kivalina rivers, which empty into the Chukchi Sea near the village of Kivalina, support populations of Arctic grayling and anadromous Dolly Varden. Sport fishing effort in northwest Alaska is relatively light compared to most other areas in the state. Heaviest use occurs on the Noatak, Kobuk, and Wulik rivers. Many visitors to Gates of the Arctic National Park, Kobuk Valley National Park, and the Noatak National Park Preserve participate in float trips on the Kobuk River or Noatak rivers. Guided and unguided anglers and river floaters use these rivers for raft, canoe, and kayak trips. Lake trout and Arctic grayling occur in Matcharak, Feniak, and Desperation lakes and in other lakes in the middle and upper Noatak drainage. Some lakes also contain Arctic char. Most lakes in the area are accessible during summer months only by floatplane. The lower floodplains of the Kobuk and Selawik rivers, especially in the vicinity of the Kobuk River delta, and the lower Noatak River contain hundreds of shallow thaw lakes of various sizes. Fisheries resources in this area have been poorly inventoried, but populations of whitefish, and northern pike are known

[38] From response to public comment 10-23 in EIS Chapter 9, the Comment Analysis Report.

to be seasonally present. Dolly Varden spawn in several Kobuk River tributary streams. The mountains in the upper Kobuk River drainage contain several relatively large lakes. Lake trout, Arctic grayling, Arctic char, northern pike, and several species of whitefish inhabit Walker, Selby, and Nutuvukti lakes.

Additional information is available at:
http://www.sf.adfg.state.ak.us/Management/Areas.cfm/FA/northwestOverview.overview

3.5.2 Norton Sound Sport Fishery Situation and Outlook

The Seward Peninsula Norton Sound sub area extends from the Seward Peninsula southward to the Yukon River. Streams in eastern Norton Sound include the Golsovia, Unalakleet, Egavik, Shaktoolik, Inglutalik, Ungalik and Koyuk rivers. All but the Koyuk drain the Nulato Hills which separate Norton Sound from the Yukon and Koyukuk River valleys. The Unalakleet River is the largest and most heavily utilized of these. The village of Unalakleet is located at the mouth of this river. The upper reaches of the Unalakleet River have been designated a National Wild and Scenic River and are under the management of the Bureau of Land Management. The river supports anadromous populations of Dolly Varden, Chinook, coho, chum and pink salmon and resident populations of Dolly Varden, Arctic grayling, and whitefish. Other area streams provide the opportunity for high quality fisheries for the same species, but are not as intensively fished because of the difficult access.

Many streams located along the southern half of the Seward Peninsula between Koyuk and Teller (including the Fish, Niukluk, Bonanza, Eldorado, Nome, Snake, Sinuk, Feather, Tisuk, Pilgrim, and Kuzitrin rivers) are accessible via the Nome road system and offer sportfishing opportunity for Arctic grayling, Dolly Varden, salmon and northern pike (Fish, Pilgrim and Kuzitrin). However, many of these streams are closed to chum salmon fishing because of weak runs,

Small sockeye salmon runs occur in the Pilgrim and Sinuk rivers, and a few remnant late run sockeye are present in most other locations while Chinook salmon are present in the Pilgrim and Fish Rivers. Large size Arctic grayling, some over 1.4 kg (3 lbs), are present in many Seward Peninsula rivers and many of Alaska's largest Arctic grayling have been taken there. Other remote streams are accessible by aircraft or boat from nearby villages and receive little sport fishing effort.

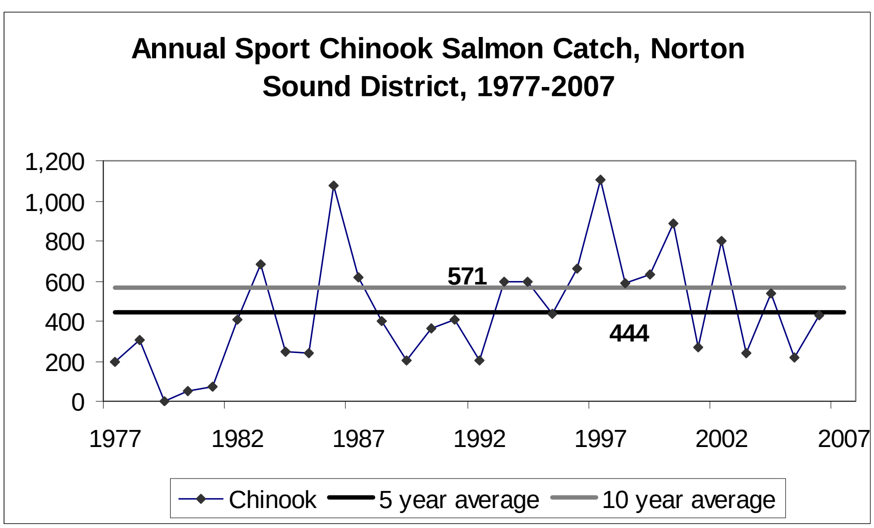


Fig. 3-29 Norton Sound Region sport Chinook salmon catch, 1977-2007.
Source: Derived from data provided to NMFS by ADF&G in response to a special data request

Table 3-21 Sport salmon catch by species, by year for all subdistricts in Norton Sound District, 1977-2007.

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1977	197	0	449	2,402	670	3,718
1978	303	0	742	7,399	546	8,990
1979	-	-	-	-	-	-
1980	52	0	1,455	7,732	1,601	10,840
1981	70	0	1,504	3,101	1,889	6,564
1982	409	0	2,986	13,742	2,620	19,757
1983	687	0	3,823	4,583	2,042	11,135
1984	247	351	7,582	8,322	1,481	17,983
1985	239	20	1,177	1,138	1,036	3,610
1986	1,077	19	3,926	3,172	1,719	9,913
1987	615	924	2,319	1,304	814	5,976
1988	400	782	5,038	2,912	1,583	10,715
1989	203	165	4,158	3,564	1,497	9,587
1990	364	198	3,305	7,647	925	12,439
1991	404	237	5,800	1,738	1,415	9,594
1992	204	131	4,671	6,403	523	11,932
1993	595	10	3,783	2,250	691	7,329
1994	600	18	5,547	7,051	536	13,752
1995	438	104	3,705	928	394	5,569
1996	662	100	7,289	5,972	662	14,685
1997	1,106	30	4,393	1,458	278	7,265
1998	590	16	4,441	6,939	682	12,668
1999	630	0	5,582	3,039	211	9,462
2000	889	45	7,441	2,886	1,097	12,358
2001	271	39	4,802	360	1,709	7,181
2002	802	0	4,211	4,303	818	10,134
2003	239	572	3,039	2,222	292	6,364
2004	535	404	5,806	8,309	498	15,552
2005	216	0	3,959	473	36	4,684
2006	427	22	11,427	5,317	344	17,110
2007						
5 year avg.	**444**	**200**	**5,688**	**4,125**	**398**	**10,769**
10 year avg.	**571**	**113**	**5,510**	**3,531**	**597**	**10,278**

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

Norton Sound region sport salmon catch, by species, from 1977 through 2006 are shown in Table 3-21. Data prior to 1977 is not available and 2007 data is not available as processing of sport fishing surveys is not yet complete. Sport Chinook catches in the region have mimicked the declines in the subsistence and commercial Chinook catches. The peak sport catch of Chinook in the Norton Sound region was in 1997, when 1,106 fish were caught. Sport Chinook catch in the region has trended downward since then and the 2006 catch 427 fish was slightly below the 5 and 10 year averages (Fig. 3-29). Overall; however, sport catch in 2006 was the second highest number on record largely due to a record coho catch.

3.5.3 Kuskokwim Area Sport Fishery Situation and Outlook

Kuskokwim Area sport fisheries are divided between 2 management areas. The Lower Kuskokwim Management Area (LKMA) includes waters including and downstream of Aniak and all drainages in Kuskokwim Bay (Lafferty 2004). The Upper Kuskokwim Management Area (UKMA) includes all waters of the Kuskokwim River upstream of Aniak (Burr 2004).

Since the BOF discontinued the stock of concern designation for Kuskokwim River chum salmon it also lifted sport fishing restrictions on chum salmon in the Aniak River drainage. Chum salmon can now be harvested by sport fishermen in the Aniak River drainage. The bag and possession limit for king, pink, sockeye, chum and coho salmon is three fish for all salmon, of which no more than two can be Chinook salmon.

3.5.4 Yukon River Personal Use and Sport Fishery Situation and Outlook

Subdistrict 6-C falls entirely within the Fairbanks Nonsubsistence Area and is managed under personal use regulations. Personal use salmon fishing permits are required in Subdistrict 6-C and can be obtained from ADF&G's office in Fairbanks. Personal use fishermen must possess a valid State of Alaska resident sport fishing license and report their harvests to ADF&G each week. Only one personal use salmon permit per household is allowed annually. The annual possession limit per permit holder is 10 Chinook salmon and 75 chum salmon for periods through August 15, and 75 chum and coho salmon in combination for the time period after August 15. Subdistrict 6-C fishery harvest limits are 750 Chinook, 5,000 summer chum, and 5,200 fall chum and coho salmon combined. If a harvest limit is reached inseason, the Subdistrict 6-C personal use fishery will be closed.

The personal use fishing schedule is two, 42-hour periods per week by regulation and fishing is from 6:00 p.m. Monday until 12:00 noon Wednesday and from 6:00 p.m. Friday until 12:00 noon Sunday. Whitefish and suckers may also be taken with dip nets under personal use fishing regulations and a separate personal use whitefish/sucker permit is required.

Annual personal use and sport Chinook salmon catch in the Alaska Yukon is shown in Fig. 3-30, and sport catch in the mainstem Canadian Yukon is shown in Fig. 3-31. Alaska Yukon catches had peaks in the late 1980s, again in the mid 1990s, and then declined, along with commercial catches, in the late 1990s and early 2000s. Catches rebounded considerably in 2004, but have declined since then. In the mainstem Canadian Yukon, historic data shows a flat catch rate that then peaked in the late 1990s before mimicking the declines seen in other parts of the Yukon through 2000, when no sport catch was recorded. From 2000 through 1996 catches improved continuously before the low returns in 2007 resulted in no sport Chinook catch in the mainstem Canadian Yukon.

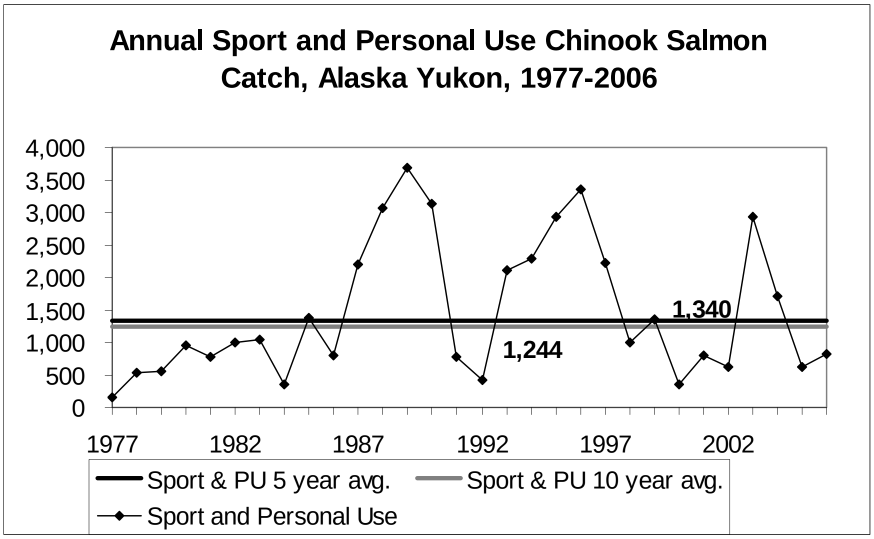


Fig. 3-30 Annual sport and personal use Chinook salmon catch, Alaska Yukon, 1977-2006
Source: Derived from data provided to NMFS by ADF&G in response to a special data request

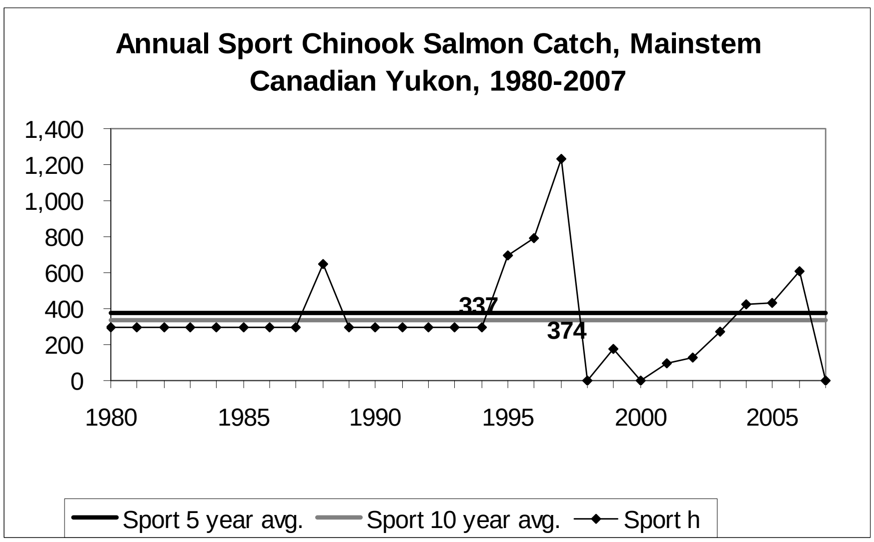


Fig. 3-31 Sport and personal use Chinook salmon catch, Alaska Yukon, 1980-2006
Source: Derived from data provided to NMFS by ADF&G in response to a special data request

3.5.5 Bristol Bay Area Sport Fishery Situation and Outlook

This section has been excerpted from ADF&G special publication No. 06-29; Report to the BOF for the Recreational Fisheries of Bristol Bay, 2004, 2005, and 2006 (Dye, et.al. 2006). This report is the most current report available on the Bristol Bay sport fisheries.

Bristol Bay is home to several world-class Chinook salmon sport fisheries. The peak of the sport Chinook salmon fishery occurs from mid-June to mid-July in the lower reaches of the Alagnak, Nushagak, Naknek, and

Togiak rivers, as well as several smaller rivers. Chinook salmon stocks throughout the management area significantly increased in abundance from the late 1970s through the early 1980s. From about 1984 through the 1990s, Chinook salmon abundance in Bristol Bay returned to previous levels.

The Chinook salmon sport fisheries of the area, like the sport fisheries for most species, are fished primarily by guided anglers. With few exceptions, the guided to unguided angler ratio is about 3 to 1. Anglers usually keep less than 50 percent of the fish they catch, especially since the adoption of area-wide annual bag limits.

Sport fishing harvests of Chinook salmon have loosely followed the trends in abundance, reaching peaks of 17,404 fish in 1987 and 17,544 fish in 1994 (Table 3-22). Chinook salmon typically account for approximately 20-30 percent of the sport salmon harvest in Bristol Bay. The 2000 through 2004 sport harvest estimate averaged slightly more than 10,000 Chinook salmon. The 2005 sport harvest for the whole Bristol Bay area was 13,076 fish. The 2005 commercial harvest was 75,569 fish and the subsistence harvest was 15,628 fish. The 2005 sport harvest was about 11 percent of the total Bristol Bay Chinook salmon harvest, which is similar to the 1995 through 2004 average.

Since 1960, bag limits for Chinook salmon in Bristol Bay, and across Alaska, have become increasingly conservative and complex. The most conservative and sweeping regulatory changes to the area's Chinook salmon fisheries were adopted during the November and December 1997 BOF meetings. A Bristol Bay-wide annual limit of five Chinook salmon was adopted, and in the Nushagak River drainage, anglers were further restricted to an annual limit of four Chinook salmon. The daily bag limits in several other major fisheries were reduced slightly. Season closures of July 25 or 31 were adopted for all Bristol Bay waters to protect spawning Chinook salmon.

In 2001, a statewide regulation (5 AAC 67.010 (b)) created a daily bag and possession limit for Chinook salmon under 20 inches of 10 per day in all fresh waters open to Chinook salmon sport fishing, except for the Nushagak River drainage. The limit is in addition to the daily limits for Chinook salmon 20 inches or longer. Chinook under 20 inches do not count toward the annual limit of four and are in addition to the daily bag limit for Chinook salmon 20 inches or longer. The sole exception is the Nushagak River which has a daily bag and possession limit of five Chinook salmon under 20 inches per day.

In the drainages of the Alagnak, Egegik, Kvichak, Igushik, Naknek, Snake, and Ugashik rivers, the daily bag and possession limits for Chinook salmon are uniform at three per day, one of which may exceed 28 inches in length (5 AAC 67.020. (1)). Additionally, recent changes were made to Chinook salmon fisheries regulations including the Nushagak-Mulchatna Chinook Salmon Management Plan, harvest limits in the Wood River drainage, and waters open to fishing in Big Creek in the Naknek River drainage.

Anglers are prohibited from removing a Chinook salmon from the water before releasing the fish in all fresh waters of Bristol Bay. Any Chinook salmon removed from the water must be kept and becomes part of an angler's daily bag limit. The goal of this regulation is to improve the potential survival of released Chinook salmon and to encourage anglers to be more careful with the fish they release.

Table 3-22 Sport harvest of Chinook salmon, by fishery, in the Bristol Bay Sport Fish Management Area, 1977-2005.

Drainage	1977-1993 Average	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2000-2004 Average	2005
Eastern														
Naknek R.	3,462	3,692	4,153	2,984	4,231	3,443	2,697	2,105	2,656	2,170	2,412	3,004	2,469	2,140
Brooks R.	10	0	19	0	12	0	0	0	0	0	0	0	0	0
Kvichak R.	146	90	175	107	47	239	0	167	61	18	183	27	91	217
Copper R.	19	0	9	43	0	17	22	20	0	0	0	27	9	0
Alagnak R.	665	1,048	891	931	982	1,531	592	501	508	305	334	1,146	559	1,008
Newhalen R.	3	30	9	0	0	0	0	0	0	0	0	13	3	0
Lake Clark	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	241	739	461	459	1,110	813	423	379	109	140	144	557	266	267
Subtotal[a]	4,423	5,599	5,717	4,524	6,382	6,043	3,734	3,172	3,334	2,633	3,073	4,774	3,397	3,632
Central														
Nushagak	1,761	8,871	4,476	4,691	3,343	5,350	3,894	5,785	5,623	3,693	5,590	6,773	5,493	7,399
Mulchatna	863	1,675	402	644	154	265	262	200	221	191	317	40	194	134
Agulowak					0	0	30	0	0	0	0	0	0	0
Agulukpak					0	30	25	0	0	0	0	0	0	0
Wood River L.[b]	70	435	93	85	23	57	58	0	208	104	186	87	117	15
Tikchik/Nuyakuk	33	60	73	11	0	170	12	0	25	58	48	93	45	61
Other	175	201	193	332	186	120	372	268	12	68	21	40	82	101
Subtotal[a]	2,862	11,242	5,237	5,763	3,706	5,992	4,653	6,253	6,089	4,114	6,162	7,033	5,930	7,710
Western														
Togiak drainage	175	663	581	790	1,165	763	644	478	1,004	76	706	1,388	730	1,734
Other	4	40	9	0	0	130	0	0	0	0	0	0	0	0
Subtotal[a]	177	703	590	790	1,165	893	644	478	1,004	76	706	1,388	730	1,734
Total		17,544	11,544	11,077	11,253	12,928	9,031	9,903	10,427	6,823	9,941	13,195	10,058	13,076

Source: Data provided by ADF&G from the Statewide Harvest Survey database. 1996-1998 estimates were revised in 2001, so may not match previously published estimates.

[a] Subtotals of averages may not be the sum of the drainages because information for some drainages is not available for some years.

[b] Wood River Lakes includes Lake Nunavaugaluk. Until 1997, Agulowak and Agulukpak rivers were included in Wood River Lakes.

3.6 Chinook Salmon Run Synopses, 2008 and 2009

This section provides updates of the Chinook salmon runs in 2008 and 2009 for the Norton Sound, Kuskokwim, Yukon, and Bristol Bay Regions. This information was provided in ADF&G news releases as well as from ADF&G regional fishery managers. At the present time (August 2009) the 2009 season is ongoing. Thus, 2009 synopses are preliminary.

Norton Sound Chinook Salmon Run Synopsis.

2008[39]

The 2008 Norton Sound Chinook salmon run is arguably the poorest return on record. At the onset of the season, a directed Chinook salmon commercial fishery was not expected, and early closures to the subsistence and sport fisheries were anticipated for Subdistricts 5 and 6 in early July. There was some optimism about meeting escapement needs while also avoiding an early closure, which was based on a combination of factors. These included: (1) sufficient escapements observed during the predominant brood years (2002 and 2003) for the 2008 return, (2) a restrictive subsistence fishing schedule that provides escapement windows throughout

[39] Excerpted from Memo, dated September 10, 2007, to John Hilsinger of ADF&G from Western Alaska area managers regarding Western Alaska Chinook stock status in 2008.

the run, and (3) mesh-size restrictions that were planned for the Unalakleet River on June 30, which were aimed at conserving age 5 and 6 Chinook salmon during their peak migration period.

The Unalakleet and Shaktoolik Rivers are the largest producers of Chinook salmon in Norton Sound. Management of Subdistricts 5 (Shaktoolik) and 6 (Unalakleet) Chinook salmon is based largely on subsistence catch indices collected inseason and passage estimates at a counting tower located on the North River, an important Chinook salmon spawning tributary of the Unalakleet River. Except for aerial surveys, escapements are not monitored in Shaktoolik, but Shaktoolik and Unalakleet Chinook are managed as one unit as previous tagging studies have shown an intermingling of salmon stocks in these subdistricts. Chinook salmon aerial surveys were not flown in 2008 due to overcast conditions during peak spawning periods.

By July 2, it was clear that the Unalakleet River Chinook salmon run had later than average run timing and was a very weak run. It seemed that if there was any chance of meeting escapement needs, an early closure was necessary, and the sport and subsistence fisheries were closed effective 8 p.m. Saturday, July 5. The decision to close the Chinook fishery was based largely on the June 30-July 2 reported Unalakleet Subdistrict marine subsistence catch of 145 Chinook salmon, a three-fold decrease from the previous 48-hour period’s catch of 460 Chinook salmon.

As of July 2, only 36 Chinook were counted by the North River tower, and July 2 is the historical quarter point of the run. Despite proactive restrictions and the eventual closure, the Chinook salmon escapement fell short of the North River tower-based Sustainable Escapement Goal (SEG) range of 1,200-2,600 for the fourth time since 2004. In addition, the North River tower Chinook salmon escapement of 924 was the second lowest on record. The 2008 Unalakleet River total run size estimate of 3,908 Chinook was 21 percent below the previous record low of 4,961 Chinook in 2005.

ADF&G anticipates that it will continue to be difficult to reach escapement goals in the Unalakleet watershed for the foreseeable future, even with restrictions and early closures to subsistence and sport fisheries. Prior to 2008, the 2004-2006 escapements at the North River tower were the three lowest on record and well below the lower end of the SEG range.

Chinook salmon runs also occur in the Kwiniuk and Tubutulik Rivers of the Moses Point Subdistrict (Subdistrict 3), and in the Inglutalik and Ungalik Rivers of the Norton Bay Subdistrict (Subdistrict 4). Except for aerial surveys, Chinook salmon escapements are not monitored in the Norton Bay Subdistrict. However, in the Moses Point Subdistrict, the Kwiniuk River tower is used to monitor Chinook escapements and has an SEG range of 300-550 Chinook. The Kwiniuk River Chinook salmon estimated escapement of 246 was the 4th lowest on record and represented the third consecutive year in which the tower count fell short of the SEG. Poor escapements since 2005 suggest that the 2009 return will be below average, but age-class data are lacking for this stock.

2009[40]

The 2009 Norton Sound Chinook salmon run forecast projected the run to be below average and possibly insufficient to provide for customary levels of subsistence use. Additionally, ADF&G anticipated having difficulty reaching escapement needs in spite of subsistence fishing schedules and early July Chinook salmon subsistence closures were expected. True to the preseason forecast, the 2009 Norton Sound Chinook salmon run appears to have been similar to the historically low return of 2008. At the onset of the season, a directed Chinook salmon commercial fishery was not allowed. In addition, the commercial buyer did not buy incidentally caught Chinook salmon.

[40] Excerpted from ADF&G, 2009a. 2009 Norton Sound, Kotzebue, and Port Clarence Salmon Fishery News Release #4. Alaska Department of Fish and Game, Division of Commercial Fisheries. Nome Alaska. July 3, 2009.

In the Unalakleet Subdistrict, reported subsistence catches and Unalakleet River Chinook salmon test net catches have been much better than anticipated for late June. However, Chinook salmon passage at a counting tower located on the North River, a tributary of the Unalakleet River, has been very weak, raising concerns that the Chinook salmon escapement goal might not be met this season. Marine subsistence catches peaked during the 48-hour period ending Saturday, June 27 when 296 Chinook salmon were caught. Subsistence catches in the lower Unalakleet River also peaked on June 27 when 203 Chinook salmon were caught. Sport catches of Chinook salmon in the Unalakleet River have been reported to be good as well. As of July 2, the North River salmon counting tower has only enumerated 90 Chinook salmon, well below the recent 5-year average passage estimate of 200 Chinook salmon. Cumulative Chinook salmon passage estimates suggest that the lower end of the North River tower escapement goal range of 1,200-2,600 Chinook salmon will not be reached.

In order to conserve Chinook salmon and reach escapement goals, subsistence salmon fishing with set gillnets was closed in the marine waters of the Shaktoolik and Unalakleet Subdistricts effective 6:00 p.m. Saturday, July 4. Subsistence salmon fishing for Chinook salmon in the Unalakleet River, and the Chinook salmon sport fishery in both the Unalakleet and Shaktoolik Rivers also closed effective 8:00 p.m. Saturday, July 4.

Kuskokwim Chinook Salmon Run Synopsis

2008[41]

Kuskokwim River Chinook salmon abundance is generally on a decline following a period of exceptionally high abundance years in 2004, 2005, and 2006 that ranged from 360,000 to 425,000 fish. Abundance is estimated to have decreased in 2007 to about 250,000 fish, and may have declined a bit more in 2008 to about 225,000 fish. The 2007 and 2008 values are preliminary considering that the subsistence harvests estimates are not yet available. Annual subsistence harvest averages about 72,000 fish +/- 9,000. Kuskokwim River Chinook salmon were listed by the BOF as a Stock of Yield Concern in September 2000, but the finding was lifted in January 2007.

Chinook salmon abundance in 2008 season was expected to be about average, and comparable to 2007; inseason indicators suggested that to be the case, but actual abundance may have been lower than expected. Achievement of tributary escapement goals was mixed with 6 of 11 streams falling below goal, 3 within their respective SEG ranges, and 2 above range. Subsistence harvest needs are thought to have been met, and there is some speculation that subsistence harvest may have been above average in partial compensation for sharp increases in local fuel and food costs. A modest commercial harvest of 8,881 fish was allowed in 2008; of note, managers required use of gillnets with 6 inch or smaller mesh size, which effectively focused harvest on male Chinook salmon that accounted for about 90 percent of the commercial harvest, plus allowed for optimizing concurrent sockeye harvest. Overall Chinook salmon exploitation rate in 2008 is estimated to have been near 40 percent, compared to the 10-year average of 29 percent. Most of the harvest was likely on larger Chinook salmon, which subsistence fishermen tend to select for through the use of gillnets with 8 inch or larger mesh size.

[41] Excerpted from Memo, dated September 10, 2007, to John Hilsinger of ADF&G from Western Alaska area managers regarding Western Alaska Chinook stock status in 2008.

2009[42]

The Kuskokwim Area has no formal forecast for salmon returns. Broad expectations are developed based on parent-year escapements and recent year trends. The 2009 Chinook, salmon returns were expected to be similar in abundance to 2008, when there were harvestable surpluses beyond what was needed for escapement and subsistence use. Anticipated available surpluses for commercial harvest will range from 20,000 to 50,000 Chinook salmon. Markets and processor capacity may limit actual harvest.

Subsistence fishing was anticipated to be open 7 days per week with the exception of closures 6 hours before, during, and 3 hours after each commercial fishing period. In District 1, when one subdistrict is open to commercial fishing, subsistence fishing will be allowed in the majority of the other subdistricts.

The preliminary 2009 Kuskokwim River commercial Chinook salmon harvest was 6,670 fish which was above the most recent 10-yr average of 2,438 fish, but well below the historical (1979-2008) average of 22,231 fish. Subsistence harvests are determined through post-season surveys. Results from the survey are not available until spring of the following year. Verbal reports from area subsistence fishermen indicated Chinook salmon harvests were adequate.

Bethel Test Fishery

The 2009 cumulative index for Chinook salmon past the Bethel Test Fishery was the third highest on record, and run timing appeared normal. Water level in Kuskokwim River was below the historical average throughout much of the season, and near historical lows in July and August.

Escapement Projects: (weir projects remain in operation through mid-September, so these number are preliminary and will change.

Tuluksak River (goal 1,000-2,100) 2009 escapement through 8/31 was 404.

Kwethluk River (goal 6,000-11,00) 2009 escapement through 8/31 was 5,710

George River (goal 3,100-7,900) 2009 escapement through 8/31 was 3,722

Kogrukluk River (goal 5,300-14,000) 2009 escapement through 8/31 was 9,434

Tatlawiksuk River (no goal) 2009 escapement through 8/31 was 1,070.

Takotna River (no goal) 2009 escapement through 8/31 was 306.

The District 4 (Quinhagak; Kuskokwim Bay) 2009 commercial harvest of Chinook salmon was 13,921 fish which was below the historical average of 21,794 fish. Escapement at the Kanektok River weir was 6,837 fish (it is difficult to put Chinook salmon escapement at the weir in context as the weir has only been in operation for 6 years and has highly variable operational start and end dates). There is no established escapement for Chinook salmon at the weir. No aerial survey for Chinook salmon was flown.

District 5 (Goodnews Bay) 2009 commercial harvest of Chinook salmon was 1,509 fish which is below the historical average of 3,934 fish. Escapement at the Middlefork Goodnews River weir through 8/29 was 1,443. The goal is 1,500-2,900 fish. The weir will remain in operation through 9/15.

[42] Estensen, Jeff. ADF&G. Information provided in personal communication via e-mail. September 1, 2009

Yukon River Chinook Salmon Run Synopsis

2008[43]

The 2008 total run of approximately 151,000 Chinook salmon was insufficient to fully support any directed fisheries, including subsistence. The 2008 run was approximately 36 percent below the recent 5-year (2003-2007) average of 235,000 Chinook salmon and 21 percent below the 10-year (1998-2007) average of 190,000. The 2008 run was expected to be below average and similar to the 2007 run of approximately 178,000. However, the run was anticipated to provide for escapements, support a normal subsistence harvest, and a small commercial harvest. By June 20, the historical midpoint of the run, all indicators pointed to a weak Chinook salmon run which was disappointing because of large spawning escapement in the parent years that produced this season's run. At that time, it was clear that there was no surplus available for a directed Chinook salmon commercial fishery and that sport and subsistence fisheries on the mainstem Yukon river would need to be reduced to provide adequate numbers of Chinook salmon on the spawning grounds.

Sport fishing bag and possession limits were reduced from 3 to 1 Chinook salmon on the mainstem Yukon River, however, the sport fish harvest only occurs in a few tributaries and is very small (<3000). Additionally, commercial fishing targeting an abundant summer chum salmon run with gillnets restricted to 6 inch maximum mesh size was delayed until July 2 in order to allow most of the Chinook run to pass through. This resulted in reducing what could have been a harvest of greater than 300,000 chum salmon to 126,000. Approximately 4,300 Chinook salmon were taken incidentally.

In an effort to conserve Chinook salmon, it was also necessary to reduce the subsistence fishery (typically around 50,000 fish) throughout the mainstem of the Yukon River. Subsistence fishing time was reduced by half for approximately two weeks implemented chronologically with the Chinook migration and mesh size restrictions (<6-inch mesh) were implemented in the lower river districts. Fishermen were affected from the mouth of the river to across the border into Canada. Fishermen reported harvesting as little as 40 percent of their needs in some locations in Alaska and the Aboriginal Fishery in Canada harvested half of their average take. Historically, Chinook salmon subsistence fishing restrictions have only been implemented once before, in July of 2000 after the run was nearly over.

High water hampered efforts to accurately assess escapement in 2008 from tower counts and aerial surveys; thus, most escapement goals could not be assessed. Based on the available data, it appears that the lower end of the BEGs in the Chena and Salcha rivers, the largest producing tributaries of Chinook salmon in the Alaska portion of the drainage, were met. Typically, about 50 percent of the Chinook salmon production occurs in Canada; hence, the US/Canada Yukon River Panel agreed to one year Canadian Interim Management Escapement Goal (IMEG) of >45,000 Chinook salmon based on the Eagle sonar program is a top priority. The preliminary estimated escapement into Canada is approximately 32,500 or 28 percent below the goal.

2009[44]

The 2009 Yukon River Chinook salmon run was projected to be below average to poor with the primary concern being for a poor run of Canadian-origin Chinook salmon. It was, therefore, prudent to enter the 2009 season with the expectation that subsistence conservation measures, beyond those used in 2008, would be required in an effort to share the available subsistence harvest and meet escapement goals. These measures included not allowing directed commercial Chinook salmon fishing, reducing the sport fishery bag and

[43] Excerpted from Memo, dated September 10, 2007, to John Hilsinger of ADF&G from Western Alaska area managers regarding Western Alaska Chinook stock status in 2008.
[44] Excerpted from 2009 Yukon River Salmon Fisheries Outlook and Management Strategies and 2009 Yukon River Summer Salmon Updates #5 through #11, as identified in the references section.

possession limit in Yukon River tributaries (excluding the Tanana River drainage) from three to one fish with no retention of Chinook salmon in the mainstem Yukon River, and reduced subsistence fishing schedules.

Initial management will be based on preseason projections and shifted to inseason project assessment information as the run developed. Because of the anticipated poor Chinook salmon return for 2009 the preseason management strategy included a reduced subsistence salmon fishing schedule that was to be initiated approximately 7 days after ice out at Alakanuk in Y-1 and implemented chronologically with the upriver migration. However, due to the severity of breakup flooding, persistent ice jams at the mouth, and the presence of shorefast ice along the coastline the department delayed implementing the reduced subsistence fishing schedule to allow fishers additional opportunity to target non salmon species. The department implemented the reduced schedule June 8 beginning in Y-1. Historically, the schedule is implemented around May 28.

Management Measures

To conserve the greatest number of Canada bound Chinook salmon, no fishing was allowed on the first pulse of Chinook salmon. It was anticipated that, beginning in Y-1, one to two subsistence fishing periods were be pulled and similarly implemented in upriver fishing districts and subdistricts based on migratory timing. In addition, the federal manager announced on June 1 a Special Action beginning on June 3 which would limit the harvest of subsistence Chinook salmon in waters adjacent to Federal Conservation units in Districts 1, 2, and 3 to federally qualified rural subsistence users only. Upriver fishing districts will have similar Special Action(s) implemented consistent with Chinook salmon run timing.

By June 29, and consistent with the preseason management plan, the reduced subsistence schedule had been implemented. It consisting of two 18-hour periods each week and two subsistence fishing periods were pulled in Districts Y-1, Y-2, and Y-3 to protect the early portion of the Chinook run. Similar actions were implemented in upriver fishing districts and subdistricts chronologically with the upriver migration. In Subdistrict Y-4A, the reduced subsistence salmon fishing schedule was implemented and two subsistence fishing periods were pulled to protect the early portion of the Chinook run. Districts Y-1, Y-2 and Y-3 returned to the reduced subsistence salmon fishing schedule following the two period closures. However, based on the poor abundance observed to this date, gillnets have been restricted to a maximum of 6-inch mesh size in Districts Y-1 and Y-2. (Update #5, June 29, 2009)

Effective July 1, due to the conservation concern for Chinook salmon and to provide opportunity for a directed summer chum commercial fishery in Districts Y-1 and Y-2, the Alaska Board of Fisheries adopted an emergency regulation specifying that during the commercial summer chum season in Districts 1-5, Chinook salmon taken may be retained but not sold. Therefore, fishermen were allowed to release live Chinook salmon or use them for subsistence purposes (Update #6, July 6, 2009).

By July 6th, two subsistence fishing periods were pulled or announced to be pulled in Districts Y-1, Y-2, Y-3, Y-4A, Y-4B and Y-4C and Y-5A, Y-5B&Y-5C and Y-5D to protect the early portion of the Chinook run. Districts Y-1, Y-2, Y-3 and Y-4A had returned to the reduced subsistence salmon fishing schedule following the two period closures. (Update #6, July 6, 2009)

As of July 13, Districts Y-1, Y-2, Y-3, and Y-4 returned to the reduced subsistence salmon fishing schedule (Update #7, July 13, 2009). By July 20, the subsistence schedules for Districts Y-1, Y-2, Y-3, and Y-4 had been relaxed as the Chinook run was nearly completed in those areas. Subdistricts Y-5A, Y-5B, Y-5C, and Lower Y-5D were on the reduced subsistence salmon fishing schedule following the two period closures. Subdistrict Upper Y-5D was the only remaining area closed to protect the early portion of the Chinook run. (Update #8, July 20, 2009).

By July 27, based on current assessment information and consistent with the management strategies taken in Districts Y-1, Y-2, Y-3, and Y-4, relaxed subsistence fishing schedules were implemented in Subdistricts Y-5A, Y-5B, Y-5C, & Y-5D (Update #9, July 27, 2009). Finally, by August 3, Relaxed subsistence fishing schedules are in effect for Districts Y-1, Y-2, Y-3, and Y-4, Y-5 (Update #10, Aug. 3, 2009).

Assessment Projects

The Scammon Bay Offshore Test Fishery transitioned to fall season on July 16. A total of 130 summer chum and 3 Chinook salmon were caught during the summer season ending on July 15. Lower Yukon Test Fishery (LYTF)- 8.5 inch set net project/ADF&G, YDFDA The LYTF concluded operations on July 15. The cumulative CPUE for the 2009 season is 11.51 which is below the average of 22.76. The first quarter point, midpoint, and third quarter point are June 16, June 22, and June 28 respectively. The season total Chinook salmon age composition from the 8.5" LYTF set nets was 2% age-4, 9% age-5, 87% age-6, and 2% age-7 fish. The sample size was 1,037 fish. Age-6 fish were 20% above average. Females were 60%; which is 7% above average. Test fishing operations were hampered by high water and debris throughout the summer season, making assessment of the Chinook salmon run challenging with the LYTF.

The 2009 Chinook salmon escapements at upriver projects have been variable. The Chinook salmon passage continues to taper off at Eagle Sonar. Approximately 68,400 fish have passed to date (Update #11, August 10, 2009)), indicating that management strategies to protect the early portion of the run have been effective. The interim management escapement goal of 45,000 fish to Canadian spawning grounds has been met and the harvest sharing agreement for Canadian fisheries have been met this season. The Chena River counts are near the upper end of the BEG of 5,700 Chinook salmon, while Salcha River counts are double the upper end of the BEG of 6,500 Chinook salmon. Chinook salmon escapements for East Fork Andreafsky and Gisasa Rivers are below average for this date.

- The E. Fork Andreafsky River Weir project completed operations August 3, with a cumulative passage of 3,004 Chinook.
- The Pilot Station sonar passage estimate for Chinook salmon through August 9 is 122,474 fish, which is below the average of 142,334 for this date. The estimates provided by the Pilot Station sonar during the summer season are considered to be conservative due to high water conditions making assessment of the run through the first 3 weeks of June challenging. As the water level dropped, the ability of this project to more accurately assess the run improved.
- The Gisasa River Weir project completed operations on July 31 with a cumulative passage of 1,955 Chinook, which is below the average of 2,449.
  The Henshaw Creek Weir project completed operations on August 8, and the cumulative passage is 1,560 Chinook. This is above the average of 886 for this date.
- The Tozitna River Weir cumulative passage estimate through August 9 is 1,109 Chinook which is below the average of 1,228 for this date.
- The Chena River Counting Tower project completed operations on August 8. The cumulative passage estimate through August 7 is 5,250 Chinook, below the average of 6,529 for this date.
- The Salcha River Counting Tower cumulative passage estimate through August 9 is 12,767 Chinook, which is above the average of 10,032 for this date.
- The Rapids Test Fish Wheel/Rapids Research Center cumulative count for Chinook salmon through August 9 is 2,938 fish, which is above the average of 2,453 for this date.
- The Nenana Test Fish Wheel Project operations concluded on August 4. The cumulative count for Chinook salmon is 1,660 which is above the average of 959.
- The Eagle Sonar preliminary passage estimate for Chinook salmon through August 9 is 68,411 fish

which is above the average of 56,467 for this date.

Bristol Bay Chinook Salmon Run Synopsis

2008[45]

The 2008 total run of Chinook salmon to the Nushagak River was 130,783. The total run was 29,817 (18 percent) less than the forecast of 160,000 Chinook salmon, 15 percent less than the recent 20-year (1988-2007) average of 153,358 and 19 percent less than the recent 10-year (1998-2007) average of 162,179.

The spawning escapement in the Nushagak River was 88,452 Chinook salmon which exceeded the SEG range of 40,000-80,000. A total of 42,331 Chinook salmon were harvested in the commercial (18,618), subsistence (16,642) and sport (7,071) fisheries in the Nushagak District and River. The commercial harvest of 18,618 Chinook salmon was 67 percent far below the anticipated harvest of 56,000 Chinook salmon. The anticipated harvest was estimated based on an average exploitation rate of 35 percent in the Nushagak District commercial salmon fishery from 2003-2007. When management of the commercial fishery shifted from being based on the preseason forecast to inseason escapement data, no further directed openings occurred because of the late run timing and indications that the run was less than forecasted. The actual exploitation rate in 2008 was 14 percent. The commercial harvest in 2008 was one of smallest harvests of Chinook salmon in the Nushagak District since 1966; only Chinook salmon harvests in 1999 (10,893), 2000 (12,055) and 2001 (11,568) have been smaller.

2009[46]

A total of 145,000 Chinook salmon were forecasted to return to the Nushagak River in 2009. This forecast is 4% less than the recent 10-year average (151,000: range of 77,000 in 2000 to 246,000 in 2005). A run of 145,000 Chinook salmon can potentially produce a harvest of 70,000 fish. Actual harvest closer to 46,000 Chinook salmon was expected based on an average exploitation rate of 36% during the previous 5 years (2003-2007).

Chinook salmon harvests in Bristol Bay districts were below average in every district. There were two directed Chinook fishing periods in the Nushagak District with 10 fish harvested in the first period, June 7, and 503 harvested in the second period, June 11. The fishery remained closed until the Department switched focus to active sockeye salmon management due to the increasing abundance of that species. Both Chinook salmon catch and escapement increased in late June. Approximately 30,000 Chinook were harvested during the directed sockeye fishery, with the majority harvested between June 22 and July 7. The final Nushagak River Chinook escapement of 81,480 is above the 75,000 inriver goal established in the Nushagak Mulchatna King Salmon Management Plan.

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[45] Excerpted from Memo, dated September 10, 2007, to John Hilsinger of ADF&G from Western Alaska area managers regarding Western Alaska Chinook stock status in 2008.
[46] Jones, Matt, ADF&G. Information provided in personal communication via e-mail. August 31, 2009.

4.0 DESCRIPTION OF THE ALTERNATIVES

In addition to the no action alternative (i.e. Alternative 1), the analysis of alternatives considers four action alternatives as well as multiple components and options under each alternative. Alternatives, components, and options may be selected in a wide array of combinations, making the "effective" suite of alternatives under consideration much more numerous than the "formal" number of alternatives might suggest. Alternative 2 would establish a hard cap on Chinook salmon bycatch, while Alternative 3 would invoke a large area closure when a triggering amount of Chinook salmon are bycaught in the pollock trawl fishery. Alternative 4, contains two cap scenarios with seasonal and sector allocations and provisions for transfers, rollovers, and an ICA. Alternative 5 contains two different overall Chinook salmon caps (60,000 Chinook salmon and 47,591 Chinook salmon). The high cap would be available if some or all of the pollock industry participates in a private contractual arrangement, called an incentive plan agreement (IPA),[47] that establishes an incentive program to keep Chinook salmon bycatch below the 60,000 Chinook salmon cap. Alternative 5 would rely on the cap to limit Chinook salmon bycatch in all years and, if the IPA works as intended by the Council, it would provide incentives to keep bycatch below the cap. EIS Chapter 2 contains a more detailed description of the alternatives.

These alternatives contain multiple components and options that would provide for sector level allocations, a range of seasonal split options, a range of bycatch allocations options, the potential for transferability and rollovers of unused bycatch allocations, and cooperative level allocations and transfers.

4.1 Alternative 1: Status Quo

Alternative 1 is the no-action alternative (status quo). This alternative is the baseline alternative against which the costs and benefits of each action alternative are compared. This alternative would leave the existing Chinook salmon bycatch reduction measures in place in the Bering Sea pollock trawl fishery. These measures include the Chinook salmon savings areas as well as the provisions of FMP Amendment 84, which exempts vessels from the Chinook salmon savings areas closures provided that they participate in the VRHS ICA described in section 2.3 above. EIS Chapter 2 provides a complete description of Alternative 1.

4.2 Alternative 2: Hard Cap

Alternative 2 would establish a Chinook salmon bycatch cap on the pollock fishery which, when reached, would require all directed Bering Sea pollock fishing to cease. Only those Chinook salmon caught by vessels participating in the directed pollock fishery would accrue towards the cap, and fishery closures upon achievement of the cap would apply only to directed fishing for pollock. Table 4-1 shows the different components, options, and suboptions for determining the scale of management for the hard cap: at the fishery level (separate hard caps for the CDQ Program and the remaining three AFA sectors combined); at the sector level (each of the 4 sectors, including the CDQ sector, receive a sector-specific cap); and at the cooperative

[47] The term IPA under Alternative 5 is the same concept as the ICA under Alternative 4. The term IPA is used under Alternative 5 because participation in the IPA is not limited to AFA cooperatives as it may include individual vessel owners or CDQ groups. In addition, more than one IPA may be approved and an IPA could be created by a single cooperative (so it does not have to involve more than one cooperative or be an agreement among cooperatives).

level (the sector-level cap for the inshore sector is further subdivided and managed at the individual cooperative level). Hard caps would be apportioned by season, according to the options in Component 1 (options 1-1 through 1-4). If the hard cap is to be subdivided by sector (under component 2), two options are provided for the allocation. Options for sector transfer are included in Component 3. Further subdivision of an inshore sector cap to individual inshore cooperatives is discussed under Component 4 (cooperative provisions). EIS Chapter 2 provides a complete description of Alternative 2.

Table 4-1 Alternative 2 components, options, and suboptions.

Setting the hard cap (Component 1)	Option 1: Select from a range of numbers	i) 87,500 ii) 68,392 iii) 57,333 iv) 47,591 v) 43,328 vi) 38,891 vii) 32,482 viii) 29,323			
		Suboption adjust periodically based on updated bycatch information			
	Divide cap between A and B season	Option 1-1: 70/30 (A season/B season) Option 1-2: 58/42 (A season/B season) Option 1-3: 55/45 (A season/B season) Option 1-4: 50/50 (A season/B season)			
		Suboption rollover unused salmon from the A season to the B season, with in a sector and calendar year.			
Allocating the hard cap to sectors (Component 2)		CDQ	Inshore CV	Mothership	Offshore CP
	No allocation	7.5 %	92.5%; managed at the combined fishery-level for all three sectors		
	Option 1 (AFA)	10%	45%	9%	36%
	Option 2a (hist. avg. 04-06)	3%	70%	6%	21%
	Option 2b (hist. avg. 02-06)	4%	65%	7%	25%
	Option 2c (hist. avg. 97-06)	4%	62%	9%	25%
	Option 2d (midpoint)	6.5%	57.5%	7.5%	28.5%
Sector transfers (Component 3)	No transfers				
	Option 1	Caps are transferable among sectors within a fishing season			
		Suboption: Maximum amount of transfer limited to:		a	50%
				b	70%
				c	90%
	Option 2	NMFS rolls over unused salmon bycatch to sectors still fishing in a season, based on proportion of pollock remaining to be harvested.			
Allocating the hard cap to cooperatives (Component 4)	No allocation	Allocation managed at the inshore CV sector level.			
	Allocation	Allocate cap to each cooperative based on that cooperative's proportion of pollock allocation.			
	Cooperative Transfers	Option 1	Lease pollock among cooperatives in a season or a year		
		Option 2	Transfer salmon bycatch		
		Suboption Maximum amount of transfer limited to the following percentage of salmon remaining:		a	50%
				b	70%
				c	90%

4.3 Alternative 3: Triggered Closures

Triggered closures are regulatory time and area closures that are invoked when specified cap levels are reached. Cap levels for triggered closures would be formulated in the same way as specified under Alternative 2. Closures may involve a single area (A season) or multiple areas (B season). Once specified areas are closed, pollock fishing could continue outside of the closure areas until either the pollock allocation is reached or the pollock fishery reaches a seasonal (June 10) or annual (November 1) closure date. EIS Chapter 2 provides a complete description of Alternative 3.

If the trigger cap is not further allocated among the non-CDQ sectors under Component 3, sector allocation, the CDQ Program would receive an allocation of 7.5 percent of the Bering Sea Chinook salmon trigger cap. This CDQ allocation would be further allocated among the six CDQ groups based on percentage allocations approved by NMFS on August 8, 2005. Each CDQ group would be prohibited from directed fishing for pollock inside the closure area(s) when that group's trigger cap is reached.

Table 4-2 provides the five components and their options included under Alternative 3. The components and options that are the same as Alternative 2 are contained in Table 4-1. These components describe how the cap is formulated (component 1), who manages the closures (component 2), how the cap is subdivided (component 3), whether and how salmon can be transferred among sectors (component 4), and the specific area closure options (component 5). The areas themselves, as described in component 5, are the same areas regardless of who manages the closure (Component 2).

Table 4-2 Alternative 3 Components and options.

<table>
<tr><td rowspan="2">Setting the cap (Component 1)</td><td colspan="2">How to formulate the cap</td><td colspan="3">Select a cap from a range of numbers, 29,323 – 87,500 (same range as Alternative 2)</td></tr>
<tr><td colspan="2">How to apportion cap by season</td><td colspan="3">Apportion cap A season : B season from range 70:30 to 50:50 (same range as Alternative 2)</td></tr>
<tr><td rowspan="2">Managing the cap (Component 2)</td><td colspan="5">NMFS closes areas to pollock fishing when cap is reached</td></tr>
<tr><td colspan="5">Option 1: An ICA will set in place a system to allow vessels to avoid bycatch, and will close areas when cap is reached for vessels managed under the ICA</td></tr>
<tr><td rowspan="3">Allocating the hard cap to sectors (Component 3)</td><td></td><td>CDQ</td><td>Inshore CV</td><td>Mothership</td><td>Offshore CP</td></tr>
<tr><td>By sector (same range as Alternative 2)</td><td>3% - 10%</td><td>45% - 70%</td><td>6% - 9%</td><td>21% - 36%</td></tr>
<tr><td>Default, if no sector allocation</td><td>7.5%</td><td colspan="3">92.5% (all three sectors combined)</td></tr>
<tr><td rowspan="2">Sector transfers (Component 4)</td><td colspan="5">Voluntary transfers among sectors are allowed</td></tr>
<tr><td colspan="5">NMFS can reapportion unused salmon to other sectors based on their proportion of remaining pollock (except not from CDQ groups)</td></tr>
<tr><td rowspan="2">Area Closures (Component 5)</td><td>A season closure area</td><td colspan="4">Once triggered, area would close for the rest of the A season</td></tr>
<tr><td>B season closure areas</td><td colspan="4">If the trigger was reached before August 15th, all three areas would close on August 15th for the rest of the B season.
If the trigger was reached after August 15th, all three areas would close immediately for the rest of the B season.</td></tr>
</table>

4.4 Alternative 4: Hard caps with an intercooperative agreement

The Council identified the following alternative as its preliminary preferred alternative at the June 2008 Council meeting. Alternative 4 would establish a Chinook salmon bycatch cap for each pollock fishery season which, when reached, would require all directed pollock fishing to cease for that season. Alternative 4 is described in detail in EIS Chapter 2.

This alternative provides for two different annual scenarios with different caps for each scenario (Table 4-3). Annual scenario 1 contains a dual cap system with a high cap of 68,392 salmon and a backstop cap of 32,482 salmon. Annual scenario 2 contains a cap of 47,591. The distinction between the scenarios lies in the presence or absence of a NMFS-approved salmon bycatch ICA which provides explicit incentive to avoid salmon. The prescribed sector splits (and provisions to divide the sector splits to the inshore catcher vessel cooperative level and among CDQ groups) are identical for both scenarios. All caps would be partitioned seasonally 70 percent to the A season (January 20 - June 10) and 30 percent to the B season (June 10-November 1).

Table 4-3 Alternative 4 components

<table>
<tr><td rowspan="6">Setting the hard cap (Component 1)</td><td rowspan="2">Annual scenario 1 (AS 1)</td><td colspan="4">High cap 68,392 Chinook salmon for vessels in a NMFS-approved ICA</td></tr>
<tr><td colspan="4">Backstop cap 32,482 Chinook salmon for vessels not in a NMFS approved ICA.</td></tr>
<tr><td>Annual scenario 2 (AS 2)</td><td colspan="4">A cap of 47,591, with no ICA.</td></tr>
<tr><td>AS1 + AS2</td><td colspan="4">A fleet-wide cap of 47,591, unless industry submits and NMFS approves an ICA agreement which provides explicit incentive for salmon avoidance, then the cap increases to 68,392 Chinook salmon. Vessels not in the ICA would be subject to the backstop cap of 32,482.</td></tr>
<tr><td>A season/B season division</td><td colspan="4">All hard caps would be divided 70/30 between the A and B season</td></tr>
<tr><td>Seasonal rollovers</td><td colspan="4">NMFS would rollover up to 80 percent of a sector’s or cooperative’s unused salmon bycatch from its A season account to that sector’s or cooperative’s B season account. No rollover would occur from the B season to the A season. No rollover would occur for the backstop cap.</td></tr>
<tr><td rowspan="3">Allocating the hard cap to sectors (Component 2)</td><td></td><td>CDQ</td><td>Inshore CV</td><td>Mothership</td><td>Offshore CP</td></tr>
<tr><td>A season</td><td>9.3%</td><td>49.8%</td><td>8.0%</td><td>32.9%</td></tr>
<tr><td>B season</td><td>5.5%</td><td>69.3%</td><td>7.3%</td><td>17.9%</td></tr>
<tr><td>Sector transfers (Component 3)</td><td colspan="5">If sector level caps are issued as transferable allocations, then these entities could request NMFS to move a specific amount of the transferable allocation from one entity’s account to another entity’s account during a fishing season. Allocations under the backstop cap are non-transferable.</td></tr>
<tr><td rowspan="3">Allocating the hard cap to cooperatives (Component 4)</td><td colspan="5">Each inshore cooperative and the inshore inshore open-access fishery would receive a transferable allocation of the inshore CV sector level cap and must stop fishing once the allocation is reached.</td></tr>
<tr><td colspan="5">Inshore cooperative allocations would be based on that cooperative’s AFA pollock allocation percentage. Inshore open access allocation would be based on the pollock history of those vessels participating in the inshore open access fishery.</td></tr>
<tr><td>Cooperative Transfers</td><td colspan="4">Upon request, NMFS could transfer allocations among all recipients during a fishing season.</td></tr>
</table>

4.5 Alternative 5: Hard caps with Incentive Plan Agreements and a Performance Standard (Preferred Alternative)

Alternative 5 includes two different overall Chinook salmon cap levels (60,000 Chinook salmon and 47,591 Chinook salmon). The high cap would be available if some or all of the pollock industry participates in an IPA that establishes an incentive program to keep Chinook salmon bycatch below the 60,000 Chinook salmon cap. Alternative 5 would rely on the cap to limit Chinook salmon bycatch in all years and, if the IPA works as intended by the Council, it would provide incentives to keep bycatch below the cap.

The combination of the high cap, transferable allocations, and one or more IPAs is intended to provide a more flexible and responsive approach to minimizing salmon bycatch than would be achieved by a cap alone. The high bycatch cap of 60,000 Chinook salmon alone would be unlikely to meet the conservation objectives of the Council and would not be expected to minimize Chinook salmon bycatch in most years. Likewise, the bycatch cap of 47,591 Chinook salmon on its own would not provide the desired flexibility to accommodate the high variability in Chinook salmon encounters and the difficulty of avoiding salmon encounters in certain years. Therefore, the Council combined the 60,000 Chinook salmon hard cap with an IPA to provide incentives to avoid Chinook salmon in all years with the goal that actual salmon bycatch would be below the cap. To ensure Chinook salmon savings regardless of whether an IPA successfully minimizes bycatch at all levels of salmon encounters, the Council established an annual sector level performance standard. For a sector to continue to receive Chinook salmon bycatch allocations under the 60,000 Chinook salmon cap, that sector may not exceed its performance standard in any three years within seven consecutive years. If a sector fails this performance standard, it will permanently be allocated a portion of the 47,591 Chinook salmon cap.

Table 4-4 Alternative 5, the preferred alternative, components

<table>
<tr><td rowspan="5">Setting the hard cap (Component 1)</td><td>47,591 Chinook salmon</td><td colspan="4">The fleet-wide cap unless industry submits and NMFS approves an IPA agreement which provides explicit incentives for salmon avoidance.</td></tr>
<tr><td>60,000 Chinook salmon</td><td colspan="4">The fleet-wide cap if fishery participants form one or more IPAs that meet the criteria in regulations.</td></tr>
<tr><td>28,496 Chinook salmon</td><td colspan="4">Vessels not in an IPA would fish under a portion of this “opt-out” or backstop cap.</td></tr>
<tr><td>A season/ B season division</td><td colspan="4">The Chinook salmon caps would be divided 70% A season and 30% B season before allocations to sectors, CDQ groups, and cooperatives.</td></tr>
<tr><td>Seasonal rollovers</td><td colspan="4">NMFS would rollover 100% percent of a sector’s, cooperative’s, or CDQ group’s unused salmon bycatch from its A season account its B season account. No rollover would occur from the B season to the A season. No rollover would occur under the backstop cap.</td></tr>
<tr><td rowspan="3">Allocating a hard cap to sectors (Component 2)</td><td></td><td>CDQ</td><td>Inshore CV</td><td>Mothership</td><td>Offshore CP</td></tr>
<tr><td>A season</td><td>9.3%</td><td>49.8%</td><td>8.0%</td><td>32.9%</td></tr>
<tr><td>B season</td><td>5.5%</td><td>69.3%</td><td>7.3%</td><td>17.9%</td></tr>
<tr><td>Sector transfers (Component 3) + Cooperative transfers</td><td colspan="5">Upon request, NMFS could transfer allocations among all recipients of transferable allocations during a fishing season.
If an entity’s allocation account falls below zero in a given season, the entity would be provided the opportunity to receive transfers of Chinook salmon bycatch sufficient to bring the entity’s account to zero.</td></tr>
<tr><td rowspan="2">Allocating the hard cap to cooperatives (Component 4)</td><td colspan="5">Each inshore cooperative and the inshore open-access fishery would receive a transferable allocation of the inshore CV sector level cap and must stop fishing once the allocation is reached.</td></tr>
<tr><td colspan="5">Inshore cooperative allocations would be based on that cooperative’s AFA pollock allocation percentage. Inshore open access allocation would be based on the pollock history of those vessels participating in the inshore open access fishery.</td></tr>
<tr><td>Performance Standard (Component 5)</td><td colspan="5">If a sector’s annual bycatch exceeds its performance standard in any three years within seven consecutive years, NMFS would reduce that sector’s Chinook salmon allocation to that sector’s portion of 47,591 Chinook salmon for perpetuity.</td></tr>
<tr><td>Observer Program (Component 6)</td><td colspan="5">Increase observer coverage to 100% for catcher vessels not delivering unsorted cod-ends at sea and modify, if necessary, shore side processors’ catch monitoring plans.</td></tr>
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5.0 POTENTIAL BENEFITS OF THE PROPOSED ACTION

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.

This analysis provides extensive treatment of a wide range of alternatives and their associated options. This treatment is necessary due to the expansiveness of the alternative set that the Council put forward for analysis. It is also important to recognize that the proposed action is to directly regulate Chinook salmon bycatch in the Bering Sea pollock fishery. Thus, the quantitative monetary impact analysis conducted to assess potential revenue impacts on the pollock fishery[48] is possible because participants in that fishery are the entities that will be directly regulated under the proposed action. A similar approach to estimating impacts on Chinook salmon users is not possible because the alternatives do not directly regulate salmon fisheries and, perhaps more critically, the analysis in the EIS (more specifically Chapter 5) is only able to assert that the bycatch of Chinook salmon in the pollock fishery 'may' be affecting stocks of western Alaska Chinook and associated subsistence, commercial, and sport fisheries. Our knowledge of these complex ecological, biological, and economic relationships remains incomplete at this time. That being said, these data deficiencies do not remove the obligation to use the "best available scientific information" to evaluate, in this case, Chinook bycatch reduction alternative actions in the Bering Sea pollock fisheries[49]

An Analytical Clarification

A benefit/cost framework is the appropriate way to evaluate the relative economic and socioeconomic merits of the alternatives under consideration in this RIR. When performing a benefit/cost analysis, the principal objective is to derive informed conclusions about probable net effects of each alternative under consideration (e.g., net revenue impacts). However, in the present case, necessary empirical data (e.g., operating costs, capital investment, debt service, opportunity costs) are not available to the analysts, making a quantitative net benefit analysis impossible. Furthermore, empirical studies bearing on other important aspects of these alternative actions (e.g., subsistence-use values, domestic and international seafood demand) are also unavailable, and time and resource constraints prevent their preparation for use in this analysis. Thus, this regulatory impact review uses the best available information and quantitative data, combined with accepted economic theory and practice, to provide the fullest possible assessment (both quantitative and qualitative) of the potential economic benefits and presumptive costs attributable to each alternative action.

[48] Public comment 10-32 in EIS Chapter 9, the Comment Analysis Report, asserted that affects on Chinook salmon users was not adequately address, in contrast to extensive analysis of the pollock fishery impacts. This text is adapted from the response to that comment and is intended to highlight the inherent limitations of the analysis of impacts on Chinook salmon users.
[49] From response to public comment 10-3, in EIS Chapter 9, the Comment Analysis Report.

For clarity of presentation, a simple analytical convention is adopted for the potentially forgone gross revenue and gross revenue-at-risk assessment (presented below), in which the 2003 through 2007 fisheries are reexamined, in succession, as if each of the proposed alternatives to minimize Chinook salmon bycatch had been in place in that year. This convention is adopted, in large part, to reduce the inherent risk of introducing parameter bias, associated with the analysts speculating on, for example, future catch distributions, species catch composition, ex-vessel and first wholesale prices, and costs, etc. By using this technique, the analysis can be performed using official, empirically observed and recorded catch and value data sets. The 2003 through 2007 records are used because they represent a recent complete data sets for the and cover the timeframe during which Chinook salmon bycatch has been increasing to record levels.

The alternatives discussed in this analysis address concerns that ongoing bycatch of Chinook salmon may be adversely affecting stocks of western Alaska origin and the associated subsistence, commercial, personal use, and sport fisheries that are dependent on those Chinook salmon stocks. In economic parlance, one might say that ongoing salmon bycatch is ‘consuming’ fish that would otherwise be expected to be utilized upon return their natal rivers. Thus, a key benefit of the proposed alternative is the extent to which they release salmon to return to their natal rivers and be utilized by those who have allocative rights to Chinook salmon, including future generations of users dependent upon sustained productivity from these salmon runs, as reflected by providing for adequate escapement.

5.1 Economic Benefits of Chinook Salmon Savings

This analysis draws heavily on the analysis in EIS Chapters 4 and 5 that estimates the likely dates of pollock fisheries closures and thereby retrospectively projects the number of Chinook salmon that may be saved under each of the alternatives due to projected fishery closures. In this way, benefits are tabulated in terms of the numbers of Chinook salmon that would not be taken as bycatch (i.e. salmon that would have been saved).

Results presented in EIS Chapter 5 include both overall changes in Chinook salmon mortality due to alternative management measures (Alternatives 2, 4, and 5), as well as resulting estimates of AEQ Chinook salmon likely to return to natal rivers as adult fish. Additional information is provided on the relative Chinook salmon catch inside and outside proposed closures in Alternative 3; however, discussion of salmon saved (overall and AEQ) is limited to the cap levels as analyzed in Alternatives 2, 4, and 5. Additional AEQ estimates as a result of continued fishing outside of the triggered closures of Alternative 3 are not evaluated due to the difficulty in modeling the potential effect of displaced effort and the resulting bycatch of specific stocks.

The AEQ estimates represent the potential benefit in numbers of adult Chinook salmon that would have returned to individual river systems and aggregate river systems as applicable over the years from 2003 to 2007. These benefits would accrue within natal river systems of stock origin as returning adult fish that may return to spawn or be caught in commercial, subsistence, or sport fisheries. Exactly how those fish would be used is the fundamental, and exceedingly difficult, question to answer in order to provide a balanced treatment of costs and benefits.

Measuring the potential economic benefit of Chinook salmon saved, in terms of effects on specific subsistence, commercial, sport, and personal use fisheries is problematic. The proportion of AEQ estimated Chinook salmon that might be taken in each of the various fisheries is a function of many variables including overall run strength, subsistence management strategies, commercial management strategies, availability of commercial markets, the effect of weather on catch (e.g. high water), and potentially, on management of other salmon runs as well. Lacking estimates of the proportion of AEQ Chinook salmon that would be caught by each user group, it is not possible to estimate economic benefits in terms of gross revenues or other monetary values for those user groups due to changes in AEQ Chinook salmon under each alternative.

Without an estimate of changes in commercial catches, it is not possible to accurately estimate changes in gross revenue for the commercial Chinook salmon fishermen from changes in AEQ Chinook salmon under the alternatives. Estimating changes in commercial Chinook salmon gross revenues would require two unrealistic assumptions. First, the analysts would have to assume the portion of the AEQ Chinook salmon that would be caught by the commercial fisheries, such as the simple assumption that the commercial fishery would catch all of the returning AEQ Chinook salmon. This assumption would not be realistic because the subsistence use of Chinook salmon has priority over commercial use. Thus, in some river systems, increases in Chinook salmon returns might be caught wholly by subsistence fishermen.

Second, to estimate changes in gross revenues, one must also make an assumption of average weight per fish and determine an appropriate average price per pound by river system. In some rivers systems, directed commercial Chinook salmon fisheries have not occurred in recent years. Thus, average weight and average price proxy values from other areas would have to be used, which creates additional uncertainty in the estimates of potential commercial value. Further, the total social and cultural value of subsistence Chinook salmon catch cannot be evaluated in a way that is directly comparable to the monetary value of potential increases in commercial Chinook salmon catch or forgone gross revenues from the pollock fleet. Estimates of changes to the gross revenues to the commercial Chinook salmon fishery may mask the true subsistence value, tempting the reader to focus on the monetary estimates of commercial value when the non-monetary value of subsistence harvests is very important and cannot be reflected in terms of gross revenues.

For the reasons outlined above, this analysis of potential economic benefits does not provided estimates of a monetary value of the salmon saved. The analysis, instead, relies on AEQ estimates of Chinook salmon saved as the measure of economic benefits of the alternatives and options. In addition to benefits, in terms of Chinook salmon saved and that may then be harvested, there are also several categories of benefits that are discussed here qualitatively due to analytical limitations identified herein. These treatments are provided for both Passive Use, and for several categories of Use and Productivity benefits. These discussions are intended to qualitatively highlight potential non-market benefits in keeping with the requirements of E.O. 12866 to consider all applicable costs and benefits of a proposed action, as discussed in the opening pages of this RIR.

5.1.1 Passive-use Benefits

It can be demonstrated that society places economic value on relatively unique environmental assets, whether or not those assets are ever directly exploited. For example, society places real and potentially measurable economic value on simply knowing that a rare or endangered species of animal or plant is protected in the natural environment. The term ‘value’ is used, in the present context, as it would be in a cost-benefit analysis (i.e., what would people be willing to give up to preserve or enhance the asset being assessed?). Because no market, in the traditional economic sense, exists within which protections or enhancement of environmental assets are bought, sold, or traded, there is no institutional mechanism wherein a market clearing price may be observed. Such a market clearing price would typically be used to estimate a consumer’s willingness-to-pay to obtain the goods or services being traded. Nonetheless, the continued and sustained existence of wild salmon, and especially Chinook salmon, does have economic value, as demonstrated by the current public debate over its preservation and enhancement in parts of the country where salmon stocks are identified as threatened or endangered under the ESA.

Among those holding these values, there is no expectation of directly ‘using’ this asset, in the normal sense of that term. Whether referred to as passive-use, non-use, or existence value, the underlying premise is that individuals derive real and measurable utility (i.e., benefit) from the knowledge that relatively unique natural assets, even if utilized sustainably, will continue to exist in perpetuity. Fundamentally, passive-use value reflects the utility an individual derives from knowing that the resource of interest (e.g., Chinook salmon) exists in a given state of being, even though no use is ever expected to be made of it by the holder of the value.

Such values are not, in any way, correlated with the risk of "extinction." Indeed, the "source" of the passive-use value need not even be a living thing (i.e., the earliest work on passive-use described values placed on free flowing rivers by individuals who reported no intention of ever visiting these rivers). Passive-use values are actual, measurable, and legitimate aspects of society's preferences for, in this case, fishery resource management. As such, passive-use values must be accounted for, to the extent practicable, in evaluating the benefits and costs of the proposed Chinook bycatch action. Along with the other sources of "benefits" and "costs," passive-use values contribute to a full accounting of the net benefit to the Nation (possibly negative) accruing from the tradeoff of Chinook bycatch for pollock harvests in the Bering Sea. This is a requirement of Presidential Executive Order 12866.

The concept of passive-use value is well established in economic theory, supported by a growing body of empirical literature, increasingly employed in both public and private valuation analyses, and accepted by most as a legitimate, appropriate, and necessary aspect of natural resource policy and management decision-making. At present, the only widely accepted means of estimating passive-use values is by surveying people to find out what they would be willing to pay (or willing to accept, depending upon with whom the implicit property right resides) for any given action that affects a resource for which non-market values are hypothesized to exist. This approach is termed the ‘contingent value’ method (CVM). A substantial body of empirical literature has developed, over perhaps the last 25 years, describing the application of this technique to the valuation of natural resource assets. The use of CVM has also been carefully reviewed and accepted (when employed appropriately) by the federal courts (*Ohio v. United States Department of the Interior*, 880 F.2 432 [D.C.Cir. 1989]), as well as by NOAA (58 Federal Register 4601, 4602-14 [1993]).

Empirical research on passive-use value, within the broad context of natural resources, suggests that these economic values may be substantial when they exist. When consciously aware of risks posed to a unique asset (e.g., the Amazon rain forest), members of the public often reveal significant willingness-to-pay values for its protection. In that particular example, there is empirical evidence to support the existence of significant passive-use values (e.g., cash donations to various *Save the Amazon Rain Forest* groups or efforts, celebrity-sponsored fund raisers and large monetary donations to the cause, outright purchase of at-risk land, or acquisition of use-rights to at-risk land, etc.). Closer to home, a USDA Forest Service (Forest Service) study that used contingent valuation to measure the value the public places on the existence of critical habitat for the northern spotted owl indicated that Oregon residents were willing to pay between $49.6 million and $99 million (or $28 per acre) (Loomis et al. 1996).

In the current context, Chinook salmon are clearly valuable because they contribute not only to the existence and productivity of many living assets for which both market and non-market values exist (e.g., commercial salmon fisheries, Steller sea lions, sea birds, and toothed whales of various species), but also the social fabric, identity, and culture of Native and non-native peoples throughout Alaska, the Pacific Northwest, and British Columbia. While this may seem intuitively obvious, isolating a passive-use value unique to Chinook salmon taken in the Bering Sea nonetheless presents conceptual problems. While society’s desire to sustain wild salmon stocks may be regarded as a derived demand, because it provides an ecological service that supplies an input to the production of goods and services from which society derives direct consumptive benefit, passive-use values are in addition to the value obtained from derived goods and services. It seems probable that a portion of the willingness to pay for goods and services obtained from all the living marine resources of the Bering Sea, whether or not it is revealed in a market, has embedded in it the value of those same resources. Few holders of these values would likely be able to either explicitly recognize or express them.

That does not imply, however, that these values do not exist, or that with sufficient time and expertise, they could not be measured. It simply means that, to the best of the analysts’ knowledge, there has been no study published to date concerning the passive-use value of changes in Chinook salmon run sizes for stocks intercepted in the Bering Sea pollock fishery. Therefore, at present, it is not possible to provide a specific monetary estimate of the passive-use value that is hypothesized to be associated with one or another of the proposed salmon bycatch minimization alternatives or, therefore, to differentiate passive use benefits by alternative. Thus, while this analysis recognizes their existence, passive use benefits cannot be further analyzed.[50]

In response to an assertion made in public comments (Comment 10-14) that the analysis "offers no proof that such values exist as to Chinook salmon...," NMFS points to the significant expression of public interest and concern, especially by non-commercial fishing interests, in the matter of Chinook (and chum) salmon bycatch. While several examples can be readily cited, perhaps the most unambiguous of these is the extraordinary cultural and social value held for Chinook salmon, by many American Native peoples (and non-natives, alike). These Chinook salmon values are reflected in treaty agreements, both between Native American Tribal entities and the U.S. government, as well as internationally (e.g., numerous U.S.-Canada, historically, U.S.-Japan-U.S.S.R. salmon treaties)

Because monetary estimates of passive uses cannot yet be derived, NMFS has assiduously avoided any suggestion of the potential magnitude of non-use impacts, choosing instead only to identify their likely existence. This is fully consistent with requirements contained in E.O. 12866 and NOAA Fisheries Guidance for Preparation of Economic Impact Analyses[51].

5.1.2 Use and Productivity Benefits

As noted above, passive-use value (e.g., existence, bequest value) is often regarded as a non-use value, because it does not depend on actual or even potential interaction between the person holding the value and the resource being valued. This section addresses values associated with direct use of the resource. Among these use-benefits are several categories: market and non-market, as well as consumptive and non-consumptive uses. Each is addressed below.

Non-market/non-consumptive uses are, in general, associated with private recreation or leisure activities. A typical example of such a use is unguided catch-and-release sport fishing. Unless a guide is hired, the user does not enter into a market transaction to acquire access of the resource, nor does his or her use ‘consume’ the resource, except perhaps for some hooking mortality. In the current context, non-market/non-consumptive values are imbedded within the discussion of sport fishing value and represent an aspect of the aggregate benefit attributable to measures to minimize Chinook salmon bycatch in the Bering Sea pollock fishery.

Non-market/consumptive uses may include, within the current context, authorized subsistence use, personal use, and consumptive sport use of Chinook salmon. Alaska Native populations, and some rural residents, have retained the right to exploit the Chinook salmon resources for customary and traditional cultural activities, as well as for personal use. Many western Alaska residents lead a subsistence lifestyle that is highly dependent on salmon. Others obtain salmon for winter food through personal use and consumptive sport fishing. These extra-market consumptive uses represent a benefit that would be enhanced by minimizing Chinook salmon bycatch. They are, therefore, appropriately listed among the gains society may expect from adoption of one or more of the alternatives to the status quo.

Market/non-consumptive uses comprise activities that involve a market transaction to acquire access to the resource, but do not involve consumption of the resource. Examples may include ecotourism, wherein clients pay outfitters to guide them to locations where migrating or spawning salmon may be observed in their natural state. Consider the willingness to pay exhibited by those who incur the cost to travel to remote areas of Alaska, guided and outfitted by commercial tourism companies, simply to watch the interaction of migrating salmon and bears, eagles, and other apex predators. In the present context, guided sport fishing, when utilizing

[50] From response to public comment 10-83 in EIS Chapter 9, the Comment Analysis Report.
[51] Excerpted from response to public comment 10-16 and 10-17 in EIS Chapter 9, the Comment Analysis Report.

catch and release practices, would also qualify as a market/non-consumptive use. While some of this activity occurs in western Alaska, mostly in the Nushagak and Togiak areas of Bristol Bay, some consumption of fish is allowed and does occur. Thus, it is not clear what proportion of guided fishing might qualify under this criterion and what might be termed market/consumptive use. In any event, economic values of these forms will necessarily be imbedded in the overall benefit assessment of prevention of Chinook salmon bycatch.

An additional class of market/consumptive-use values may be identified in connection with Chinook salmon bycatch minimization measures in the Bering Sea. Improved in-river "Production and Yield" of Chinook salmon in the ocean environment may enhance commercial fishery opportunities (consumptive-use value) as well as improve escapements and sustainability of future Chinook salmon runs. The implication of these improvements could be quite important, given the numerous "source" water-sheds that contribute Chinook salmon lost to PSC interception in the Bering Sea pollock fisheries. As discussed in EIS Chapter 5, a very small amount of these Chinook salmon losses accrues to stocks of fish that are either under a "threatened" status, or already listed as "endangered" under the ESA.

5.2 Chinook Salmon Bycatch and Fisheries Under Alternative 1

In October 2005, to reduce the pollock fishery's bycatch of Pacific salmon, the Council adopted Amendment 84 to the BSAI groundfish FMP. Regulatory management measures implemented prior to Amendment 84 to reduce salmon bycatch had not been sufficiently effective at controlling Chinook salmon bycatch. The Council developed Amendment 84 to attempt to resolve the bycatch problem through the AFA pollock cooperatives. Amendment 84 exempts pollock vessels from Chinook and Chum Salmon Savings Area closures, if the vessel participates in the VRHS ICA to reduce salmon bycatch. Despite these efforts, salmon bycatch numbers have continued to increase substantially.

While the inter-cooperative reports on Chinook salmon bycatch indicate that the VRHS has reduced Chinook salmon bycatch rates compared with what they would have been without the measures, concerns remain because of escalating amounts of Chinook salmon bycatch through 2007. From 1990 through 2001, the Bering Sea Chinook salmon bycatch average was 37,819 salmon annually. Since 2002, Chinook salmon bycatch numbers have increased substantially. The averages from 2002 to 2007 were 82,311 Chinook salmon, with a bycatch peak of approximately 122,000 Chinook salmon in 2007. Currently, the best scientific data identifying the "source of origin" of the Chinook salmon intercepted in the Bering Sea pollock trawl fisheries, while not exhaustive, do permit assignment of Chinook salmon losses to specific regional stocks (e.g., AYK, Pacific Northwest (PNW), Asia) with an acceptable level of confidence. Estimates vary by year and fishing season, but more that half of the Chinook salmon caught in the Bering Sea pollock fishery were destined for western Alaska river systems.

The description of potentially affected salmon fisheries in Chapter 3 provides an extensive treatment of Chinook salmon fisheries in western Alaska. The major Chinook fisheries occur in the Norton Sound Region, Kuskokwim area, the Yukon River, and in the Nushagak and Togiak Districts of the Bristol Bay Region. A summary of findings is presented here to characterize the present situation in those fisheries.

Norton Sound

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 Chinook salmon management plan for Subdistricts 5 and 6 (Shaktoolik and Unalakleet) was established to address the poor Chinook salmon runs in the 2000s. This plan placed a series of restrictions on subsistence harvest of Chinook salmon. Overall subsistence salmon harvest in the Norton Sound region peaked in 1996), with 129,046 fish caught. A downward trend in overall harvest occurred in the late 1990s, but the 2002 harvest of 103,488 fish was above historic averages. Since then, overall harvest has trended downward and the 2007 harvest of 48,694 fish was well below the 84,950 fish five year average. Within these overall trends are downward trends in subsistence catch of Chinook salmon since the late 1990s. Norton Sound area subsistence Chinook harvests peaked in 1997 at 8,989 fish. Since then, subsistence Chinook harvests have declined in nearly every year and the 2007 harvest of 2,646 fish was the lowest level recorded since 1994. Note; however, that prior to 1994, and between 2004-2006, subsistence surveys were not completed in all subdistricts.

Within the Norton Sound area, the subdistricts that have been most affected by declining Chinook salmon runs have been the Shaktoolik and Unalakleet subdistricts In the Shaktoolik subdistrict, the peak subsistence Chinook Catch of 1,275 fish occurred in 1995. Since then, catch declined through the late 1990s before rising to 1,230 fish in 2002. Since 2002, Shaktoolik subsistence Chinook catches have trended downward to a low of 382 fish in 2006. The 2007 harvest of 515 fish was well below the 5 and 10 year averages.

In the Unalakleet district, the peak subsistence Chinook catch of 6,325 fish occurred in 1997. Since then, the catch has trended downward through the 2000s. The 2007 harvest of 1,665 fish was the lowest level recorded since complete surveys began in 1994.

Norton Sound commercial Chinook catches trended downward in the late 1990s and early 2000s. As recently at 1997, more than 12,000 Chinook were commercially harvested in the region; however, by 2000 the harvest had declined to 752 fish. By 2004, no commercial Chinook harvest was allowed.

Norton Sound Region Chinook value peaked in 1985 at $452,877, when it represented more then 55 percent of the overall value. Chinook value has fluctuated since the 1980s and rose to $225,136 in 1997 when it was nearly 62 percent of the overall value. During the 2000s, Chinook value has declined as the run has declined and has been restricted to incidental catch value since 2004. In 2007, no value was earned from Chinook target fisheries and just $113 was earned from incidental catch in other salmon fisheries. Similar to subsistence Chinook catch, the impact of declines in commercial Chinook catch have been felt most in the Shaktoolik and Unalakleet districts.

Kuskokwim Area

From the beginning of the 2007 season there was a good showing of Chinook, chum, and sockeye salmon throughout the Kuskokwim Area; however, run timing for these species was approximately 5 to 7 days late compared to average. Chinook salmon abundance was characterized as average to above average while sockeye and chum salmon abundance was characterized as above average. Coho salmon abundance was characterized as average to below average with overall early run timing. Amounts necessary for subsistence use are expected to have been achieved throughout the area.

The BOF met in Anchorage from January 31 to February 5, 2007, to review regulatory fisheries proposals concerning the Arctic-Yukon-Kuskokwim (AYK) areas. 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.

Yukon River

In response to the guidelines established in the Sustainable Salmon Policy, the BOF discontinued the Yukon River summer and fall chum salmon as stocks of 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.

There was an increasing trend in overall Lower Yukon subsistence catch through the early 1990s. Since 1993, when lower Yukon total subsistence Chinook catch was 28,513 fish, catch has trended downwards. The 2007 lower Yukon Chinook subsistence catch of 20,514 fish was below the ten year average but above the 5-year average. In Districts 1 and 3 the 2007 catch was below both the 5 and 10 year averages; however, the 2007 district 2 subsistence Chinook catch of 10,496 was the greatest since 2001 and well above both the 5- and 10-year averages.

Subsistence Chinook catch numbers in the Upper Yukon River, by district; have been at historically high levels during the early to mid 2000s, and above averages in 2007. District 4 2007 catches were below the 5-year average and close to the 10 year average, while Districts 5 and 6 had catches greater than both averages in 2007. Canadian aboriginal subsistence catch declined steadily in the 2000s. The 2007 catch of 5,000 fish is well below the 5- and 10-year averages of 6,375 and 6,801, respectively. The small Porcupine aboriginal catch has exceeded the 5- and 10-year averages in each of the years since 2003.

Lower Yukon Chinook commercial harvests have trended downward since the mid 1990s when nearly 120,000 Chinook were harvested. By 2001, there were no commercial Chinook openings in the Yukon River. Since 2001, the Chinook run has improved enough to allow for commercial openings with a peak harvest during that period of 52,548 in 2004. Since 2004, however, runs have weakened and catch has fallen steadily.

The 2007 lower Yukon Chinook catches were well below the 5-year and 10-year averages in Districts 1 and 2 as well as overall. In district 3, the 2007 commercial Chinook catches were the first recorded since 1999. Historically, however, District 3 has had commercial Chinook harvests numbering more than 5,000 fish. Overall, upper Yukon commercial Chinook harvests have been well below historic levels during the 2000s, and the 2007 harvests were below 5 year and 10 year averages in all parts of the Upper Yukon.

Alaska Yukon Chinook commercial harvest value peaked in 1992 at just over $10 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 2007 harvest was worth just under $2 million.

The 2008 run is expected to be below average and similar to the 2007 run, although, it is anticipated that the 2008 run will provide for escapements, support a normal subsistence harvest, and a below average commercial harvest. If inseason indicators of run strength suggest sufficient abundance exists to have a commercial Chinook salmon fishery, the U.S. commercial harvest could range from 5,000 to 30,000 Chinook salmon including the incidental harvest taken during anticipated summer chum salmon directed periods. The run of Canadian-origin Upper Yukon River Chinook salmon in 2008 is expected to be below average. The preseason outlook is for approximately 111,000 Canadian-origin Chinook salmon. However, due to the relationship between the expected and observed run size in 2007, expected 2008 run size could be as low as 80,000 fish.

Bristol Bay Region

In 2007, Chinook salmon escapement into the Nushagak River was 60,000, 80 percent of the 75,000 inriver goal. Harvest was 51,000 Chinook in the Nushagak District. Peak Chinook salmon production in the early 1980’s resulted in record commercial harvests and growth of the sport fishery. Declining run sizes and the question of how to share the burden of conservation among users precipitated the development of a management plan for Nushagak Chinook salmon. Since the plan was adopted in 1992, the Nushagak-Mulchatna Chinook Salmon Management Plan (NMCSMP) has governed management of the Nushagak Chinook salmon fisheries (5 AAC 06.361). The plan was amended in 1995, 1997, and 2003.

Bristol Bay Subsistence Chinook harvests hit a 20 year high of 21,231 in 2003 but have fallen significantly with 12,617 and 16,002 fish harvested bay wide in 2006 and 2007 respectively. The 20 year average is presently 15,438. While it appears that subsistence Chinook harvests in the Bristol Bay area have improved over historic levels, there were declines in subsistence Chinook harvests in the Naknek-Kvichak District during the late 1990s and early 2000's. The Nushagak District had a similar decline, rebounded to a record catch in 2003, but then declined for the next four years before recovering to 13,615 fish, or just above the 10 year average, in 2007.

Overall, Bristol Bay commercial Chinook salmon harvests in 2007 were below the recent 20-year averages in all districts. The 2007 bay-wide commercial harvest of 62,670 Chinook was below the 20-year average of 66,607. The main factor here was the unexpected shortfall in the Nushagak District where the harvest was only 51,350. This was well below the expected harvest of 140,000.

5.3 Effects of Alternative 2 on Chinook Salmon Savings

This analysis draws heavily on an analysis in EIS Chapter 5 of hypothetical reductions in coastal-west Alaska specific AEQ Chinook salmon bycatch areas. The values are based on median AEQ values and mean region proportional assignments within strata (A-season, and northwest (NW) Bering Sea and southeast (SE) Bering Sea in the B seasons) genetics data collected from 2005 through 2007, as described in EIS Chapter 3. This analysis reproduces output from the AEQ analysis for western Alaska river system, specifically the Yukon, Bristol Bay, and Kuskokwim areas.

The benefits, in numbers of AEQ Chinook salmon that would potentially have accrued under Alternative 2 are dependent on the level of bycatch and on the level of the hard cap. The greatest benefits under Alternative 2, in numbers of adult Chinook salmon estimated to return, would occur in the highest bycatch years (2006 and 2007) and under the most restrictive hard cap of 29,300 fish. Total AEQ estimates for those years and under the 29,300 cap range from around 40,100 to more than 65,000 fish, depending on year and management option. In low bycatch years, the 29,300 cap, with its various management options, would have resulted in adult Chinook salmon savings ranging from about 12,000 to just over 20,000 fish. The 2005 year falls in between with AEQ estimates ranging from 23,000 to 27,500 fish.

A similar pattern of the relative value of AEQ Chinook salmon benefits is apparent at each cap level. At the 48,700 cap level, AEQ Chinook salmon benefits range from just over 3,000 fish in 2003 to about 52,000 fish in 2007. When the cap increases to 68,100, that range is 267 fish to 43,135, and at the 87,500 cap level the range is -153 to 35,215. A negative number, which can occur in years when the actual bycatch was below a given cap level, means that more, not fewer, Chinook salmon would have been prevented from spawning than actually occurred. This can happen when the combined cumulative effect from prior years' bycatch levels are low in some season and sectors and high in others.

The maximum benefit to the western Alaska region would be approximately 37,492 Chinook salmon that may accrue in a high bycatch year like 2007, and for the most restrictive cap and option as discussed previously. In a low bycatch year such as 2004, that maximum benefit is estimated at 10,713 Chinook salmon. The minimum benefit in the 2007 year would have been 8,375 Chinook salmon, but in 2004, the minimum is estimated to be negative. These data demonstrate that the scenarios analyzed here have a broad range of potential benefits that depend on the level of cap and the severity of the bycatch year as well as on how restrictive the season splits and/or sector apportionments options are. Further, not all scenarios provide salmon savings benefit.

Table 5-1 provides estimates of the number of adult equivalent Chinook salmon that would have been saved (e.g. reduction in mortality) under each management option of Alternative 2, by year. These estimates combine all stock based estimates to give an overall estimate of salmon saving benefits in numbers of adult equivalent Chinook salmon and are calculated from the AEQ estimates provided in EIS Chapter 5. The estimates presented here are intended to provide a broad overview of potential benefits in terms of the total number of adult fish that would return to their natal streams, wherever they may be located. A comparative analysis, including treatment of impact on specific western Alaska river systems, which comprise the greatest proportion of the AEQ estimates, is presented in Chapter 7.

Table 5-1 Hypothetical adult equivalent Chinook salmon saved under each cap and management option in Alternative 2, 2003-2007. Numbers are based on the median AEQ values with the original estimates shown in the second row.

	2003	2004	2005	2006	2007
No Cap	**33,215**	**41,047**	**47,268**	**61,737**	**78,814**
87,500 70/30 opt2d	312	2,792	8,789	12,679	22,417
87,500 70/30 opt2a	134	2,562	8,515	11,751	24,650
87,500 70/30 opt1	351	3,465	10,633	18,356	27,708
87,500 58/42 opt2d	-153	1,191	5,071	14,602	26,833
87,500 58/42 opt2a	1,072	1,160	2,866	6,777	19,695
87,500 58/42 opt1	107	2,884	9,115	17,399	27,802
87,500 50/50 opt2d	205	104	4,340	12,509	26,843
87,500 50/50 opt2a	2,468	2,080	4,128	13,760	25,602
87,500 50/50 opt1	64	1,300	5,356	18,598	35,215
68,100 70/30 opt2d	53	4,181	10,954	21,154	33,702
68,100 70/30 opt2a	3,234	6,352	10,414	17,447	31,171
68,100 70/30 opt1	267	4,256	11,761	21,846	36,148
68,100 58/42 opt2d	851	3,630	9,564	20,789	35,620
68,100 58/42 opt2a	3,192	4,389	8,163	18,203	33,675
68,100 58/42 opt1	107	3,570	9,866	25,842	40,677
68,100 50/50 opt2d	2,446	3,440	6,019	22,785	40,751
68,100 50/50 opt2a	3,131	3,823	8,086	18,537	33,670
68,100 50/50 opt1	873	3,388	9,065	25,403	43,135
48,700 70/30 opt2d	3,966	7,382	13,860	31,660	50,537
48,700 70/30 opt2a	4,417	9,616	16,247	27,972	44,517
48,700 70/30 opt1	3,060	7,500	13,894	30,002	49,438
48,700 58/42 opt2d	3,228	7,355	13,147	31,040	48,694
48,700 58/42 opt2a	5,493	9,872	15,261	33,712	51,749
48,700 58/42 opt1	4,866	7,846	13,480	31,194	53,360
48,700 50/50 opt2d	4,418	7,274	13,668	30,861	49,167
48,700 50/50 opt2a	6,266	10,188	16,129	33,087	51,599
48,700 50/50 opt1	6,361	9,100	15,990	32,207	52,098
29,300 70/30 opt2d	14,015	18,368	24,173	41,224	65,476
29,300 70/30 opt2a	12,100	17,234	23,443	41,125	61,594
29,300 70/30 opt1	13,963	18,523	25,382	42,636	63,594
29,300 58/42 opt2d	14,252	17,401	24,875	41,261	63,773
29,300 58/42 opt2a	13,839	18,004	25,136	40,910	63,775
29,300 58/42 opt1	14,956	19,780	25,982	43,406	63,890
29,300 50/50 opt2d	14,093	18,917	25,886	43,072	64,766
29,300 50/50 opt2a	14,092	19,120	25,755	40,812	62,810
29,300 50/50 opt1	16,111	20,375	27,592	44,195	65,653

5.4 Effects of Alternative 3 on Chinook Salmon Savings

The triggered closures analyzed here are based on the same hard caps as those under Alternative 2. In other words, the triggers may be chosen from within the set of hard caps and would be used to trigger the closure areas identified in the Alternative set (discussed in detail in EIS Chapter 2) for the A and B seasons. The difference here is that the triggered closure does not cap salmon bycatch but rather uses the cap number to trigger the closure, which moves fishing effort outside of the trigger-closure area.

To determine the effects of the triggered closure on salmon bycatch, Chapters 4 and 5 presents an analysis of both pollock catch and Chinook salmon bycatch within and outside the trigger-closure area in each of the years 2003-2007. That methodology has estimated the numbers of Chinook salmon that are potentially saved by moving effort outside of the closure areas and the following tables document those numbers as potential benefits in terms of the number of Chinook potentially saved under each trigger, option, and seasonal split. These estimates are based on changed catch rates of Chinook inside and outside the trigger-closure area. The AEQ analysis presented previously in the discussion of Alternative 2 has not been specifically re-created for the trigger-closure analysis at this time, thus it is not possible to relate these savings in Chinook salmon to specific western Alaska River systems.

Table 5-2 shows the expected Chinook salmon saved by all vessels in the A season trigger closure have been invoked. The maximum Chinook saved of 40,311 fish would come from the lowest cap in the highest bycatch year (2007) and occurs for all but the 70/30 split, which had 36,899 Chinook saved. Thus, the 70/30 split reduces estimated Chinook savings overall in all years under the 29,300 trigger. In the low bycatch year of 2004, the maximum Chinook savings under the trigger-closure with the 29,300 cap is 5,224 fish and is greatest under the 50/50 split option. In general, in the more moderate bycatch years the 50/50 split results in the greatest Chinook savings under both the 29,300 and 48,700 triggers. Note, however, that the 48,700 trigger level is not estimated to save any Chinook salmon in 2004. Further, the higher triggers are only expected to save salmon in the highest bycatch years of 2006 and 2007. Under the high trigger of 87,500, the maximum Chinook salmon saved would have come from the 50/50 split and would have been 12,098 and 15,088 in 2006 and 2007, respectively.

Table 5-3 through Table 5-5 provide a breakout of these data specific to CPs, shore-based CVs and motherships in the A season; those tables show consistent patterns and indicate that the greatest number of salmon saved generally come from the shore-based CV sector, and the least from the Mothership sector.

B season Chinook savings show a different pattern than in the A season. As expected, the maximum number of Chinook saved, 36,290, comes from the lowest trigger of 29,300 fish in the highest overall bycatch year (2007), and from the 70/30 season split (Table 5-6). However, even the 87,500 trigger with the 70/30 season split is expected to save Chinook salmon, with savings of 2,680, 11,300 and 20,322 expected for 2004, 2005, and 2007 respectively. There are some instances when the trigger closure is shown to produce a negative savings of Chinook salmon. That finding implies that, in some years, the catch rate of Chinook outside the B season triggered closure area is actually higher than inside of it. In the 2004 A season, this would have been the case under a 48,700 trigger with either the 58/42 or 55/45 splits and with a 70/30 split under the 68,100 trigger.

Table 5-7 through Table 5-9 provide the breakdown of these results for at CPs, CVs, and Motherships, respectively. These tables show that the vast majority of B season Chinook salmon savings is expected to come from the CV sector under all trigger levels.

Table 5-2 Expected Chinook salmon *saved* by all vessels if A-season trigger-closure had been invoked.

Chinook Salmon saved			Sector (All), A season				
Cap scenario		CAP	2003	2004	2005	2006	2007
87,500	1-1: 70/30	61,250					4,827
	1-2: 58/42	50,750				6,795	11,908
	1-3: 55/45	48,125				8,736	13,417
	1-4: 50/50	43,750				12,098	15,008
68,100	1-1: 70/30	47,670				8,853	13,417
	1-2: 58/42	39,498				14,948	21,393
	1-3: 55/45	37,455				16,738	22,964
	1-4: 50/50	34,050				21,129	24,865
48,700	1-1: 70/30	34,090				21,129	24,865
	1-2: 58/42	28,246	2,824			25,409	29,031
	1-3: 55/45	26,785	3,530		83	25,409	32,071
	1-4: 50/50	24,350	5,659		878	28,632	33,279
29,300	1-1: 70/30	20,510	7,351	1,815	3,329	32,243	36,899
	1-2: 58/42	16,994	9,568	3,043	5,556	34,389	40,311
	1-3: 55/45	16,115	10,513	3,815	6,369	34,389	40,311
	1-4: 50/50	14,650	11,545	5,224	7,591	34,389	40,311

Table 5-3 Expected Chinook salmon *saved* by CPs if A-season trigger-closure had been invoked.

Chinook Salmon saved			Sector CP, A season				
Cap scenario		CAP	2003	2004	2005	2006	2007
87,500	1-1: 70/30	61,250					2,206
	1-2: 58/42	50,750				4,216	7,381
	1-3: 55/45	48,125				5,048	7,544
	1-4: 50/50	43,750				6,673	7,854
68,100	1-1: 70/30	47,670				5,088	7,544
	1-2: 58/42	39,498				7,112	9,676
	1-3: 55/45	37,455				7,321	10,356
	1-4: 50/50	34,050				7,731	11,028
48,700	1-1: 70/30	34,090				7,731	11,028
	1-2: 58/42	28,246	456			8,791	12,288
	1-3: 55/45	26,785	662		-36	8,791	14,389
	1-4: 50/50	24,350	1,518		268	9,976	15,641
29,300	1-1: 70/30	20,510	2,517	195	1,496	10,858	16,847
	1-2: 58/42	16,994	3,239	771	2,671	11,091	17,630
	1-3: 55/45	16,115	3,904	897	2,859	11,091	17,630
	1-4: 50/50	14,650	4,766	1,437	3,158	11,091	17,630

Table 5-4 Expected Chinook salmon *saved* by inshore catcher vessels if A-season trigger-closure had been invoked.

Chinook Salmon saved					**Sector CV, A season**		
Cap scenario		**CAP**	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	61,250					2,546
	1-2: 58/42	50,750				2,362	3,804
	1-3: 55/45	48,125				3,389	4,972
	1-4: 50/50	43,750				4,297	6,065
68,100	1-1: 70/30	47,670				3,464	4,972
	1-2: 58/42	39,498				6,346	9,998
	1-3: 55/45	37,455				7,668	10,777
	1-4: 50/50	34,050				11,346	12,062
48,700	1-1: 70/30	34,090				11,346	12,062
	1-2: 58/42	28,246	1,620			14,252	14,670
	1-3: 55/45	26,785	1,862		156	14,252	15,599
	1-4: 50/50	24,350	2,961		616	16,233	15,621
29,300	1-1: 70/30	20,510	3,664	1,778	1,749	18,705	17,498
	1-2: 58/42	16,994	4,956	2,393	2,763	19,957	19,757
	1-3: 55/45	16,115	5,182	2,989	3,393	19,957	19,757
	1-4: 50/50	14,650	5,327	3,639	4,303	19,957	19,757

Table 5-5 Expected Chinook salmon *saved* by mothership operations if A-season trigger-closure had been invoked.

Chinook Salmon saved					**Sector M, A season**		
Cap scenario		**CAP**	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	61,250					195
	1-2: 58/42	50,750				209	724
	1-3: 55/45	48,125				317	909
	1-4: 50/50	43,750				1,198	1,097
68,100	1-1: 70/30	47,670				323	909
	1-2: 58/42	39,498				1,570	1,724
	1-3: 55/45	37,455				1,833	1,839
	1-4: 50/50	34,050				2,140	1,796
48,700	1-1: 70/30	34,090				2,140	1,796
	1-2: 58/42	28,246	310			2,546	2,105
	1-3: 55/45	26,785	451		-32	2,546	2,111
	1-4: 50/50	24,350	520		28	2,601	2,075
29,300	1-1: 70/30	20,510	607	-33	126	2,866	2,621
	1-2: 58/42	16,994	739	-10	173	3,497	2,894
	1-3: 55/45	16,115	779	67	178	3,497	2,894
	1-4: 50/50	14,650	736	269	193	3,497	2,894

Table 5-6 Expected Chinook salmon *saved* by all vessels if B-season trigger-closure had been invoked.

Chinook saved			Sector (All), B season				
Cap scenario		CAP	2003	2004	2005	2006	2007
87,500	1-1: 70/30	26,250		2,680	11,300		20,322
	1-2: 58/42	36,750			739		13,590
	1-3: 55/45	39,375					11,852
	1-4: 50/50	43,750					7,497
68,100	1-1: 70/30	20,430		-5,462	16,127	3,363	25,504
	1-2: 58/42	28,602		858	8,643		19,180
	1-3: 55/45	30,645			7,181		17,304
	1-4: 50/50	34,050			4,119		14,998
48,700	1-1: 70/30	14,610		9,588	21,384	8,537	30,513
	1-2: 58/42	20,454		-5,462	16,127	3,363	25,504
	1-3: 55/45	21,915		-3,568	14,713	1,630	24,008
	1-4: 50/50	24,350		1,105	12,612		22,069
29,300	1-1: 70/30	8,790	2,406	16,424	25,081	13,582	36,290
	1-2: 58/42	12,306	3	13,859	23,032	10,504	33,092
	1-3: 55/45	13,185		11,721	22,437	10,050	31,236
	1-4: 50/50	14,650		9,588	21,384	8,537	30,513

Table 5-7 Expected Chinook salmon *saved* by CPs if B-season trigger-closure had been invoked.

Chinook saved			Sector CP, B season				
Cap scenario		CAP	2003	2004	2005	2006	2007
87,500	1-1: 70/30	26,250					1,534
	1-2: 58/42	36,750			0		457
	1-3: 55/45	39,375					45
	1-4: 50/50	43,750					
68,100	1-1: 70/30	20,430				-	1,666
	1-2: 58/42	28,602					1,402
	1-3: 55/45	30,645			0		1,082
	1-4: 50/50	34,050			0		998
48,700	1-1: 70/30	14,610		-	-	41	1,863
	1-2: 58/42	20,454		-	-	-	1,666
	1-3: 55/45	21,915		-	-	-	1,664
	1-4: 50/50	24,350		-	-		1,639
29,300	1-1: 70/30	8,790	252	194	163	158	3,020
	1-2: 58/42	12,306	-	-	114	104	2,609
	1-3: 55/45	13,185		-	63	101	2,346
	1-4: 50/50	14,650		-	-	41	1,863

Table 5-8 Expected Chinook *saved* by inshore catcher vessels if B-season trigger-closure had been invoked.

Chinook saved			Sector CV, B season				
Cap scenario		CAP	2003	2004	2005	2006	2007
87,500	1-1: 70/30	26,250		-	9,970		18,508
	1-2: 58/42	36,750			739		-
	1-3: 55/45	39,375					-
	1-4: 50/50	43,750					-
68,100	1-1: 70/30	20,430	-		15,570	-	23,583
	1-2: 58/42	28,602		-	-		17,906
	1-3: 55/45	30,645			7,181		16,640
	1-4: 50/50	34,050			4,119		-
48,700	1-1: 70/30	14,610		8,192	21,244	8,570	28,102
	1-2: 58/42	20,454	-		15,570	-	23,583
	1-3: 55/45	21,915	-		14,192	-	22,142
	1-4: 50/50	24,350		1,208	11,981		19,981
29,300	1-1: 70/30	8,790	2,250	13,814	24,708	13,339	27,940
	1-2: 58/42	12,306	103	10,929	22,643	10,302	27,349
	1-3: 55/45	13,185		9,889	22,081	9,891	28,282
	1-4: 50/50	14,650		8,192	21,244	8,570	28,102

Table 5-9 Expected Chinook *saved* by mothership operations if B-season trigger-closure had been invoked.

Chinook saved			Sector M, B season				
Cap scenario		CAP	2003	2004	2005	2006	2007
87,500	1-1: 70/30	26,250		268	-		533
	1-2: 58/42	36,750			-		-
	1-3: 55/45	39,375					-
	1-4: 50/50	43,750					-
68,100	1-1: 70/30	20,430	-		-	0	654
	1-2: 58/42	28,602		-	0		339
	1-3: 55/45	30,645			-		136
	1-4: 50/50	34,050			-		161
48,700	1-1: 70/30	14,610		394	4	-	1,192
	1-2: 58/42	20,454	-		-	0	654
	1-3: 55/45	21,915	-		-	0	638
	1-4: 50/50	24,350		218	-		624
29,300	1-1: 70/30	8,790	278	860	-	-	1,546
	1-2: 58/42	12,306	24	781	1	0	1,449
	1-3: 55/45	13,185		496	5	-	1,261
	1-4: 50/50	14,650		394	4	-	1,192

5.5 Effects of Alternative 4 and Alternative 5 on Chinook Salmon Savings

The benefits, in numbers of total adult Chinook salmon that would potentially have accrued under Alternatives 4 and 5, are dependent on the level of bycatch and on the level of the hard cap. Alternative 4 provides for transferable allocations and rollovers of up to 80 percent of a sector's or cooperative's allocation from the A season to the B season. In addition, Alternative 4 is composed of two cap level annual scenarios. A bycatch cap of 68,000 Chinook salmon is applied in Annual Scenario 1 (AS1), while a 47,591 Chinook salmon backstop cap is applied in Annual Scenario 2 (AS2). Alternative 5 reduces the AS1 cap to 60,000 Chinook salmon and retains the AS2 cap of Alternative 4 as a performance standard. Alternative 5 also allows transferability and 100 percent rollover. Thus, this analysis presents salmon savings numbers for AS1 of Alternative 5, AS1 and AS2 of Alternative 4, and treats the AS2 scenarios as equivalent impacts for both Alternative 4 and Alternative 5. Table 5-10 provides a hypothetical retrospective analysis of the AEQ Chinook salmon savings (i.e., reductions in bycatch numbers) that would have occurred under the Alternative 4 and Alternative 5 hard cap scenarios and their associated transfer and rollover provisions.

In the A season under AS1 of Alternative 5, the 60,000 Chinook salmon cap would have been constraining in 2006 and 2007, which are the highest bycatch years. The effect would have been to save 17,559 Chinook salmon in 2006 and 28,753 Chinook in 2007, with the greatest savings coming from the inshore CV sector, followed by the CP sector and then Motherships. There would have been no savings of Chinook salmon coming from the CDQ sector because their historic bycatch of Chinook salmon has been below the level they would be allocated under the 60,000 Chinook salmon cap. In the B season, Alternative 5 AS1, with 100 percent rollover allowed, would save 6,206, 5,162, and 34,535 Chinook salmon in 2005, 2006, and 2007, respectively. In total, Alternative 5 AS1 would have saved 6,206, 22,271, and 63,288 Chinook salmon in 2005, 2006, and 2007, respectively, with the majority of the savings coming from the inshore CV sector.

In the A season under AS1 of Alternative 4, with no transferability, the high cap would have only been constraining in 2006 and 2007, which are the highest bycatch years, and would affect the non-CDQ sectors of the fishery. The A season effect of the high cap would have been to save 14,796 Chinook salmon in 2006 and 23,341 Chinook in 2007, with the greatest savings coming from the inshore CV sector.

Under AS2 of Alternative 4, with no transferability, the hard cap would have been constraining in 2003, but not in either 2004 or 2005. The total A season Chinook savings would have been 2,059, 26,883, and 37,296 Chinook salmon in 2003, 2006, and 2007, respectively. When A season transferability is allowed under AS2 of Alternative 4, which is equivalent to AS2 of Alternative 5, the hard cap would have resulted in total A season Chinook savings of 430, 25,744, and 37,296 Chinook salmon in 2003, 2006, and 2007, respectively. As is the case under AS1 of Alternative 4, the greatest A season Chinook salmon savings comes from the inshore CV sector followed by the CP sector, motherships, and the CDQ sector with savings of 576 Chinook salmon and only in 2007.

The B season Chinook savings of each retrospective scenario is also shown in Table 5-10. As was the case in the A season, the effect of the hard cap constraint on the inshore CV sector generates the greatest salmon savings and the greatest savings would have occurred in 2007. In contrast with the A season, however, the 2006 year under AS1 of Alternative 4 would have had relatively modest B season savings of 4,109 fish, all from the inshore CV sector. In total, the B season salmon savings under AS1 of Alternative 4 range from zero in 2003, to 32,346 in 2007. Under AS2 of Alternative 4, these numbers increase to 142, in 2003, to 38,050 in 2007.

The general effect of A season transfers is to allow more pollock catch by necessarily utilizing more of the available salmon bycatch hard cap. As a result, transfers necessarily reduce salmon savings; however, the reduction may be relatively small. Under AS1 of Alternative 4, transfers have the most effect in a bycatch year like 2006, when 3,113 fewer Chinook would be saved, mostly in the inshore CV sector and with none in the CDQ sector. It is important to note that 2006 was not the highest bycatch year on record. The 2007 year had much higher Chinook bycatch; however, transfers in 2007 would have reduced salmon savings by 59 fish. Thus, it appears in this retrospective analysis, that the binding constraint of the hard cap is only mitigated by transfers when the constraint affects sectors at differing times, allowing for transfers among sectors in a season. If the hard cap is non-binding, transfers are not necessary; and if the hard cap is severely binding, as in the highest bycatch year, all sectors are shut down relatively quickly and transfers would not affect the outcome very much.

Under AS2 of Alternative 4, where the hard cap is smaller, transfers reduce salmon savings by 1,629 and 1,139 fish in 2003 and 2006 respectively. In contrast with AS1, the effect is shown in both the CP and inshore CV sector where it was split evenly in 2006, and the 2003 impact accrued to only the CPs. These differences are directly the result of the dates of fishery closure, as discussed in EIS Chapter 5.

Under AS1 of Alternative 4, an 80 percent rollover reduces Chinook salmon savings in several different sectors, but mostly in the inshore CV sector, and by as much as 15,845 fish in a bycatch year such as 2005. Under AS2 of Alternative 4 the lower cap means that there are fewer Chinook to rollover from A to B season. Thus, the reduction in Chinook savings is necessarily less and would have been greatest in 2004 when 6,817 fewer Chinook would have been saved, mostly in the inshore CV sector. A season transfers, in this retrospective analysis, had almost no effect on the timing of B season closures with or without rollovers. This counterintuitive result is due to the timing of B season closures, which is discussed in EIS Chapter 5.

Table 5-11 shows the effect of A season transferability on Chinook salmon savings under each Alternative 4 scenario. The general effect of A season transfers is to allow more pollock catch by necessarily utilizing more of the available salmon bycatch hard cap. As a result, transfers necessarily reduce salmon savings; however, the reduction is relatively small. Under AS1, transfers have the most effect in the 2006 years, when 3,113 fewer Chinook would be saved, mostly in the inshore CV sector and none in the CDQ sector. It is important to note that 2006 was not the highest bycatch year on record. The 2007 year had much higher Chinook bycatch; however, transfers in 2007 would have reduced salmon savings by 59 fish. Thus, it appears in this retrospective analysis, that the binding constraint of the hard cap is only mitigated by transfers when the constraint affects sectors at differing times, allowing for transfers among sectors. If the hard cap is non-binding, transfers are not necessary and if the hard cap is severely binding, as in the highest bycatch year, all sectors are shut down relatively quickly and transfers don’t affect the outcome very much.

Under AS2, where the hard cap is smaller, transfers reduce salmon savings by 1,629 and 1,139 fish in 2003 and 2006, respectively. In contrast with AS1, the effect is shown in both the CP and inshore CV sector where it was split evenly in 2006, and the 2003 impact accrued to only the CPs. These differences are directly the result of the dates of the fishery closure discussed in EIS Chapter 5.

Table 5-12 provides a tabulation of the reduction in B season Chinook salmon savings that would occur due to rollovers. The table provides the reductions in numbers of fish that an 80 percent rollover would result in. Under AS1, an 80 percent rollover reduces Chinook salmon savings in several different sectors, but mostly in the inshore CV sector, and by as much as 15,845 fish (2005). Under AS2, the lower cap means that there are fewer Chinook to rollover from A to B season. Thus, the reduction in Chinook savings is necessarily less and would have been greatest in 2004 when 6,817 fewer Chinook would have been saved, mostly in the inshore CV sector.

Table 5-13 shows the effect of allowing A season transfers on the Chinook salmon savings under an 80 percent B season rollover. In other words, this table shows when A season transfers result in a reduction in salmon to rollover to the B season and what that reduction does to the 80 percent rollover amounts. A careful comparison of these amounts with those under no A season transferability, shown immediately above, reveals that there is almost no difference between the two. The one exception is that 142 fewer Chinook would have been saved under AS2, in the mothership sector in 2003. Otherwise, A season transfers, in this retrospective analysis, had no effect on the timing of B season closures with or without transfers and with or without rollovers. This counterintuitive result is due to the timing of B season closures, which is discussed in EIS Chapter 5.

Table 5-10 Hypothetical Chinook salmon savings under Alternative 4 Annual Scenario 1 and Annual Scenario 2, and Alternative 5 Annual Scenario 1 with and without transfers and rollovers. (Note: A tabular explanations of the layout of this table format is contained in EIS Chapter 5)

AS	A-season Transfer-Ability	Year	A-Season CDQ	M	P	S	A total	A-B Roll over	B-Season CDQ	M	P	S	B Total	Annual Total
5-1	Yes	2003	0	0	0	0	0	100 %	0	0	0	0	0	0
		2004	0	0	0	0	0		0	0	0	0	0	0
		2005	0	0	0	0	0		0	0	0	6,206	6,206	6,206
		2006	0	1,352	1,840	14,368	17,559		0	0	0	5,163	5,162	22,721
		2007	0	1,243	12,491	15,021	28,753		1,546	580	2,842	29,568	34,535	63,288
4-1	No	2003	0	0	0	0	0	0%	0	0	0	0	0	0
		2004	0	0	0	0	0		675	547	0	9,085	10,307	10,307
		2005	0	0	0	0	0		0	0	0	18,076	18,076	18,076
		2006	0	829	1,145	12,822	14,796		0	0	0	4,109	4,109	18,906
		2007	0	824	10,617	11,901	23,341		1,401	457	2,562	27,942	32,362	55,704
	Yes	2003	0	0	0	0	0		0	0	0	0	0	0
		2004	0	0	0	0	0		675	547	0	9,085	10,307	10,307
		2005	0	0	0	0	0		0	0	0	18,076	18,076	18,076
		2006	0	646	0	11,038	11,683		0	0	0	4,109	4,109	15,793
		2007	0	764	10,617	11,901	23,282		1,401	457	2,562	27,942	32,362	55,644
4-2	No	2003	0	0	2,059	0	2,059		0	142	0	0	142	2,200
		2004	0	0	0	0	0		1,112	966	60	13,764	15,902	15,902
		2005	0	0	0	0	0		0	0	1,314	22,983	24,297	24,297
		2006	0	1,980	5,375	19,529	26,883		0	0	0	10,004	10,004	36,887
		2007	576	2,069	14,843	19,808	37,296		1,743	834	3,593	31,881	38,050	75,346
	Yes	2003	0	0	430	0	430		0	142	0	0	142	571
		2004	0	0	0	0	0		1,112	966	60	13,764	15,902	15,902
		2005	0	0	0	0	0		0	0	1,314	22,983	24,297	24,297
		2006	0	1,980	4,806	18,959	25,744		0	0	0	10,004	10,004	35,749
		2007	576	2,069	14,843	19,808	37,296		1,743	834	3,593	31,881	38,050	75,346
4-1	No	2003	0	0	0	0	0	80%	0	0	0	0	0	0
		2004	0	0	0	0	0		0	0	0	0	0	0
		2005	0	0	0	0	0		0	0	0	2,231	2,231	2,231
		2006	0	829	1,145	12,822	14,796		0	0	0	3,482	3,482	18,278
		2007	0	824	10,617	11,901	23,341		1,268	457	2,358	27,942	32,025	55,366
	Yes	2003	0	0	0	0	0		0	0	0	0	0	0
		2004	0	0	0	0	0		0	0	0	0	0	0
		2005	0	0	0	0	0		0	0	0	2,231	2,231	2,231
		2006	0	646	0	11,038	11,683		0	0	0	3,482	3,482	15,165
		2007	0	764	10,617	11,901	23,282		1,268	457	2,358	27,942	32,025	55,307
4-2	No	2003	0	0	2,059	0	2,059		0	0	0	0		2,059
		2004	0	0	0	0	0		0	0	0	9,085	9,085	9,085
		2005	0	0	0	0	0		0	0	399	19,697	20,096	20,096
		2006	0	1,980	5,375	19,529	26,883		0	0	0	10,004	10,004	36,887
		2007	576	2,069	14,843	19,808	37,296		1,743	794	3,593	31,881	38,010	75,306
	Yes	2003	0	0	430	0	430		0	142	0	0	142	571
		2004	0	0	0	0	0		0	0	0	9,085	9,085	9,085
		2005	0	0	0	0	0		0	0	399	19,697	20,096	20,096
		2006	0	1,980	4,806	18,959	25,744		0	0	0	10,004	10,004	35,749
		2007	576	2,069	14,843	19,808	37,296		1,743	794	3,593	31,881	38,010	75,306

Table 5-11 Reduction in Chinook salmon savings due to transferability by Alternative 4 scenario

Alt. 4	A-Season					A total
	Year	CDQ	M	P	S	
AS1	2003	0	0	0	0	**0**
	2004	0	0	0	0	**0**
	2005	0	0	0	0	**0**
	2006	0	183	1145	1784	**3113**
	2007	0	60	0	0	**59**
AS2	2003	0	0	1,629	0	**1,629**
	2004	0	0	0	0	**0**
	2005	0	0	0	0	**0**
	2006	0	0	569	570	**1,139**
	2007	0	0	0	0	**0**

Table 5-12 Reduction in B season Chinook salmon savings due to rollovers under Alternative 4 scenarios with no A season transfers

Alt. 4	Rollover Percent	Year	CDQ	M	P	S	**total**
AS1	80%	2003	0	0	0	0	**0**
		2004	675	547	0	9,085	**10,307**
		2005	0	0	0	15,845	**15,845**
		2006	0	0	0	627	**627**
		2007	133	0	204	0	**337**
AS2		2003	0	142	0	0	**142**
		2004	1,112	966	60	4,679	**6,817**
		2005	0	0	915	3,286	**4,201**
		2006	0	0	0	0	**0**
		2007	0	40	0	0	**40**

Table 5-13 Reduction in B season Chinook salmon savings due to rollovers under Alternative 4 scenarios with A season transfers

Alt. 4	Rollover Percent	Year	CDQ	M	P	S	**total**
AS1	80%	2003	0	0	0	0	**0**
		2004	675	547	0	9,085	**10,307**
		2005	0	0	0	15,845	**15,845**
		2006	0	0	0	627	**627**
		2007	133	0	204	0	**337**
AS2		2003	0	0	0	0	**0**
		2004	1,112	966	60	4,679	**6,817**
		2005	0	0	915	3,286	**4,201**
		2006	0	0	0	0	**0**
		2007	0	40	0	0	**40**

In addition to the estimates of total reductions in salmon bycatch presented above, Table 5-14 provides estimates of the number of adult equivalent Chinook salmon that would have been saved (e.g. reduction in mortality) under Alternative 4 and Alternative 5. These estimates combine all stock based estimates to give an overall estimate of salmon saving benefits in numbers of adult equivalent Chinook salmon and are calculated from the AEQ estimates provided in EIS Chapter 5. Specific impacts on specific western Alaska river systems, which comprise the greatest proportion of the AEQ estimates, are discussed further below. The estimates presented here are intended to provide a broad overview of potential benefits in terms of the total number of adult fish that would return to their natal streams, wherever they may be located.

The benefits, in numbers of total adult Chinook salmon that would potentially have accrued under Alternative 4 and Alternative 5, are dependent on the level of bycatch, and on the level of the hard cap. The greatest benefits, in numbers of adult Chinook salmon, would occur in 2007, the highest bycatch years, and under Alternative 4 AS2. Total AEQ estimate for AS2 of Alternative 4 in 2007 is 40,843. The potential benefits decrease in lower bycatch years with 24,474, 11,282, 4,709, and 608 AEQ Chinook salmon estimated in 2006, 2005, 2004, and 2003, respectively. Alternative 4 AS1 results in lower AEQ benefits numbers, which range from 26,928 in 2007 to negative value in 2003. Alternative 5 AS1 numbers are, as expected, between those of Alternative 4 AS1 and Alternative 4 AS2 and range from -233 in 2007 to 27,130 in 2003.

Table 5-14 Hypothetical adult equivalent Chinook salmon saved under each cap in Alternatives 4 and 5, 2003-2007. Numbers are based on the median AEQ values with the original estimates shown in the second row.

	2003	**2004**	**2005**	**2006**	**2007**
No Cap	**33,215**	**41,047**	**47,268**	**61,737**	**78,814**
Alt. 5 AS1	-233	2,924	7,852	14,585	27,130
Alt4 AS1	-414	2,697	7,751	13,766	26,928
Alt.4 & 5 AS- 2	608	4,709	11,282	24,474	40,843

Table 5-15 provides an analysis of hypothetical reductions in western Alaska specific adult equivalent Chinook salmon bycatch under the annual scenarios of Alternative 4 and Alternative 5 Values are based on median AEQ values and mean proportion regional assignments within strata (A-season, and NW and SE B seasons, see EIS Chapter 5) genetics data collected from 2005-2007. The proportional breakout of western Alaska Chinook is from Myers et al. 2004 analysis is presented in more detail in EIS Chapter 5. What is reproduced here is the estimation of adult equivalence by western Alaska River.

As expected, the potential benefit of Chinook salmon bycatch reduction, in terms of Western Alaska salmon adult equivalency, increases as the cap decreases and the greatest adult equivalence benefits would have occurred in years when bycatch was highest (2007). This is simply due to the cap being a more binding constraint in high bycatch years and/or when the cap is lowered (e.g. Alt. 4 AS2). The Western Alaska AEQ totals range from -823 to a high of 13,069 Chinook salmon under Alternative 4 AS1 and from -153 to 22,100 Chinook salmon under Alternative 4 AS2. The greatest component of the total, under each scenario, is from the Yukon, followed by Bristol Bay and the Kuskokwim. Alternative 5 AS1 numbers are, as expected, between those of Alternative 4 AS1 and Alternative 4 AS2 and range from -137 in 2003 to 13,488 in 2007.

Table 5-15 Difference (reduction) in AEQ mortality (i.e., added salmon due to alternative and year relative to observed).

	Total WAK	Yukon	Kuskokwim	Bristol Bay
Alt. 5 AS1				
2003	-137	-54	-36	-47
2004	1,612	645	419	548
2005	4,296	1,718	1,117	1,461
2006	8,967	3,587	2,331	3,048
2007	13,488	5,396	3,507	4,586
Alt. 4 AS1				
2003	-823	-329	-214	-280
2004	1,478	591	384	503
2005	4,879	1,952	1,269	1,659
2006	8,525	3,410	2,217	2,898
2007	13,069	5,228	3,398	4,444
Alt. 5 AS2: Alt. 4 AS2				
2003	-153	-61	-40	-52
2004	1,158	463	301	394
2005	4,860	1,944	1,264	1,653
2006	14,804	5,922	3,849	5,033
2007	22,100	8,840	5,746	7,514

In terms of impacts on Chinook salmon fisheries, it is impossible to make a direct connection between these AEQ estimates and commercial, subsistence, and sport fisheries that exist in the various regions of western Alaska. Thus, the relative benefit of this alternative, in terms of AEQ Chinook salmon saved, must be made on the basis of these overall impact estimates and not on specific impacts to specific fisheries.

5.6 Identification of Regions and Communities Principally Dependent on Commercial Salmon Fisheries

5.6.1 Northern Region

Table 5-16 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 5-17, 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 5-16 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 5-17 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 5-18. 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 5-18 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. 5-1 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.

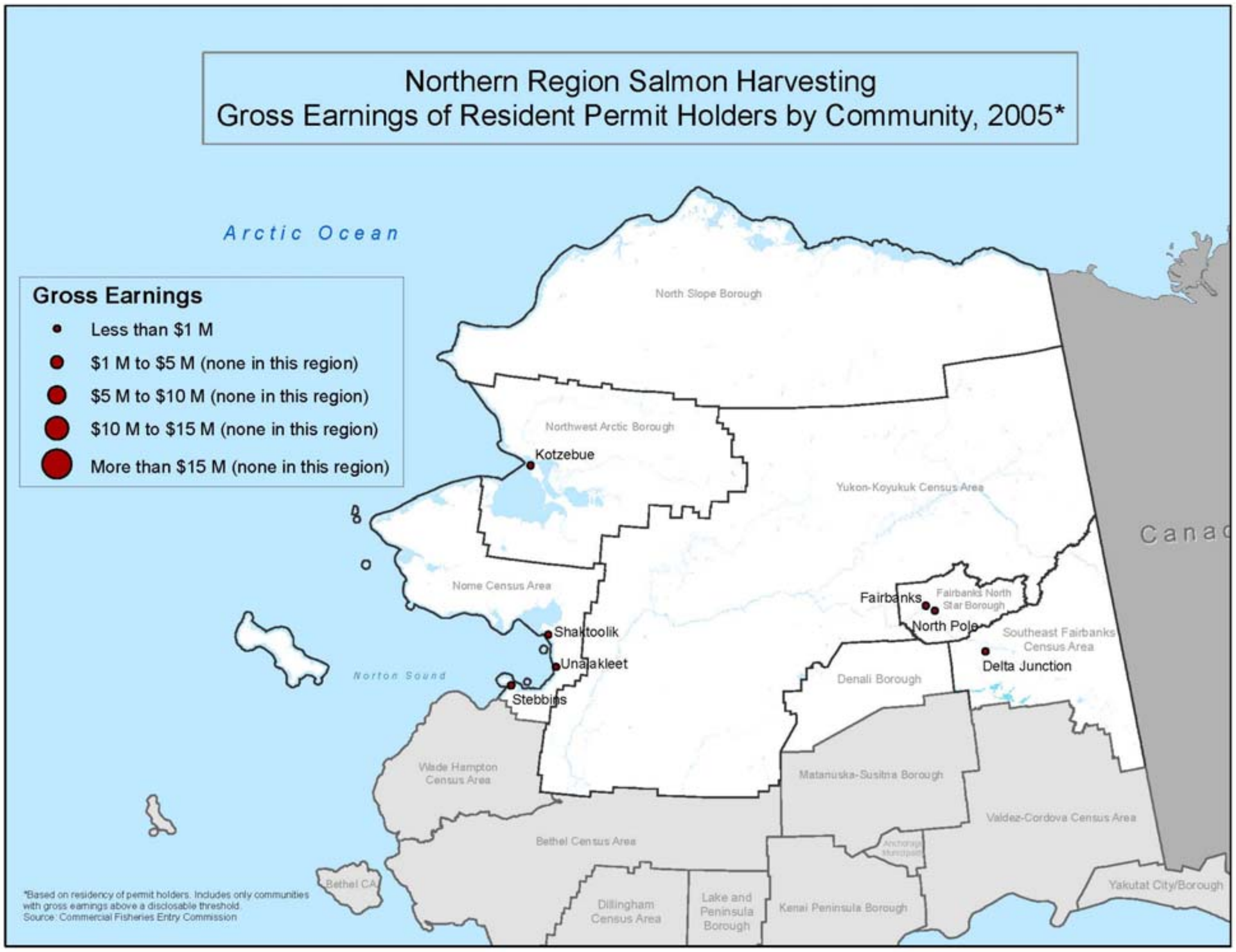

Fig. 5-1 Northern region salmon harvesting, gross earnings of resident permit holders by community, 2005.
Source: ADOLWD

Northern Region fish harvesting employment, by species and month, also tabulated by ADOLWD, are shown in Table 5-19. 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 5-19 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. 5-2 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.

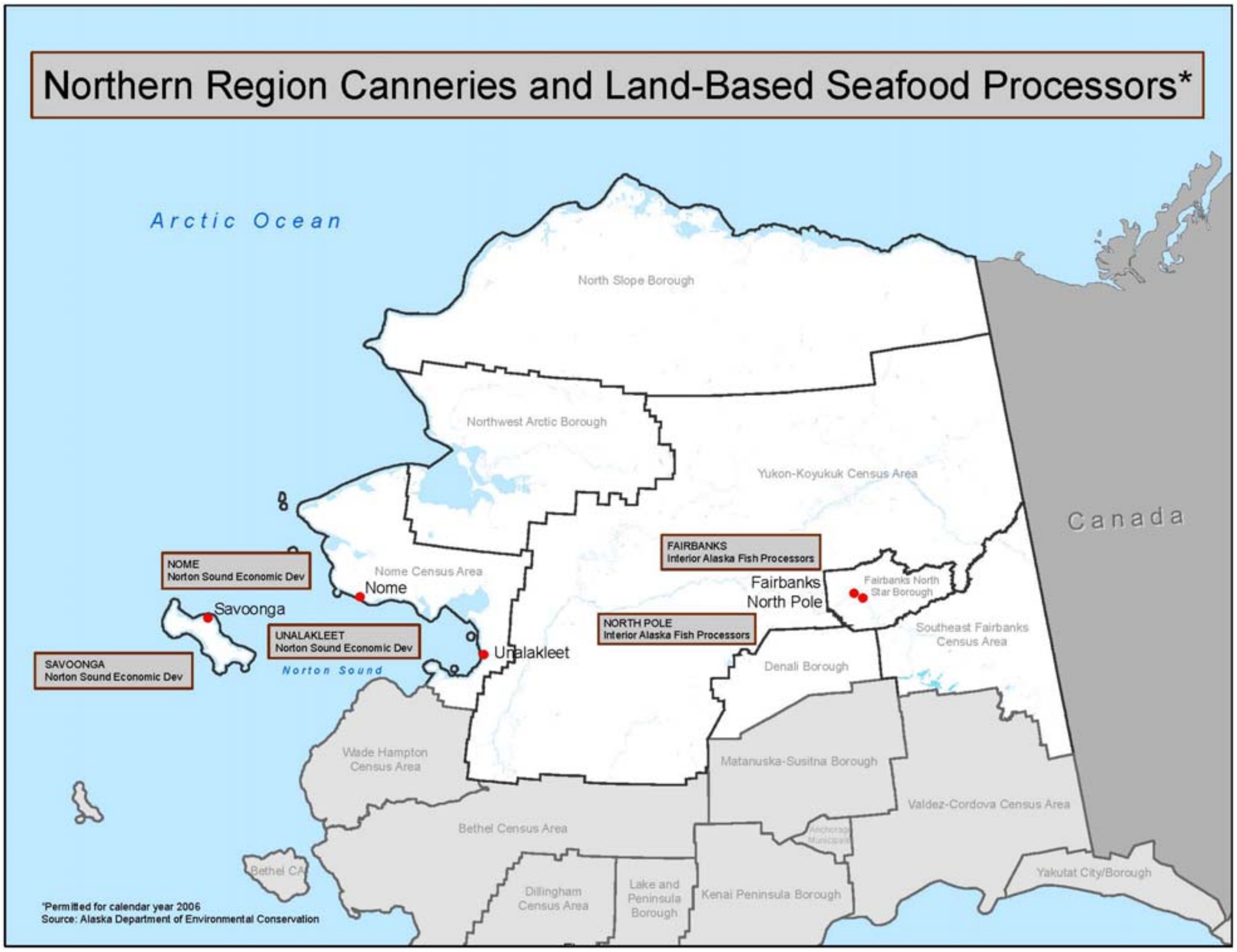

Fig. 5-2 Northern Region canneries and land based seafood processors.
Source: ADOLWD

Table 5-20 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 5-20 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

5.6.2 Yukon Delta Region

Table 5-21 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 5-21 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 5-22. 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 5-22 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. 5-3 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.

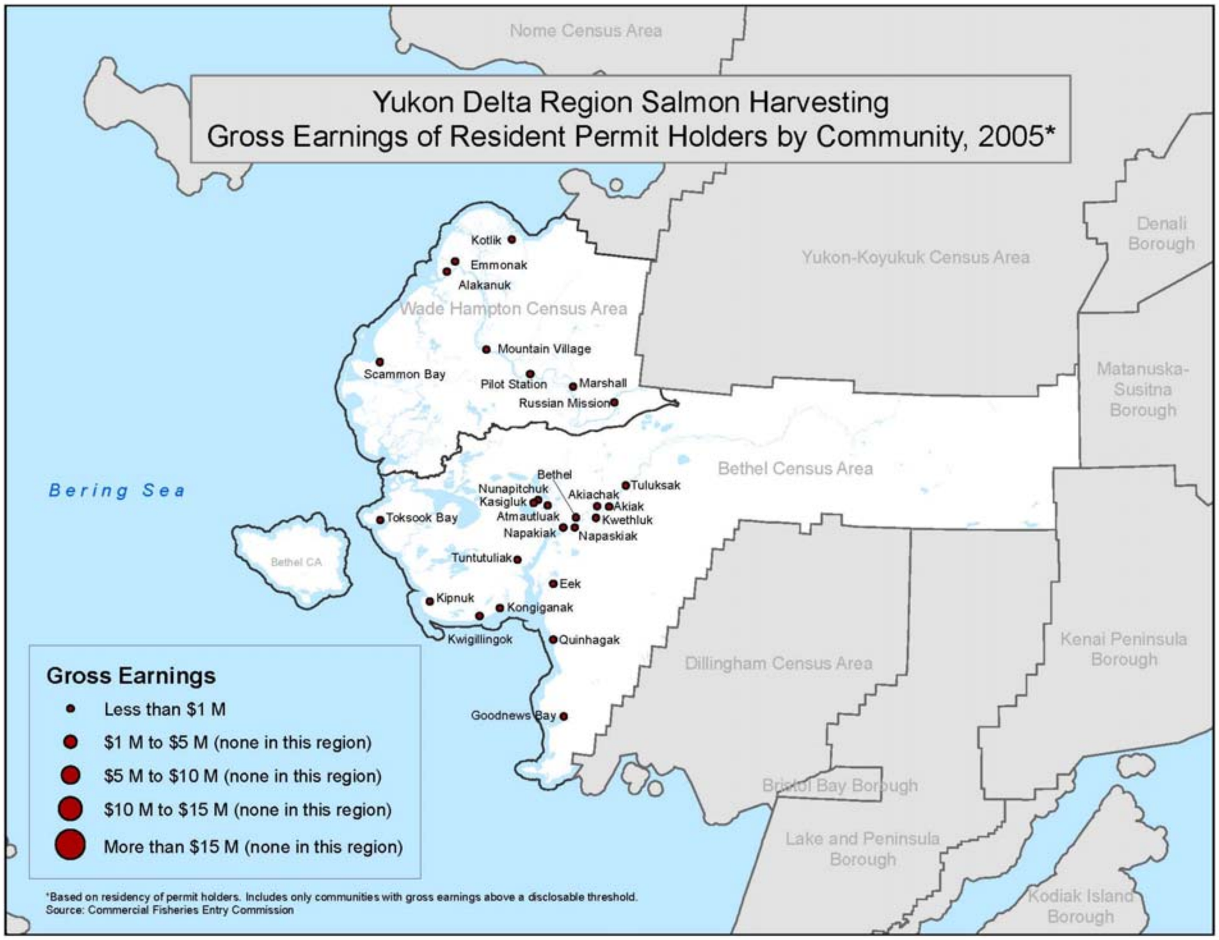

Fig. 5-3 Yukon Delta Region salmon harvesting gross earnings of resident permit holders by community, 2005
Source: ADOLWD

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 5-23. 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 5-23 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. 5-4 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 5-24.

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.

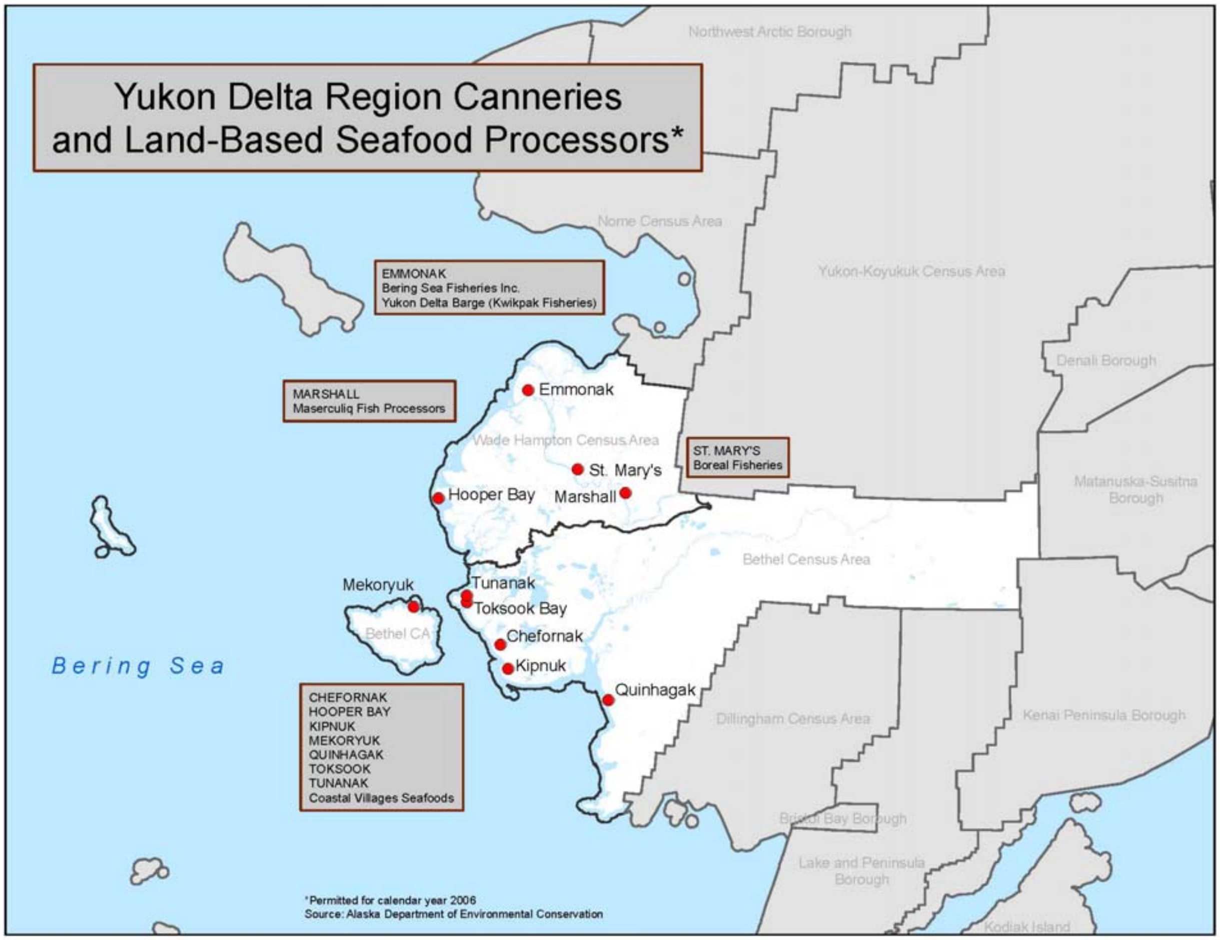

Fig. 5-4 Yukon Delta Region canneries and land based seafood processors.
Source: ADOLWD

Table 5-24 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 5-25 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 5-25 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.

5.6.3 Bristol Bay Region

Table 5-26, 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 5-26 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 5-27. Overall, in the Bristol Bay Region, 669 resident permit holders and a total of 2,405 permit holder were active in 2006.

Table 5-27 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. 5-5 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.

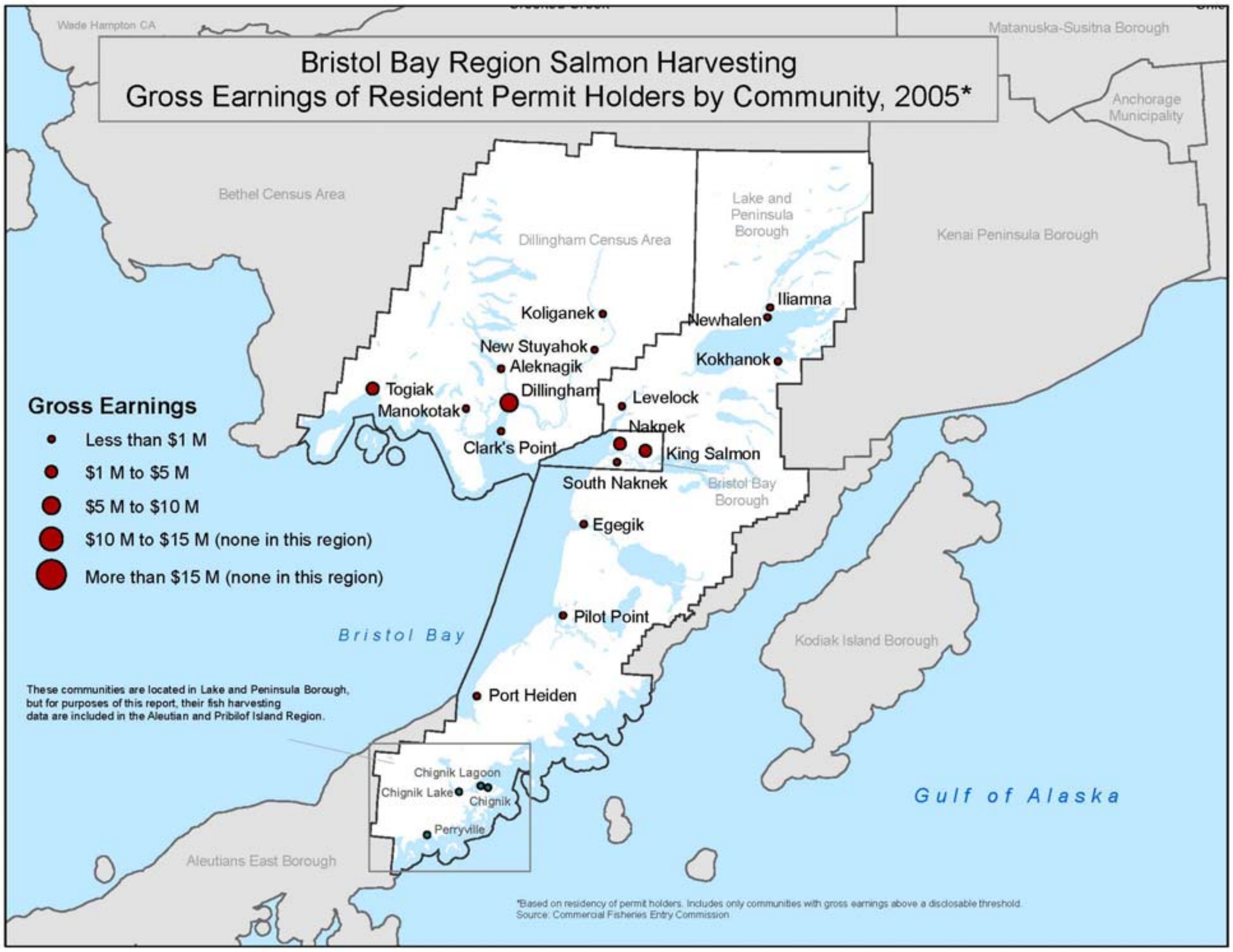

Fig. 5-5 Bristol Bay Region salmon harvesting gross earnings of resident permit holders by community, 2005.
Source: ADOLWD

ADOLWD has also tabulated data on fish harvesting employment and earning by gear type in the Bristol Bay Region, which is shown in Table 5-28. 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 5-28 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 5-29. 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 5-29 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. 5-6 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.

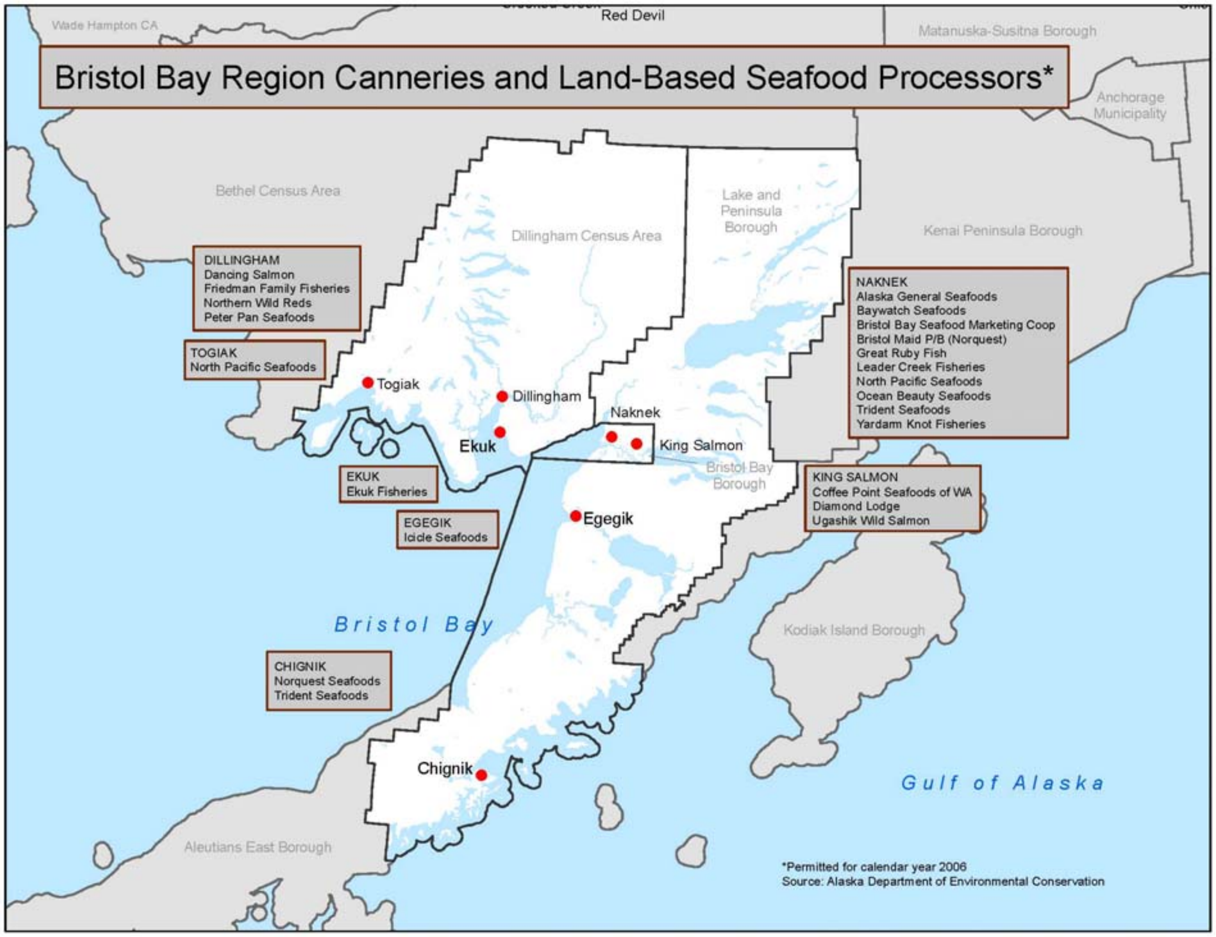

Fig. 5-6 Bristol Bay Region canneries and land-based seafood processors
Source: ADOLWD

Table 5-30 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 5-30 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

5.7 Importance of Commercial Chinook 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 5-31 and Table 5-32 summarize information on the importance of Chinook salmon revenues for western Alaskan permit holders. Table 5-31 provides information on relative importance, and Table 5-32 provides information on absolute importance. Table 5-31 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 5-32 shows the average revenues per person fishing received by these permit holders.

Table 5-31 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 5-32 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.

6.0 POLLOCK INDUSTRY IMPACT ANALYSIS

This section examines the expected potential impacts on the pollock industry's gross revenues attributable to potential reductions in pollock products being delivered to market as a result of fishery closure (potentially forgone gross revenue) or due to relocation of effort outside of a closure area (revenue at risk)[52]. To better place these impacts in a comparable empirical context, an analytical approach is adopted here, in which the question evaluated is expressed as follows: "What would the effects of these alternatives have been, had each, in turn, been in place in 2003 through 2007?" By posing the analytical question in this way, it is possible to use actual empirical information and official data records on fleet participation, catch composition, production patterns, first wholesale prices, bycatch quantities, spatial and temporal distribution of effort, and geographical patterns of deliveries to primary processors or transshipping facilities. These estimates can provide at least a crude empirical measure of the potential economic impact of the alternatives on different fleet sectors. Moreover, if it is assumed that harvest foreclosed to a fleet sector could not have been made up elsewhere by that fleet sector, then the forgone or at-risk estimate becomes an approximation of the potential maximum forgone gross revenues directly attributable to the proposed action.

The Council has chosen to consider the proposed action because of recent high numbers of Chinook salmon taken as bycatch in the Bering Sea pollock fishery. The analytical timeframe was chosen because it represents the most recent five-year time period and is most reflective of recent fishing patterns (DEIS section 3.2, page 108). Those status quo conditions include observed high levels of Chinook salmon bycatch under present regulations that provide an exemption to Chinook salmon savings area closures for operators that participate in the VRHS. The analytical period encompasses years when the VRHS was in place, either via industry initiative, via an experimental fishery, or as a formal program under present regulations. Including data prior to 2003 would not be representative of current bycatch levels, of current regulations, or of current efforts by industry to avoid bycatch.

In addition, in 2003 NMFS implemented the current catch accounting system known as e-landings. Thus, the period of 2003 thorough 2007 is covered by e-landings data. Prior to 2003, a "blend" system was used and differs from the present methodology. These data represents the most consistent and uniform data set available on a sector-specific basis for analysis. Thus, for data consistency, accuracy, and to meet the agency's obligation to use the "best scientific information," the analytical period of 2003-2007 was chosen and NMFS asserts that it is the appropriate analytical period[53]

The analysts acknowledge that the use of potentially forgone first wholesale gross revenues is not an ideal reflection of the expected economic costs (or, conversely, benefits if the catch reduction can be mitigated by actions of the operator) attributable to the proposed changes in Chinook bycatch management. However, in order to estimate "profits," one must have data on costs, not simply revenues. NMFS does not have data to estimate net impacts until such time as the Council develops a socioeconomic data collection program that

[52] "Revenue at risk" should be regarded as an upper-bound estimate. That is, it represents a projection, based upon historical effort and landings data, of the gross value of the catch that would be forgone as a result of one or more provisions of the proposed action, assuming none of that displaced catch could be made up by shifting effort to another area. In many cases, this will not be the case. Therefore, the true impact on gross revenue is likely to be smaller than the estimated revenue at risk, although that is not assured.

[53] From response to public comment 10-4 in EIS Chapter 9, the Comment Analysis Report.

requires the industry to submit cost data under new MSA authority. These gross receipts may, of course, not be, in any meaningful way, indicative of realized net revenues, but by default serve as the best available "proxy" for economic earnings in these fisheries.

The ability to mathematically derive net economic welfare measures is fundamentally dependent upon empirical data on input prices, costs, capital investment, debt service, consumer demand, sources of supply, market structure, substitutes and complements, measures of consumer responsiveness to changes in price, quantity, quality, income, tastes, and preferences. Exogenous factors also influence rigorous derivation of these welfare measures, such as, currency exchange rates, tariffs, political and economic instability. Very few of these necessary data are available to NMFS, at present. NMFS does not have data to estimate net impacts until such time the Council develops a socioeconomic data collection program that requires the industry to submit cost data under new MSA authority. At present, the analysts must employ methods and strategies predicated on extremely limited data and virtually non-existent economic modeling of these resources and uses.[54]

Without accurate verifiable cost data and operational information for the pollock trawl fleets operating in the BSAI, gross revenue estimates constitute the "best" empirical economic information available. NMFS fully acknowledges that changes in first wholesale (or ex-vessel, as appropriate) revenues cannot be regarded as indicative of net results. That said, these estimates represent the current limit of NMFS's ability to empirically characterize the expected outcome for each sector in the pollock fishery, from the changes in Chinook bycatch management under consideration. And, further, this explains the very extensive reliance upon, and systematic treatment of, "qualitative" cost and benefit analysis, reflected in the RIR, as required under E.O.12866.[55]

It must also be understood that the proposed action is **not** to close the pollock fishery; it is to create **incentives for pollock fishermen to avoid** Chinook salmon bycatch as evidenced by the inclusion of provisions, in both Alternative 4 and the Preferred Alternative (Alternative 5) for inter-cooperative agreements aimed at creating effective Chinook salmon bycatch avoidance incentives. Thus, the impacts are reported as **potentially** forgone gross revenue or revenue **at risk**, depending on alternative, and are not reported as industry losses of revenue. The RIR does not identify these impact estimates as lost revenue specifically because mitigation of the impacts via harvesting behavior changes are expected as that is the point of incentivizing avoidance of prohibited species bycatch. Furthermore, the Council's stated preliminary preferred alternative modifies the strict hard cap formulations contained in Alternative 2 by including provisions for an industry managed Intercooperative Agreement (ICA provision) to reduce Chinook salmon bycatch to levels below the strict hard cap via industry derived incentives. Clearly, the Council's intent is to incentivize Chinook salmon bycatch avoidance in order to reduce it and the hard cap used in the potentially forgone gross revenue analysis is one part of the incentive. The implication is that the pollock industry will change behavior so that they do not face all of the potential forgone gross revenue, and/or revenue at risk estimated in the analysis as direct losses in revenue due to direct contraction in pollock harvest.[56]

Thus, it is acknowledged that the gross revenue estimates shown in this analysis reflect highly simplified assumptions about the outcome of competing alternative bycatch rules. In a sense, they are intended to portray the "worst case" outcome if the pollock fishery was required to forgo a specific catch amount in response to each of the Chinook bycatch prohibition actions being examined. There is no expectation that this outcome will be realized as a result of any of the proposed Chinook bycatch management measures under consideration, and these "techniques" are employed solely to provide a crude approximation of the first wholesale gross dollar value associated with unharvested pollock, by sector, processing mode, etc.

[54] From responses to public comments 10-51 and 10-83 in EIS Chapter 9, the Comment Analysis Report.
[55] From response to public comment 10-1 in EIS Chapter 9, the Comment Analysis Report.
[56] From response to public comments 10-2 and 10-3 in EIS Chapter 9, the Comment Analysis Report.

Confronted with these facts, NMFS is nonetheless legally obligated to analyze, to the fullest extent practicable, the benefits and costs (as well as their expected distribution) of the proposed management actions being considered. These mandates (e.g., E.O.12866, OMB Circular A-4, MSA) recognize and explicitly provide for adoption of qualitative analytical strategies and approaches to evaluating benefits and costs in the absence of fully adequate empirical data and quantitative models. Thus, this analysis will first provides qualitative discussions of the potential effects on five general categories of potentially impacts costs. The qualitative treatment is then followed by the revenue analysis. (Comment 10-59) The cost categories that will be qualitatively discussed are as follows:

- Fleet Operational effects
- Safety Impacts
- Product quality, Markets, and Consumers
- Potentially Forgone State and Local Tax Revenues
- Management and Enforcement Costs

6.1 Fleet Operational Effects

Under the alternatives to the status quo, fishermen would be expected to attempt to minimize losses associated with potentially forgone gross revenue and/or revenue placed at risk by altering their current operations. These reactions could include the following: (1) mitigating a triggered area closure by re-deploying fishing effort, using the same fishing gear and methods, to known adjacent fishing grounds that may be equally or only somewhat less productive (similar CPUE) than the fishing grounds lost to the salmon bycatch minimization measure; (2) avoiding Chinook salmon bycatch by re-deploying fishing effort to an area of unknown productivity and operational potential, using the identical fishing gear, in an exploratory mode; (3) switching to a different target fishery if possible (e.g. yellow fin sole); and (4) mitigating the risk of a hard cap induced closure by speeding up harvesting and processing activities (race for fish). Each of these strategies may have operational cost implications as described below. While empirical data on operating cost structure at the vessel or plant level are not available, cost trends for key inputs may shed some light on the probable impacts of the fishing impact minimization alternatives on the pollock industry in the aggregate and on average.

Any regulatory action that requires an operator to alter his or her fishing pattern, whether in time or space, is likely to impose additional costs on that operator. The alternative salmon bycatch minimization actions may affect the operating costs of the pollock fleet, compared to the status quo condition, **with the degree of those effects necessarily dictated by the extent to which hard cap and/or triggered closures constrain harvests.** The following sections address this issue in terms of both fixed and variable costs. Fixed costs tend to arise from investment decisions and variable costs arise from short-run production decisions. As the terms imply, fixed costs are those that do not change in the short run, no matter what the level of activity. Variable costs, on the other hand, are those costs that do change directly with the level of activity, recognizing that variable inputs must be used if production exceeds zero.

6.1.1 Fixed Costs

As suggested earlier, many costs confronting operators in these fisheries are fixed; that is, they do not change with the level of production. Fixed costs include such expenses as debt payments, the opportunity cost of the investment in the vessel (or plant), the cost of having the vessel or plant ready to participate in the fisheries, some insurance costs, property taxes, and depreciation. Following an action that negatively affects, for example, CPUE, TAC, or catch share, these fixed costs must be distributed across a smaller volume of product output, raising the average fixed cost per unit of production. As previously noted, available information on the cost structure of operations fishing for and processing pollock is very limited. This is largely so because cost information is often considered highly proprietary by industry members and is, under the best of circumstances, expensive to collect and analyze. Only scattered anecdotal information at the operation level is available on fishing costs (fixed or variable). It is, therefore, impossible to do more than provide a qualitative discussion of the impact of the proposed alternatives on pollock industry's operating costs.

6.1.2 Variable Costs

Of all the categories of variable factor costs, fuel ranks at or near the top of the list of operating expenses in the fisheries under consideration. Even a qualitative evaluation of the elements of the Chinook salmon bycatch minimization actions of Alternative 3 (e.g., triggered area closures) suggest that the proposed regulatory changes may likely result in the following: 1) longer average trip duration to travel to remaining open fishing grounds; 2) greater total distances traveled per trip (perhaps under more extreme operating conditions); and 3) longer periods fishing in lower CPUE areas to mitigate the potential loss of catch. In addition, the Chinook salmon bycatch minimization actions of Alternative 2 (e.g., hard caps) may induce a race for fish that could result in vessels operating at maximum speed and capacity in order to harvest as much pollock as possible prior to a hard-cap-induced fishery closure. Alternative 4 could have a similar impact; however, under AS1, the ICA with incentive to reduce Chinook salmon bycatch would give some control to fleet operatives and avoid the race for fish.

Fig. 6-1 provides representative diesel fuel cost information for the Bristol Bay area and for Dutch Harbor. These data, provided by the Pacific States Marine Fisheries Commission Economic Information System, clearly show that diesel fuel prices more than doubled in the region between 2005 and 2008 and approached $6 per gallon in the Bristol Bay area in 2008. These increases have likely had a severe impact on the variable costs of all fishing operations in the region, including those for Chinook salmon. While it is true that some fuel is purchased by the pollock fleet in other areas, such as Seattle, there is, at present, no comprehensive accounting of costs or expenditures in the pollock fishery that would allow analysis of actual fuel consumption and costs.

How changes in running time would affect fuel costs depends on how much fuel must be burned per unit catch. While it is not possible to place a numerical estimate on this factor, it is reasonable to conclude that, on average, total fuel consumption would potentially increase, due to movement to avoid Chinook salmon, relative to the status quo under each of the proposed alternatives provided that a hard cap had the potential to be reached and/or a trigger closure level of bycatch was expected to be reached. This increased fuel use would apply except in the case of vessels that cease to fish as a result the Chinook salmon bycatch minimization measures, and perhaps in the case of vessels that switch to a different fishery, although opportunities to do the latter are highly restricted for the AFA pollock fleet.

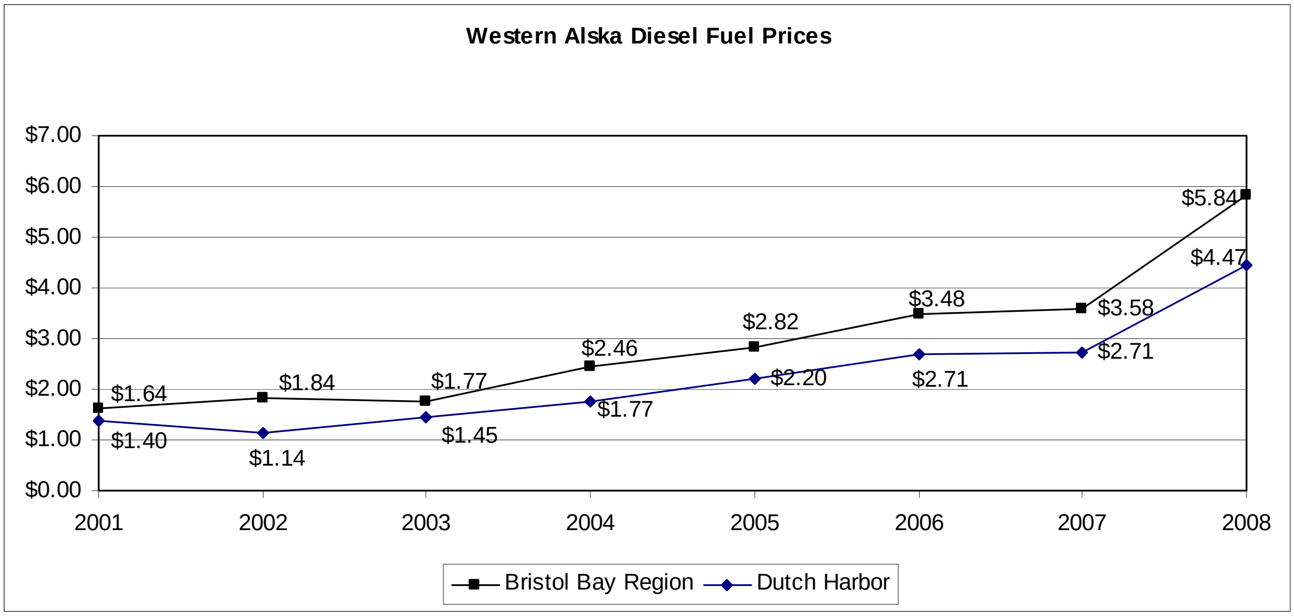

Fig. 6-1 Representative diesel fuel costs from western Alaska, 2001-2007 ($/gallon)

What economists refer to as the 'opportunity cost' of labor is another variable cost that may increase by triggered closure scenarios contained within Alternative 3. Measures that increase fishing time would reduce the time available for other activities and, in so doing, would impose a cost on fishermen. Several of the contemplated measures may increase the time required for fishing in affected fisheries. As noted elsewhere, avoiding Chinook salmon bycatch may increase transit time to and from fishing grounds; fishermen may be forced to fish on grounds with lower CPUE, thus increasing the time required to harvest any given amount of fish; or they may force fishermen to learn new fishing grounds, thus increasing fishing time, at least initially. Because fishing crew members are generally paid with shares of an operation's net (or modified gross) revenues, the additional time spent at sea as a result of these measures may actually decrease crew earnings, if the operating expenses of the fishing vessel increase.

This opportunity cost is also reflected in lost time, which reduces the individual's opportunities to engage in other activities and is treated as a cost in economic benefit/cost analysis. The limitations of available models for predicting how fishing operations would behave, given the constraints, and the limited amount of cost information available for fishing operations, make it impossible to make quantitative estimates of the change in fishing hours or days associated with these alternatives, or to make monetary estimates of the changes in associated opportunity costs.

Clearly, upon attainment of a hard cap, some portion of TAC would remain unharvested, representing forgone gross revenue; however, it has been suggested by some in the industry that fishing costs may increase so much, as a result of the triggered closure provisions contained in Alternative 3, that fishermen would not be able to completely harvest the TACs available to them and may simply choose to "hang it up" for the season following the area closures. It has been suggested that this is more likely for the smallest catcher vessels in the fleet as the triggered closure area may encompass virtually all of their near shore fishing grounds. The loss of revenues in these instances has been discussed above and is detailed in the analysis of direct effects of the alternatives, below. On the cost side, those revenue losses may be offset, to an unknown extent, by associated reductions in the variable operating costs these operations would otherwise have incurred. From the operator's perspective, for example, fewer days fishing as a result of trigged closures would mean reductions in variable costs (e.g., stores, lubricants and fuel expense), reduced wear and tear on vessels and gear, and reduced processing, packaging, and storage expenses for the product. It would also mean reduced payments to labor (although the other side of that coin reflects forgone wages to the skipper and crew, as well as the social value of other goods and services the fishermen might have produced).

On the other hand, the cost of fishing would tend to increase, per unit of the pollock that continue to be caught. Based on information provided by the industry at public meetings and through individual contacts, as well as the professional judgment of the preparers of this RIR, seven categories of costs were defined for consideration, as follows:

- Increased travel costs
- Costs of learning new grounds or using new or modified gear (e.g. excluder devices)
- Costs of bycatch avoidance measures, or (if these efforts are unsuccessful) premature closure due to excessive bycatch
- Reduced pollock CPUE due to less concentrated target stocks;
- Potential gear conflicts
- Effects on processors (floating or shoreside) built for higher throughput
- Safety impacts (addressed separately below in section 6.2)

Increased Travel Costs

Vessels that had formerly been able to fish areas nearer shore, and in relative proximity to their preferred port of operation, could be pushed farther offshore and/or into more remote fishing areas, as a result of specific provisions contained in Alternative 3. Running to the remaining open fishing areas, prospecting for harvestable concentrations of target species, then (depending on operating mode) running back to port with raw catch or product would, as previously noted, require increased expenditures of fuel and other consumable inputs, as well as more time on the water (i.e., trips may be longer, and all variable operating costs and wear and tear on equipment and crew would increase). These changes in fleet operating patterns would likely require a greater total number of days for a given vessel to take its share of the available TAC, other things being equal.

How many additional days may be required would vary by stock and ocean conditions, by rates of success in locating fishable concentrations of the target species in remaining open areas or time periods, by operational mode and capacity, by the level of aggregate effort exerted by the fleet or sub-sector in the remaining open areas, and by other factors. But clearly, if catch per unit effort declines, cost per unit of catch would increase. Smaller vessels may be so disadvantaged by the distances that must be traversed between port and open fishing grounds that they may be unable to operate economically (perhaps, even physically) under these circumstances.

The smallest, least mobile vessels could be effectively closed out of some fisheries. Even vessels that have the capacity to reach open fishing grounds may incur prohibitively high operating costs (e.g., excessive fuel consumption), increased risk (e.g., should sea or weather conditions change unexpectedly), and reduced product quality (i.e., as hold-time increases). Longer distances and more time in transit mean higher operating costs and less time fishing.

Costs of Learning New Grounds or Using New Gear

It is axiomatic that fishermen fish when and where they believe the fish are most valuable and most readily available. Under the triggered closure area provisions, triggered closures would compel operators to alter the pattern of operations they would voluntarily choose to maximize profits. That is, in many instances, fishermen would be required to fish on grounds with which they may be unfamiliar. Fishermen would face a learning curve on these new grounds. They would have to become accustomed to a new physical geography underwater and perhaps more extreme and/or exposed sea surface conditions, to new fish locations, behaviors, and habits, and, importantly, to new patterns of bycatch.

While fishermen learn to operate within these new parameters, they would likely incur increased operating costs. Gear could be more frequently lost or damaged, CPUE would likely be lower, and bycatch of other species could be higher. Higher bycatch, especially of PSC, could force early closures of fishing grounds, and with fewer optional open areas available, it would be more difficult (and, thus, more costly) for operators to voluntarily move off hot spots to reduce or avoid bycatch of both Chinook salmon and other prohibited species.

Even if the bycatch is composed of species which pose no potential risk of regulatory closure, the additional resources (e.g., time and labor) required to land, sort, and discard unwanted catch would increase operating costs. Because, in many instances, large volumes of fish would have to be taken in places and at times when they have never been taken before, there is little available information for fishermen to use to make inferences about these issues in advance of committing the effort. Thus, they would have very little opportunity to avoid incurring the costs of prospecting new areas (at new times) even if, subsequently, the effort proved uneconomical from the standpoint of catch success.

Costs of Bycatch Avoidance Measures

While, as a general rule in pollock trawl fishery, the selectivity of the gear fished varies, pollock fishermen unavoidably take other species as incidental catch when they fish for pollock. In some instances (e.g., bycatches of halibut, salmon, herring, and some species of crabs), pollock fishermen are subject to limitations on the amounts of bycatch that they may take. When the bycatch limits (or caps) are reached, the fishery is closed. Fishermen can, to a greater or lesser degree, reduce bycatch by modifying their gear or the way they use it, and by learning the times and places when unacceptably large bycatches might take place (Queirolo et al. 1995). Both bycatches and the avoidance measures that they make necessary impose costs on the operations. Finally, with temporal and geographic dispersion provisions associated with the triggered closure alternative, there is the potential for increased interactions with protected species (e.g., short-tailed albatross, ESA-listed PNW Chinook salmon), which could require Section 7 consultation (with the potential to trigger further and more extensive fishing closures).

Reduced CPUE Due to Less Concentrated Target Stocks

The economic, operational, and socioeconomic response of individual operators may take several forms following adoption of a triggered closure. For example, anecdotal information supplied by the industry in public meetings and through individual contacts suggests that CPUE may decline, in some cases substantially, as a result of significant fishing effort being forced into unfamiliar or unfavorable areas. The effect of these declines would not likely be uniformly distributed across each management area, gear type, processing mode, or vessel size category and, thus, would carry with them very different implications for profitability, economic viability, and sustained participation in these fisheries.

Potential Gear Conflicts

Concerns have been expressed, from a variety of sources, about the adverse economic effects associated with forcing gear-specific effort out of traditional operating areas and into proximity with other gear groups and/or target fisheries. Trawl gear, pot gear, and longline gear are incompatible when fished simultaneously in a given area. Gear damage or loss is a common outcome when these competing fishing technologies come into contact with one another on the fishing grounds. Each gear group perceives itself as facing unique operating challenges with respect to such conflicts. For example, Pacific cod longline fisheries occur north of the Pribilof Islands at the same time that bottom trawl fisheries target flathead, yellowfin, and rock sole in the same area. By voluntarily isolating themselves in well defined and generally recognized areas, they insulate themselves from the high cost and frustration associated with gear conflicts (loss of longline gear and catch). If either a total pollock fishery closure and/or a triggered closure induced pollock vessels to switch, to the extent that sideboard regulations allow, to bottom trawl fishing on the flatfish fishing grounds gear conflicts could emerge. The likelihood of occurrence and magnitude of any such conflict is speculative at this time.

Effects on Processors Built for Higher Throughput

If CPUEs decline and fishing is more geographically dispersed under the triggered closure alternative, the aggregate rate of catch could slow. This implies that the rate of delivery to processors would also decline. Because existing processing plant capacity has been built, in many cases, for peak through-put (i.e., to maximize the rate at which catch is received and processed in response to the race-for-fish on the grounds), lower and slower deliveries may not supply sufficient quantities of raw fish for the largest plants to operate profitably. Many plants have been designed, configured, and operated to exploit economies-of-scale in production. They are designed to move an optimal volume of fish through the processing plant at the most efficient, most cost effective rate, given the capacity of the facility and expectations of catch and delivery rates from the catcher-vessel fleet. If operated at rates that significantly deviate from those for which the plant was designed, these economies would be lost, and a plant could become unprofitable to operate.

The nature of these interactive and compounding relationships is important to keep in mind. None of these economic, operational, or logistical elements works in isolation from one another. Further, while many of these considerations have specifically been identified as being related to relocation of effort under a triggered closure alternative, they may also affect overall fleet operations under the threat of a hard cap induced total, and/or sector level, pollock fishery closure. Given the level of cooperation that exists within the pollock industry presently, and the fact that the VRHS ICA is a system conceived and implemented by industry (before Amendment 84 regulations took effect) for proactive bycatch avoidance, it is not unreasonable to expect that the pollock industry may continue to operate the VRHS ICA, or some variant of it, in order to try to prevent attainment of a hard cap. As such, they would invoke various closures upon their membership that could have similar effects on operational costs as described above for Alternative 3. It follows that these cost impacts are presently being felt by the members of the ICA due to VRHS closures under the status quo.

6.2 Safety Impacts

Commercial fishing is a dangerous occupation. Lincoln and Conway, of the National Institute of Occupational Safety and Health (NIOSH), estimate that, from 1991 to 1998, the occupational fatality rate in commercial fishing off Alaska was 116 persons per 100,000 full time equivalent jobs, or about 26 times the national average of 4.4/100,000 (Lincoln and Conway 1999). Fatality rates were highest for the Bering Sea crab fisheries. Groundfish fishing fatality rates, at about 46/100,000, were the lowest of the major fisheries identified by Lincoln and Conway. Even this relatively lower rate was about ten times the national average (Lincoln and Conway 1999).

During most of the 1990s, commercial fishing appeared to become relatively safer. While annual vessel accident rates remained comparatively stable, annual fatality per incident rates (case fatality rates) dropped. The result was an apparent decline in the annual occupational fatality rate. From 1991 to 1994, the case fatality rate averaged 17.5 percent per year; from 1995 to 1998 the rate averaged 7.25 percent per year. Lincoln and Conway report that, “The reduction of deaths related to fishing since 1991 has been associated primarily with events that involve a vessel operating in any type of fishery other than crab” (Lincoln and Conway 1999, page 693). Lincoln and Conway described their view of the source of the improvement in the following quotation. “The impressive progress made during the 1990s, in reducing mortality from incidents related to fishing in Alaska, has occurred largely by reducing deaths after an event has occurred, primarily by keeping fishermen who have evacuated capsized (sic.) or sinking vessels afloat and warm (using immersion suits and life rafts), and by being able to locate them readily, through electronic position indicating radio beacons” (Lincoln and Conway 1999, page 694).

There could be many explanations for this improvement. Lincoln and Conway point to improvements in gear and training, flowing from provisions of the Commercial Fishing Industry Vessel Safety Act of 1988 that were implemented in the early 1990s. Other causes may be improvements in technology and in fisheries management. Technological improvements may include advances in Emergency Position Indicating Radio Beacon (EPIRB, sometimes also called an ELT or Emergency Locator Beacon) technology. Current 406 MHz EPIRBs are more effective as a means of communicating distress than the 121.5 MHz EPIRBs in use in the early 1990s, in that they now transmit a unique identification code in addition to position information, which allows USCG personnel ashore to quickly identify the vessel, use point of contact telephone numbers, and more effectively filter out false alarms.

Fishery management changes have included the introduction of individual quotas for halibut and sablefish, actions that have dramatically slowed the historically frenetic pace of these fisheries. The introduction of co-ops in the pollock fisheries in 1999 and 2000 is not reflected in these statistics. Rationalization of the pollock fishery in the BSAI, however, may have furthered safety improvements. The Lincoln-Conway study implies that safety can be affected by management changes that affect the vulnerability of fishing boats, and thus the number of incidents, and by management changes that affect the case fatality rate. These may include changes that affect the speed of response by other vessels and the USCG. Starting in 1997, the Coast Guard's Seventeenth District instituted a practice of forward deploying a long range search helicopter to Cold Bay, Alaska, to improve agency response time during the Bristol Bay red king crab fishery. This practice was expanded in 1998 to cover the snow crab fishery. In 1999, approximately 11 lives were saved, in a 6-day period of extreme weather, when the forward deployed helicopter responded to several vessel sinkings and other marine casualties in short order.

In this RIR, several safety-related issues have been considered with respect to the alternatives. These include the following; fishing farther offshore, reduced profitability, and changes in risk.

Fishing Farther Offshore

Changes in fishery management regulations that result in vessels, particularly smaller vessels, operating farther offshore appear likely to increase the risk of property loss, injury to crew members, and loss of life. Chinook salmon bycatch minimization measures that close nearshore areas to fishing operations, such as the triggered closures of Alternative 3, could compel vessel operators to choose between assuming these increased risks or exiting these fisheries entirely. Weather and ocean conditions in the BSAI are among the most extreme in the world. The region is remote and sparsely populated, with relatively few developed ports. The commercial fisheries are conducted over vast geographic areas. While many vessels in these fisheries are large and technologically sophisticated, some are relatively small vessels with limited operational ranges.

Several factors associated with fishing farther from shore can reduce the safety of fishing operations by increasing the likelihood of emergency incidents. Vessels would probably have to spend more time at sea in order to take a given amount of fish. It would take more time to travel between port and the remaining open fishing grounds. Operators would also be likely to be fishing in less familiar conditions and on stocks that may be less highly aggregated, thus reducing CPUE. Increases in the time spent at sea increase the length of time fishermen are potentially exposed to accidents. Furthermore, longer trips are likely to increase fatigue and thus the potential for mistakes and accidents.

Other factors may tend to increase the case fatality rate. Fishing vessels may be farther from help if an accident occurs. In many cases, the initial response to trouble comes from other fishermen. If fishing farther offshore, on more extensive fishing grounds, increases the dispersion of the fishing fleet, assistance from other fishermen may not be as readily available. In addition, regulatory actions that force fishing vessels to work farther offshore may turn what would normally have been a request for assistance search and rescue case into an emergency or life threatening situation. Many search and rescue cases involving fatalities start as a casualty to the vessel that degrades its stability or survivability, but does not immediately threaten the vessel or crew. After the initial casualty, other environmental factors (e.g., heavy seas, winds, freezing spray, etc.) may quickly cause the situation to deteriorate. The ability to render assistance early is essential. Vessels fishing farther from shore and/or in more remote and exposed locations may experience additional delays before help can arrive.

In a similar respect, the ability to satisfactorily treat personnel injuries is often determined by the speed with which the injured can receive adequate medical attention. While these factors may affect all operations, they are likely to be most serious for the smaller vessels based in Alaska ports, which have tended to fish relatively close to the shore in the past.

Reduced Profitability

As discussed throughout this RIR, proposed restrictions on fishing to minimize Chinook salmon bycatch could reduce the profitability of many operations, especially including many of the smaller operations. Reduced profitability could be an indirect cause of higher accident rates. For example, fishermen facing a profit squeeze could defer needed maintenance on vessels and equipment, reduce operating costs by cutting back on safety expenditures, or scale back the size of their crew in order to reduce crew share expenses. Remaining crew would have expanded responsibilities and could risk greater fatigue, increasing the likelihood of accidents. Finally, these operators could decide to fish more aggressively, even in marginal conditions, in an effort to recoup lost revenues. These factors may affect the incident rate and the case fatality rate, as well.

Changes in Risk

Each of the factors described above increases risk. On the other hand, the potential for increased risk may be offset to some extent by changes in fleet behavior. An increase in risk effectively increases the cost of each additional day of fishing that, in turn, may contribute to reduced levels of participation (e.g., fewer fishing days) by smaller vessels. If this leads to a safety-induced reallocation of harvest from smaller to larger vessels, risk calculations may be affected. Similarly, smaller crew sizes mean that fewer people on a vessel are exposed to danger. Furthermore, skippers who have less invested in safety gear may have an incentive to behave more cautiously or conservatively in other respects in order to offset some of this perceived increased risk. Very little is known about factors that might increase risk, or that might offset risk increases, for fishermen in the North Pacific and Bering Sea. Even the best estimates of statistics as fundamental as the occupational fatality rate are not precise, and are not available at all for recent years. Rough estimates of the relative ranking of occupational fatality rates in different fisheries are known. Little more than qualitative speculation is available concerning the factors that affect the rates in the different fisheries, however. Available information does not permit quantitative modeling of changes in these rates in response to changes in fishery management regulations that could be induced by fishing impact minimization measures. These changes in fishing behavior and patterns could lead to an increased level of risk to vessels and crews, albeit an increase that cannot be empirically estimated.

Unfortunately, it is not possible to predict the changes in behavior that the industry might undertake to avoid Chinook salmon bycatch and the effect on vessel, and human, safety. It is important to recognize; however, that the AFA pollock fishery is a rationalized fishery operating under a cooperative structure. A careful review of the alternative set reveals that the hard cap alternatives all contain provisions for cooperative level allocations, rollovers, and transfers. Thus, the alternative set includes measures to mitigate the possibility for a "race for fish" that could occur under unallocated bycatch caps. These provisions also provide some mitigation of the associated impacts on vessel, and human, safety that might exist if a "race for fish" were created due to a bycatch cap.[57]

6.2.1 Pollock Product Quality, Markets, & Consumers

This section discusses the economic impacts of the alternatives on (1) product quality and revenue impacts, including changes in the time between harvest and delivery and changes in the average size of pollock, (2) costs to consumers, (3) impacts on related fisheries, and (4) impacts of fishery dependent communities.

[57] From response to public comment 10-55 in EIS Chapter 9, the Comment Analysis Report.

This RIR is developed in compliance with Executive Order 12866, which specifies a cost-benefit analytical framework, either qualitatively or quantitatively where possible, and consideration of the implications for net national benefits. It is important to understand that the Office of Management and Budget has determined that effects on non-us citizens do not enter into the net national benefit calculation defined as the appropriate analytical metric in Executive Order 12866. Thus, implications on world markets, world food supply, and non-US consumers are not appropriate considerations in the analysis contained in the RIR.[58]

6.2.2 Product Quality & Revenue Impacts

The Chinook salmon bycatch minimization alternatives considered in lieu of the status quo may impose restrictions on pollock fishing vessel operations that might lead to a decline in product quality and associated reductions in the price the industry receives for fishery products. Changes in product quality may occur for at least three reasons:

- If a triggered closure occurs, CV operations may have to fish farther away from shoreside processors, requiring them to travel greater distances taking more time to deliver their catch;
- If forced out of the most productive grounds, either by a triggered spatial closure or a voluntary hot spot closure, fishermen may be induced to target stocks of sub-optimal sized fish;
- If a hard cap threatens a fishery closure, a race for fish may occur and catcher processors and motherships may change product mix in order to speed up production, thereby possibly reducing product quality and/or finished product value.

These potential effects on product quality would all be expected to lower the value of payments to CV operators as well as returns to shoreside processing value added.

The interval between catching and initiating processing pollock is, reportedly, negatively correlated with product quality (and, thus, value). Some reports suggest that, on a product-for-product basis, the quality of pollock harvested and processed at-sea is uniformly higher than that of product produced onshore, owing primarily to the significant difference in the interval of time between catching and processing. Inshore processors routinely place limits on the maximum holding time for pollock onboard catcher vessels, and deduct from the price or refuse delivery if the delivery time is exceeded. For those vessels that do not have the capability to process their own catch, given a fixed catch rate and hold capacity, any action that substantially increases the time between catch and delivery imposes costs, both on the harvester and the processor. Beyond some point (which varies by vessel size, configuration, condition of the target fish, and weather/sea conditions) delivery of a usable catch (i.e., one with an economic value to the fisherman and processor) is not feasible.

In this latter connection, a concern common to all operators delivering catch ashore for processing is the effective time limit that exists from ‘first catch onboard’ until offloading to deliver a salable catch. Informed sources in the industry place the maximum interval at 72 hours (at least in the case of pollock). If fishing grounds that remain open under one or another of the fishing impact minimization alternatives are more remote from sites of inshore processing facilities than the traditional fishing locations, the delivery time for the raw product by the catcher vessel may be lengthened and the value of the delivered product lowered. For smaller vessels with more limited holding capacity and slower running speeds, this limit would impose relatively greater constraints (i.e., operational burdens). The result may be an effective intra-sectoral redistribution of catch share.

Closures (or other operational restrictions) of fishing grounds adjacent to inshore processing facilities may inadvertently redistribute the catch within a sub-sector, from the smaller, least operationally mobile vessels to

[58] From response to public comment 10-46 in EIS Chapter 9, the Comment Analysis Report.

the larger, faster, more seaworthy elements of the fleet. In the long run, this may have the added and undesirable effect of inducing further 'capital stuffing' behavior within the industry as those disadvantaged small boat owners perceive the need to invest in added capacity to continue to participate profitably in the fishery.

A corollary effect of altering the timing and/or location of catch might accrue if the average size of fish in the catch falls below the minimum requirement for specific product forms, as discussed in EIS Chapter 4. These minimums are often dictated by the marketplace, but may also be directly linked to the technical limits of the available processing technology. These impacts could accrue to any or all segments of the fishery. For example, on average, fillet production requires a larger pollock than does, say, surimi production. If spatial displacement (e.g. via a triggered area closure) results in a significant decline in the average size of fish harvested by a given operation, there could be adverse effects on product mix, quality, grade, and value.

In contrast to potential declines in product value that could occur, there may be upward price pressure due to reduced quantity of pollock supplied to markets if a bycatch management measure results in forgone pollock catch. The economic law of demand (e.g., a downward sloping demand curve) suggests that (assuming all other factors are held constant), if fewer units of a normal good or service are supplied, the individual unit price would be expected to rise. This means that, within the limits of this model and the context of this action, if fewer fish of a given species are harvested, then fishermen should receive more for each unit of that species they continue to catch and deliver to the market, all else being equal. Any increase in price that would actually occur would depend on, among other things, how responsive the price consumers are willing to pay is to changes in the quantity of catch supplied. The consumers' willingness to pay more for these products is dependent upon how unique the products are, that is, whether the consumer can substitute a lower cost alternative product. There is evidence to support the idea that reduced pollock production would tend to push prices up. The prices shown in this analysis reveal an upward trend in the past several years as pollock TACs have declined from roughly 1.4 million metric tons to approximately 800,000 metric tons. However, very little empirical information is available at this time concerning the responsiveness of price to quantity supplied for the species and product forms potentially affected by the alternatives over the range of possible quantity change that might be anticipated.

To the extent that these pollock fishery products are consumed in the United States, any producer benefit accruing from a price response to diminished supply would be, to a very large extent, offset by a reduction in consumer welfare from the increase in price. That is, the benefit to the industry would simply be the result of a transfer from consumers. Thus, under these conditions, this hypothesized supply-induced price increase would create no net benefits to Americans that could be revealed in a cost-benefit analysis for domestically consumed fish. Quantity changes under some alternatives under consideration in this action (e.g., Alternative 3) may be small enough to have no perceptible impact on prices, while under other alternatives (e.g., Alternative 2, Alternative 4, and Alternative 5) they may. It is not possible, at this time, to estimate the likelihood or magnitude of these hypothetical supply and price effects.

Alternatively, to the extent that these fish are exported and consumed outside of the United States, any supply-induced price increase would create an attributable net benefit improvement to the Nation, from a cost/benefit perspective. This is because the price increase would accrue, in the form of increased gross revenues, to United States producers, while the loss in consumer welfare would be imposed on citizens of other countries. Under OMB guidelines, costs incurred by (and, for that matter, benefits accruing to) foreign producers and consumers are excluded from the net benefit analysis performed in a Regulatory Impact Analysis. Such changes would (all else equal) have no effect on net benefits to the nation.

6.2.3 Costs to Consumers

Ultimately, fish are harvested, processed, and delivered to market because consumers place a value on the fish that is over and above what they have to pay to buy them. A person who buys something would often have been willing to pay more than they actually did for the good. The difference between what they would have been willing to pay and what they had to pay is treated, by economists, as an approximation of the value of the good or service to consumers (i.e., consumer's surplus) and as one component of its social value. If the price of the good rises, the size of this benefit will be reduced, all else equal. If the amount of the good available for consumption is reduced, the size of this benefit is also reduced. Provisions of the proposed Chinook salmon bycatch minimization actions could reduce the value consumers of seafood (and associated fish products) receive from the fisheries for several reasons, including 1) consumers may be supplied fewer fish products; 2) consumers may have to pay a higher price for the products they do consume; and 3) the quality of fish supplied by the fishing industry may be reduced and, thus, the value consumers place on (and receive from) them will decline.

The domestic consumer losses would fall into two parts. One part, corresponding to the loss of benefits from fish products that are no longer produced, would be a total loss to society. This is often referred to as a deadweight loss. The second part, corresponding to a reduction in consumer benefits because consumers have to pay higher prices for the fish they continue to buy, would be offset by a corresponding increase in revenues to industry (i.e., producers' surplus gains). While a loss to consumers, this is not a loss to society. It is a measure of the benefit that consumers used to enjoy, but that now accrues to industry in the form of increased prices and additional revenues.

The actual loss to society cannot be measured with current information about the fisheries. Estimation would require better empirical information about domestic consumption of the different fish species and products, and information about the responsiveness of consumers to the reduction in the supply (e.g., their willingness and ability to substitute other available sources of protein). In addition in the present case, because, under the status quo, society is already in a suboptimal state (i.e., incurring a welfare loss associated with the economic negative externalities imposed by salmon bycatch), actions taken to reduce these externality impacts (i.e., minimizing pollock trawl fishing impacts on salmon) will result in an aggregate welfare improvement to society, offsetting any apparent welfare reduction in the retail/wholesale domestic seafood/fish products commercial marketplace (i.e., no deadweight loss is incurred).

6.2.4 Impacts on Related Fisheries

Direct changes to a fishery, induced by salmon bycatch minimization measures, could have indirect and unanticipated impacts on other fisheries beyond the gear conflict issue addressed earlier. Some of these impacts could impose (perhaps substantial) costs on these other fisheries. EIS Chapter 7 provides a detailed discussion on the impacts of the alternatives on related groundfish fisheries. The following costs have been considered in this RIR:

- Displacing capacity and effort,
- Compression/overlapping of fishing season, and
- Increased costs of gearing up and standing down.

<u>Displacing Capacity and Effort</u>: While AFA sideboard provisions and license limitation program constraints seek to manage and control transfer of effort and capacity across fisheries, they are not absolute barriers to this phenomenon. Should salmon bycatch minimization measures become too constraining to support existing levels of effort, it is possible that effectively displaced capacity would redistribute to remaining open target fisheries within the limits imposed by AFA sideboards, imposing potentially increased costs on the operations that currently prosecute them.

Compression/Overlapping of Fishing Season: Many of the larger operations in the Bering Sea pollock fishery are highly specialized (e.g., AFA surimi C/Ps). Many others, however, rely upon diversification (i.e., fishing a sequential series of different target fisheries over the course of the year) to sustain an economically viable operation. Communities have developed around, and invested in facilities and infrastructure to support, these fishery participation patterns. The classic Alaska example has come to be the 58-foot Limit Seiner. This class of commercial fishing vessel was specifically designed to meet the State of Alaska's regulatory limit (i.e., maximum 58 feet LOA) for participation in the salmon seine fishery. Over time, these, as well as many other, small boats have evolved patterns of operation that include participation in fisheries for (among others) crab, halibut, and various combinations of groundfish species.

Because these operations are economically dependent on participation in a suite of fisheries, anything that alters their ability to move sequentially from fishery opening to fishery opening places them at economic risk. For example, should the Council select a Chinook salmon bycatch minimization action that results in temporal displacement of fisheries (either directly or indirectly), placing fishery openings in conflict, it could reduce the economic viability of some fishing operations. They could find themselves in the position of choosing to participate in only one fishery, among two or more alternative openings, and foregoing participation in the others. It may not be possible, under these circumstances, for such an operation to remain economically viable in the long run. Besides losing the revenues from participation in fisheries that overlap, these operations could find themselves idled during portions of the year when weather and sea conditions would otherwise permit fishing operations. This could have unintended consequences, such as difficulty retaining a professional crew and smaller gross revenues over which to spread fixed costs. It could also mean lost wages to the community.

There could be an analogous concern about the inshore processing sector. Processing plants often are equally dependent on the predictable sequential prosecution of fisheries during their operating year. Many plants in Alaska are specifically designed and configured to take advantage of efficiencies attributable to a consistent seasonal sequence of species delivered for processing. Crews are hired, maintained, or let go, as needed, based on expected demand for processing services. Likewise, start-up, maintenance, and shut-down costs are predicated on the timing and duration of fishery openings, as are logistical and staging costs to assure production inputs are in place when needed, and outputs reach markets on time.

In the worst case scenarios considered in this RIR, owners of processing capacity could be forced to consider not opening their plants because of uncertainty about the timing and duration of fisheries. If some plants fail to open on schedule, fishermen who otherwise would have participated in a fishery may have no market for their catch. This may be particularly significant for small catcher boats operating in relatively remote areas of the state. Furthermore, these effects need not necessarily accrue only to operators in the pollock fishery. In some areas, processors are able to provide markets for, say, salmon, only because they can underwrite some of their fixed staging costs by keeping their operations employed over an extended season with deliveries of crab, halibut, groundfish, etc. The extent to which these potential adverse effects are actually realized cannot be assessed at this time. Nonetheless, they represent potentially significant sources of economic disruption for these sectors of the industry, and the coastal communities dependent upon them.

Increased Costs of Gearing Up and Standing Down: Logistical and staging costs can represent a significant expense for many operations participating in the fisheries of the Bering Sea. Should one or more of the Chinook salmon bycatch minimization measures result in temporal displacement of fisheries there would be adverse economic and operational impacts on vessels, plants, and crews that could not be readily avoided or compensated for. That is, if a salmon bycatch minimization measure results in, for example, an early fishery shutdown due to attainment of a hard cap, the immediate result would be an idling of the fleet and associated processing plant capacity. In effect, the fishery would be required to stand-down until the next scheduled seasonal opening. From the perspective of the fishing industry, mandatory idle periods between openings impose direct costs. The longer the duration of imposed idleness and the more numerous these periods, the greater the potential economic and operational burden.

Presumably, there exists some form of a step function that characterizes these potential adverse impacts. That is, it may be likely that a mandatory stand-down of 24 hours, or 48 hours, or even 72 hours, would impose costs that could be absorbed by most operators participating in the target fishery (although all would likely prefer to avoid them). Indeed, over such a relatively brief interval, an operator might keep the crew productively employed with maintenance and/or other forms of preparation for the anticipated re-opening. Nonetheless, the plant or vessel must continue to pay its variable costs (e.g., wages and salaries, food and housing expenses, fuel and other consumable input costs, etc.) during the stand-down while producing no marketable output, and therefore earning no revenues.

Under such circumstances, each operator could eventually reach a threshold, beyond which the cost of standing-by would become a significant economic burden. Precisely where this threshold lies would likely vary by operation. At present, no empirical information is available with which to predict when these thresholds might be attained by any given plant or vessel. However, if the threshold were reached, the operator would face a series of decisions with potentially significant economic costs and operational consequences.

These costs may be characterized as staging expenses. For example, transporting crews by air to and from remote Alaska locations multiple times in a fishing year (rather than once or twice, as has historically been required) would represent a significant additional operating expense. In association with analysis of the Bering Sea Pollock/Steller RPA analysis undertaken in late 1999 and early 2000, the At-sea Processors Association reported that each C/P that participates in the pollock target fishery carries a crew of 100 to 125. Motherships and inshore plants in that same fishery have at least as many transient employees. Repeated movement of crew to and from staging areas in remote Alaska ports in response to stand-down periods, on the scale suggested by these estimates, would represent a potentially significant economic and logistical burden for these fleets and plants.

Similarly, moving fishing supplies and support materials to and from the vessel's staging port or onshore plant location two or more times each season, as well as providing for secure stand-down status of the vessel or plant and its equipment between openings, could impose considerably higher operating costs, and thus smaller profit margins. Moorage slips, especially for the larger vessels in these fleets, may be in short supply, given the limited physical facilities that currently exist in ports and harbors. If entire fleets must lay-up for weeks or even longer periods between openings, existing moorage facilities could be overwhelmed. Even if adequate space could be found, it is probable that rental/leasing costs for that space would be bid up significantly. In the long run, this induced demand could result in investment in additional port and harbor facilities.

As suggested above, inshore processors may experience equivalent logistical costs, depending upon their relative level of operational diversification, geographic location, length of current operating season, etc. Presumably, there exists a balance-point between the minimum necessary volume of deliveries of catch to a plant, the duration of idleness between delivery flows, and the ability to operate a processing facility at all. While likely varying from plant to plant, operator to operator, and even species to species delivered, it is clear that if a plant cannot cover its variable operating costs, it is better off (from an economic perspective) to cease operation altogether. As staging costs (e.g., moving crews and supplies to and from the facility) increase, this operating margin shrinks. Data limitations preclude estimating which plants can or would choose to operate under these circumstances. It is apparent, however, that significant temporal changes in fishery openings and/or duration (as implicitly or explicitly provided for under several of the proposed alternatives) would increase the likelihood that some may not continue to operate.

6.3 Management & Enforcement Costs

This section describes the costs to the industry and NMFS associated with requirements for managing, monitoring, and enforcing the alternatives. These costs include increased observer coverage for catcher vessels delivering to inshore processors; equipment and operational requirements needed to count all salmon bycatch in the Bering Sea pollock fishery; recordkeeping and reporting requirements; revisions to NMFS's Catch Accounting System; and costs associated with enforcement of the Chinook salmon bycatch caps. This section also includes a discussion about electronic monitoring as an alternative to reduce the costs of observer coverage. The discussion summarizes several existing fisheries in which electronic monitoring is being used or has been tested, makes applicable comparisons to the pollock catcher vessel fleet, and provides suggestions for future research in electronic monitoring.

6.3.1 Observer Costs

As discussed in EIS Section 2.2.5, hard caps for Chinook salmon bycatch proposed under Alternatives 2, 3, 4, and 5 would increase the need for accurate salmon bycatch accounting for all vessels and in all processing plants. Observer coverage on all vessels, except those delivering unsorted codends to motherships, and in all processing plants is necessary to identify the salmon by species, to count them, and to monitor requirements to retain all salmon bycatch until it is counted by an observer. Inshore processing plants, catcher/processors, and motherships currently are required to have all catch from the Bering Sea pollock fishery observed. However, observer coverage for catcher vessels delivering to inshore processors is based on vessel length with one observer required on vessels 125 feet length overall (LOA) and greater, an observer required on 30 percent of fishing days for vessels between 60 and 125 feet LOA, and no observer coverage required on vessels less than 60 feet LOA.

Under Alternatives 2, 3, 4, and 5, NMFS would require an observer to be onboard during all days that a catcher vessel delivering to an inshore processor is directed fishing for pollock in the Bering Sea. In its April 2009 motion, the Council included the requirement for 100 percent observer coverage as component 6 for Alternative 5. The requirement for 100 percent observer coverage on all catcher vessels would result in increased observer coverage for each of the 56 inshore catcher vessels that currently are required to carry an observer at least 30 percent of the time that they are fishing. One AFA-eligible inshore catcher vessel is less than 60 ft. LOA (Morning Star, ADF&G number 70323). This vessel has not fished for pollock in recent years. However, if it participated in the Bering Sea pollock fishery in the future, it would be required to carry an observer at all times in this fishery.

Estimates of salmon bycatch by unobserved catcher vessels currently are based on NMFS calculated bycatch rates from observed vessels, as described in EIS Chapter 3. NMFS intends to use a count, or a census of all salmon bycatch as a basis for management of the Chinook salmon hard caps under Alternatives 2, 3, 4, or 5. The reasons for using a count are described in detail in EIS Section 2.2.5. To facilitate the count, operators of the catcher vessels would be required to retain all salmon bycatch and deliver it with the pollock catch to the inshore processor. The count of salmon would be done by the observer at the processing plant. The purpose of the observer on the catcher vessel would be to monitor compliance with the retention requirements, in addition to continuing to perform all of the other assigned duties.

NMFS estimates that a certified observer costs a vessel or processor approximately $355 per day.
In 2007 and 2008, 56 vessels between 60 feet and 124 feet LOA participated in the AFA pollock fishery. In 2007, these vessels carried an observer 1,590 days out of their total 3,364 fishing days. These vessels had observer coverage for an average of 47 percent of their pollock fishing days. NMFS estimates that observer coverage costs for this level of coverage was approximately $564,450 (1,590 days x $355). If all of the 2007 fishing days had been observed, the estimated total cost for 100 percent observer coverage would have been $1,194,220 (3,364 days x $355). Increasing observer coverage requirements to 100 percent would have cost

vessel operators an additional $629,770, as depicted in the following table. This equates to slightly over $11,000 more per vessel in this observer coverage category. If these vessels continued to fish the same number of days in future years, as used in this example, the total cost for observer coverage per vessel would be approximately $21,300 annually, using existing observer cost estimates. These costs do not include days when an observer is aboard a vessel, but the vessel was not fishing. Vessels operators have to pay for onboard observers even during non-fishing days. In 2007, the gross ex-vessel value of the 572,745 mt of pollock caught by the entire Bering Sea inshore catcher vessel fleet (90 vessels) was about $200 million (Hiatt et al., 2007).

Table 6-1 Estimated cost of increasing observer coverage levels to 100 percent for inshore CV currently subject to 30 percent observer coverage requirements (estimated cost for all vessels combined).

Inshore catcher vessels < 125 ft. LOA	(A) Estimated cost/day of observer coverage	(B) Actual number of fishing days in 2007	(C) Number of observed fishing days in 2007	(D) Estimated 2007 cost of observer coverage [A*C]	(E) Estimated cost of increasing to 100 pct observer coverage [A*B]	Cost increase for fleet [E-D]	Average cost increase per Vessel [(E-D)/56]	Total cost of increased observer coverage per vessel [E/56]
56	$355	3,364	1,590	$564,450	$1,194,220	$629,770	$11,246	$21,325

When considering potential observer cost increases, it is also important to consider that costs will vary with the amount of pollock each vessel catches, and that some participants' pollock allocations could differ from the average. The future amount of additional coverage is difficult to predict because vessel operators may coordinate fishing efforts in order to consolidate observer coverage and reduce costs. Inshore sector catcher vessel may achieve cost savings if operators "stack" their pollock history on a single, or fewer, vessel(s) than have been fishing in recent years. However, these savings may be relatively small, as this fleet is already highly efficient and the main savings in stacking permits would be related to reductions in the time spent in transit to and from fishing grounds, as well as the time needed to offload catch. Vessels also may choose to reduce the number of non-fishing days during which they have an observer aboard. Additionally, vessels may choose to change the pace of their fishing operations by increasing operational efficiencies or decreasing the amount of time they operate in marginal weather. If vessel operators alter their typical fishing behavior, it is likely to change the number of days they fish and thus, their observer costs. Other vessel costs could change as well, such as those associated with crew compensation, consumables (fuel, lube, stores), maintenance, and insurance. It has long been asserted that the presence of an observer, especially aboard a smaller vessel, can only be achieved by displacing a crewmember. If this is true, reducing the number of working crew on a commercial fishing vessel likely will reduce operational efficiency, slow harvest rates, or both.

The cost of implementing a program that allows salmon bycatch allocations and transfers is likely to exceed NMFS's current observer-related costs for the Bering Sea pollock fishery. In addition to increased management costs, increasing the number of observer days and associated increase in the amount of data collected would increase costs for the Observer Program. Such increases can be attributed to increased staffing needs for data quality control and processing, additional training classes to accommodate the increase in observers to meet the expanded demand, additional observer sampling equipment to acquire scientifically accurate and statistically reliable catch and bycatch data, and additional travel costs associated with providing field support. The estimated costs to the Observer Program for increased staffing and costs associated with this action include 2.5 fulltime equivalent staff positions and approximately $325,000, annually.[59]

[59] Jennifer Ferdinand, NMFS AFSC, personal communication, March 2008.

6.3.2 Catch Accounting System

Monitoring and managing the seasonal Chinook salmon bycatch allocations under Alternatives 2, 3, 4, and 5 would increase the costs to NMFS of managing the Bering Sea pollock fishery. Chinook salmon bycatch caps allocated to the sector level would increase the complexity of changes that would be required to be made to NMFS's Catch Accounting System (CAS). These costs include the initial creation of account structures, long-term maintenance, and other subsequent programming changes required as accounting for other management programs evolve. NMFS would incur additional software design and development costs to accommodate allocating Chinook salmon bycatch among the sectors, inshore cooperatives, and CDQ groups. NMFS would use CAS data to determine Chinook salmon bycatch allocations, conduct transfers and rollovers, and for enforcing allocation overages.

The allocations would require NMFS to design and test its CAS software to ensure that Chinook salmon bycatch is correctly counted and debited from the appropriate allocation. Programming the business rules and establishing new accounts is a time-consuming process that often requires contracting with third party computer software developers. The costs associated with both NMFS staff time and contractors time will depend on the complexity of revised salmon bycatch management measures. This complexity includes the number of sector specific accounts and seasonal accounts and the transferability and rollover provisions.

Transferable allocations would further increase the complexity of the changes that would be required to the CAS, since it involves both sector level caps and transferable allocations. Transfer provisions would require accounts to be established for entities that receive Chinook salmon bycatch allocations, including designing accounts that enable NMFS to track and archive transfers and changes in cooperative membership. Transfers between entities would require receipt of transfer information and readjustment of accounts for the transferor and transferee. For these reasons, this option would require significant software development resources for database construction, an internet-based interface for quota-holding entities to check their salmon accounts, and, to transfer salmon. Estimating the development costs associated with a new management program is difficult due to the complexity of the CAS and the ripple effect that new programming changes may have on existing programming and data base structures.

The Gulf of Alaska Rockfish Program provides a recent example of the development and programming costs associated with implementing a new quota-based fishery program. The implementation of this program in 2007 established transferrable rockfish and PSC quotas. This required approximately 850 hours of contracted programmer time for changes to the CAS. Contract costs were approximately $100,000[60]. This estimate does not include a substantial amount of NMFS staff time that was required to design appropriate databases, test account structures, track errors, and design reports. While establishing an increased number of salmon bycatch caps (both annual and seasonal) would require NMFS to incur additional programming costs, these costs probably would not be the same magnitude as those incurred with the development of the GOA Rockfish Program. That program implemented a more complex suite of target and prohibited species allocations to GOA rockfish fisheries participants, whereas this proposed action address the allocation of a single prohibited species.

Under Alternatives 4 and 5, the inclusion of the backstop cap would further increase the extent of the CAS changes that would be needed to properly account for Chinook salmon bycatch. This bycatch potentially could be accruing to parallel accounts established for (1) sector, inshore cooperative, or CDQ level accounts under the high cap and (2) the backstop cap accounts established for the aggregate Chinook salmon catch made by all vessels or CDQ groups fishing under the backstop cap.

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[60] Jennifer Mondragon, Catch Accounting and Data Quality Branch, NMFS Alaska Region, personal communication, April 2008.

6.3.3 Monitoring Shoreside Processors

Under current regulations, each inshore processor that receives AFA pollock is required to develop and operate under a NMFS-approved catch monitoring and control plan (CMCP). Each processor must annually submit a CMCP to NMFS. The monitoring standards for CMCP are described in regulation at 50 CFR 679.28(g). Plant layouts and operations vary widely among processors; therefore, the CMCP regulations were developed as a series of performance-based standards that each processor must meet. Each CMCP describes how a particular processor will meet each standard. NMFS would need to implement additional measures to existing CMCP performance standards in order to ensure that fisheries observers have the means to count all Chinook salmon in each delivery.

CMCP performance standards require that an observer sampling station and an observation area be provided in the vicinity of the first location where catch can be sorted. Salmon and other species that are sorted out by the processor are collected by the observer in this area. Depending on the depth of fish flow, the width and number of belts, and the volume of bycatch, some bycatch (including prohibited species) will pass the sorting area and arrive in the processing area of the plant. Plant personnel bring salmon found in the factory to the vessel's observer so that they can be counted. Salmon found in the shoreside factory, after a vessel has departed (with its observer) are brought to the plant observer.

The procedures established under the AFA for the CMCPs were designed to monitor the weighing of pollock at the inshore processing plants. Proper weighing of large volumes of a target species such as pollock require different conditions than does the proper sorting, identification, and counting of a more infrequently occurring bycatch species such as salmon. Salmon can be difficult to see, identify, and count amidst the large volume of pollock. The factory areas of processing plants are large and complex. Preventing observers from seeing Chinook salmon that enter the factory area of the processing plant would not be difficult. In addition, observers must examine each salmon to verify the species identification.

Therefore, NMFS intends to propose regulations that include the following additions to requirements for the inshore processors to ensure that observers have access to all salmon bycatch prior to the fish being conveyed into the processing area of the plant.

- Processors would be prohibited from allowing salmon to pass from the area where catch is sorted and into the factory area of the processing plant;
- No salmon of any species would be allowed to pass the observer's sampling area;
- The observer work station currently described in regulations at 679.28(g) would be required to be located within the observation area;
- A location must be designated within the observation area for the storage of salmon, and;
- All salmon of any species must be stored in the observation area and within view of the observer at all times during the offload.

These requirements would be effective for the 2011 fishing year so inshore processors would have to modify their plants to meet these requirements and have these modifications reflected in CMCPs approved by NMFS prior to January 20, 2011.

Proposed changes to inshore monitoring requirements would likely impose processing costs associated with lower throughputs of pollock in the plant to properly sort out all of the salmon bycatch from the pollock. In addition, product quality could decline if fish remain unprocessed for longer periods of time. Costs would increase in concert with an increase in the time required to convey fish through a processing facility, increased vessel offload times, and the need to reconfigure conveyor belt and sorting layouts. However, the variability in the flow of fish through a given plant and the changes to sorting conditions make it difficult to predict costs to industry. Further, the magnitude of these costs would likely be plant-specific as needed to facilitate a salmon census of observed deliveries.

Requirements to deliver pollock to inshore processors that have approved CMCPs currently apply only to AFA catcher vessels delivering non-CDQ pollock to inshore processors. These requirements do not apply to catcher vessels directed fishing for pollock on behalf of a CDQ group. With few exceptions, pollock allocated to the CDQ Program since 1992 has been processed at sea on catcher/processors or motherships. Therefore, this requirement would not require any of the CDQ groups to stop delivering pollock CDQ to a currently contracted processing partner. In the future, if they chose to have pollock CDQ delivered to a shoreside processing plant, the catcher vessel used to harvest the pollock CDQ would be required to comply with the retention and observer coverage requirements described above and the pollock would have to be delivered to a processor with an approved CMCP. This requirement is necessary to ensure that salmon bycatch from the pollock CDQ fishery is properly counted and reported.

6.3.4 Monitoring At-sea Processors

Existing observer coverage requirements and species composition sampling methods for catcher/processors and motherships participating in the AFA pollock fisheries, including the directed fisheries for pollock CDQ, represent NMFS's current method for estimating Chinook salmon bycatch and could continue to be used to account for transferable Chinook salmon bycatch allocations. However, industry members have expressed interest in using counts of salmon bycatch (a census) rather than estimates based on observer species composition samples. This is the method used for catcher vessels delivering to shoreside processing plants. NMFS supports the use of a census on catcher/processors and motherships, as long as the retaining and counting of salmon can be properly monitored. A census would remove the uncertainty associated with expanding the observer species composition data for each haul to estimate the number of salmon in each haul.

Current regulations require the retention of salmon “until the number of salmon has been determined by an observer”. Observers report the count of salmon for each haul in data submitted to NMFS and vessel operators separately report the count of salmon bycatch each day on their daily production reports. Therefore, the information needed to both (1) count salmon bycatch, and (2) estimate salmon bycatch using observer species composition data is already being collected by observers on catcher/processors and motherships. However, to use salmon counts to account for Chinook salmon bycatch accruing against allocated amounts, some revisions to existing regulations would be needed.

To ensure accurate counts of salmon bycatch, NMFS intends to apply the following requirements to the catcher/processors and motherships:

- All salmon bycatch of any species must be retained until it is counted by an observer;
- Vessel crew must transport all salmon bycatch from each haul to an approved storage location adjacent to the observer sampling station so that the observer has free and unobstructed access to the salmon, and the salmon must remain within view of the observer from the observer sampling station at all times;
- The observer must be given the opportunity to count the salmon and take biological samples, even if this requires the vessel crew to stop sorting or processing catch until the counting and sampling is complete;

- The vessel owner must install a video system with a monitor in the observer sample station that provides views of all areas where salmon could be sorted from the catch and the secure location where salmon are stored;
- No salmon bycatch of any species may pass the last point where sorting occurs in the factory; and
- Operators of catcher/processors would be required to submit the count of salmon by species in each haul to NMFS using an electronic logbook.

Processor vessels may incur additional costs related to providing additional space in the observer sample station for a salmon storage location. These costs depend on the current layout of the observer sample station and the extent to which modifications to the area will be required to comply with the new requirements. Therefore, these costs are difficult to estimate.

The requirement to allow the observer to count all the salmon in the previous haul prior to the beginning of the next haul may reduce the flow of fish through the factory. The degree to which the processing will be slowed would be highly variable and depend on the number of salmon in each haul.

Ensuring no salmon bycatch pass the last point where sorting occurs in the factory would likely impose processing costs associated with lower throughputs of pollock and potential decreases in product quality if fish remain unprocessed for longer periods of time. Costs would increase in concert with an increase in the time required to convey fish through the sorting area, increased processing times, and the need to reconfigure conveyor belt and sorting layouts. However, the variability in the flow of fish through a given factory and the changes to sorting conditions make it difficult to predict costs to industry. Further, the magnitude of these costs would likely be vessel-specific as needed to facilitate a salmon census of observed deliveries

The video requirements would be modeled similar to those designed for the bin monitoring requirements under Amendment 80 and the Rockfish Pilot Program. A vessel may provide and maintain cameras, a monitor, and a digital video recording system for all areas where sorting, storage, and discard of salmon prior to being counted by an observer could be located. The video data must be maintained and made available to NMFS upon request for no less than a 120 day period. The video systems would also be subject to approval by NMFS at the time of the observer sample station inspection.

Costs for the video include cameras, waterproof monitors, a digital video recorder (DVR), associated software, storage of the data, installation of the equipment, and maintenance of the system. Because vessel configurations are variable, the costs for a vessel to implement video to ensure an observer can monitor all locations where sorting, storage, and discard of salmon prior to being counted could be located could be quite variable, depending on the nature of the system chosen. In most cases, the system would be expected to consist of one DVR/computer system, a monitor and between two and five cameras. Waterproof or water-resistant monitors may range in price between $2,000 and $12,000 dollars depending on the size of the monitor and the degree of protection against intrusion of foreign objects, such as water. DVR systems range in price from $1,500 to $10,000 and cameras cost between $75 and $450 each. Storage costs will vary depending on the frame rate, color density, amount of compression, and image size. The system would be expected to record data at a rate of between 5 and 20 GB (gigabits)/day. Assuming that a CP fishes for an average of 10 days per trip, the amount of storage space would be between 50 and 200 GB/per camera, or between 100 (for a two camera system producing highly compressed images, with 8 bit color density, and a fairly small frame size) and 1,000 GB (for a five camera system producing moderately compressed images, with 16 bit color density, and a fairly large screen size). Assuming that vessels choose to purchase redundant storage capacity, and that USB compatible hard drives cost approximately $1.00 per GB, NMFS estimates that storage will cost between $400 and $3,000. Installation costs will be a function of where the DVR/computer can be located in relation to an available power source, cameras, and the observer sampling station. In most cases, the DVR/computer would be located on the factory deck in an office/lab, if one is available, or in the wheel house if one is not. It is also possible that vessel owners will choose to build a weather resistant enclosure for the DVR/computer in or near the observer sampling station. We estimate that a fairly simple installation will cost approximately $4,000, while a complex installation will cost approximately $22,000.

However, these costs could be considerably lower if the vessel owner chooses to install the equipment while upgrading other wiring. Thus, total installed system costs would be expected to range between $6,050 and $46,650 per vessel. Maintenance costs are difficult to estimate because much of this technology has not been extensively used at-sea by the U.S. fleet. However, we estimate a hard disk failure rate of 20 percent per year, and a DVR/computer lifespan of three years, or between $680 and $4,100 per year. We estimate one camera replacement at between $75 and $450 every three years depending on how much vibration and shocks the camera might endure.

During the first years of implementation, the video systems aboard the Amendment 80 vessels have been reported to cost between $10,000 and $40,000 depending on the systems.[61] However, the systems in place for the Amendment 80 vessels occur in harsher environments such as inside the fish bins and must sometimes cover large areas that may need up to 8 cameras to allow viewing of all areas. The systems required for catcher/processors and motherships participating in the Bering Sea pollock fishery may not operate in as harsh environments or may require fewer cameras to achieve the needed coverage.

Operators of catcher/processors participating in the Bering Sea pollock fishery would be required to report the salmon bycatch counts by species for each haul rather than the daily total currently required. This requirement is necessary so that industry reports and observer reports of salmon counts are collected at the haul level and these counts can be compared if disagreements occur about the salmon bycatch numbers.

The count of salmon bycatch by species for each haul would be required to be submitted to NMFS using an electronic logbook so that the data is readily available to NMFS in an electronic format. The electronic logbooks would replace the catcher/processor trawl daily cumulative production logbook (DCPL) paper logbooks currently required to be submitted by the operators of catcher/processors under § 679.5(m). The discard, disposition, and production information formerly recorded in the DCPL are now entered through eLandings. This new step would remove the requirement for the AFA catcher/processors to record any information in the DCPL and thus to remove the catcher/processor trawl DCPL from use for these vessels. The electronic logbooks would be an additional component to “eLandings”, the program through which the operators of catcher/processors currently submit their daily production reports.

The requirement to maintain and submit daily logbook information electronically instead of maintaining and submitting a paper catcher/processor trawl DCPL logbook is not expected to increase costs for the catcher/processors. The electronic logbook software will be developed by NMFS and provided to the vessel operator as part of the eLandings software that is updated annually by NMFS. Data entry for the electronic logbooks will be done on the same computer as already is required on the vessel to submit the electronic daily production reports. The same communications hardware and software currently used for eLandings can be used for the electronic logbooks. The vessel operators will be required to print out a copy of the electronic logbook and maintain it onboard the vessel. The additional cost of data entry of information into the electronic logbook should be offset by the reduction in cost associated with maintaining the paper logbook.

[61] Much of the information about the costs of video were provided by David Pratt, SeaTechnology Company, Seattle, WA (206-282-9158), through personal communications in September and October 2009.

NMFS would incur the costs associated with revisions to the eLandings software to support reporting of haul level salmon bycatch data. The costs of providing this additional level of detail on the daily production reports submitted by the vessel operators is expected to be minimal

AFA catcher/processors required to use an electronic logbook in the Bering Sea pollock fishery would be required to use this electronic logbook for the entire year for any other fishery in which they participate. Use of the electronic logbook all year for all fisheries is necessary to provide logbook information to NMFS in a consistent format throughout the year. In 2008, 13 of the 17 catcher/processors that fished in the Bering Sea pollock fishery also participated in other fisheries, primarily yellowfin sole and Pacific cod. The days fishing in non-pollock fisheries represented 20 percent of the total fishing days for these vessels in 2008.

Electronic logbooks would not be required for the AFA motherships or catcher vessels delivering to inshore processors. Motherships already are required to submit daily an electronic landings report that includes a report of the number of salmon by species in each delivery by a catcher vessel. When NMFS develops the electronic logbook component of eLandings for the AFA catcher/processors, it likely also will develop an electronic logbook for the motherships, which could be used voluntarily in place of the paper logbook. Electronic logbooks also will not be required for catcher vessels delivering to inshore processors because the counting and reporting of the number of salmon by species in each delivery will be done at the processing plant and reported on the inshore processors electronic logbook.

6.3.5 Electronic Monitoring In Lieu of Observers

In order to ensure adequate monitoring of salmon bycatch by inshore catcher vessels, the Council recommends that all catcher vessels be required to have 100 percent observer coverage, as discussed previously. NMFS included consideration of electronic monitoring (EM) in lieu of observer coverage in a discussion paper presented to the Council in February 2008. While considerable progress has been made in the development and application of EM technologies in various fisheries programs, NMFS believes that additional research must take place before such an EM approach could be recommended for the Bering Sea pollock fishery. This section summarizes several existing fisheries in which EM is being used or has been tested, makes applicable comparisons to the pollock catcher vessel fleet, and provides suggestions for future research in EM.

Pacific whiting (hake) catcher vessels

Catcher vessels fishing in the hake fishery off the west coast of the United States have operated under an exempted fishing permit (EFP) requiring the use of EM since 2004. The EFP exempts vessels from regulatory requirements to discard prohibited species and any groundfish above applicable trip limits, but requires "nearly" full retention of all catch. An EM system consisting of two or more video cameras, global positioning systems (GPS), hydraulic and winch sensors, and on-board data storage is used by these vessels to document compliance with the EFP retention provisions. Until 2007, the EM program was funded entirely by NMFS. In 2007, vessels fishing under the EFP paid the costs of equipment installation and maintenance directly to the EM service provider. Because the hake fishery operates under an EFP, regulations have not yet been implemented to specify the technical requirements for the EM systems, the responsibilities of vessel owners for their installation and upkeep, or how the resultant electronic data must be archived or submitted. According to the draft Environmental Analysis (EA)[62] prepared for EM in the hake fishery, future regulations would include:

- an EM service provider permitting process;
- EM service provider responsibilities;
- EM service provider data confidentiality standards;
- EM coverage requirements for vessels;

[62] http://www.nwr.NMFS.gov/Groundfish-Halibut/Groundfish-Fishery-Management/NEPA-Documents/upload/Amend-10-EA.pdf

- prohibitions against intentionally damaging EM equipment;
- vessel operator's responsibilities for procuring EM equipment and services;
- vessel operator's responsibilities for scheduling EM installations, equipment, maintenance and data retrieval; and,
- vessel operator's responsibilities for scheduling EM system removal.

As described in the hake fishery draft EA, NMFS would use base funds to administer the program and analyze the EM data unless the Magnuson-Stevens Act is amended to allow NMFS to accept funds directly from industry for administrative and analytical infrastructure costs. The draft EA does not detail the level of review that would be required for the EM data nor estimate what those costs may be.

The hake fishery does share some similarities with the AFA pollock fishery. Both are high volume, mid-water trawl fisheries with relatively small amounts of bycatch. Catch is quickly moved from the deck to refrigerated seawater tanks. Both fleets deliver their catch to a shore-based processor, where the majority of bycatch sorting occurs. The hake fishery is limited by the amount of certain rockfish species it is allowed as bycatch. If salmon hard cap management is adopted for the AFA pollock fleet, then both fleets could be limited to a catch of a species that could close the fishery without allowing the complete harvesting of the target species.

However, there are also distinct differences between the hake and pollock fisheries. First, pollock catcher vessels are often significantly larger and may have multiple decks where fish may be sorted or be designed with on deck belts for efficient at-sea sorting. This ability to sort in multiple locations and the generally larger trawl decks would increase the complexity of an appropriate EM system. The current EM provider's standard system in the hake fishery allows for up to 4 cameras, but with larger vessels more cameras may be needed.

Given the large areas that cameras must cover and the low light levels in which fishing often takes place, it would be difficult or impossible to distinguish salmon discard from the discard of other species on a pollock catcher vessel using an EM system. Thus, given the current state of technology, any EM program in this fleet would have to be coupled with an absolute prohibition on discard of any species, and the degree to which it is practical to mandate a zero discard policy that would prohibit normal operations such as net cleaning is unknown. The hake EFP fishery, on the other hand, uses EM to monitor a minimal discard requirement under which the limited discard of large animals and normal operations such as net cleaning are allowed.

The AFA pollock catcher vessel fleet currently has a mix of vessels that require 30 percent and 100 percent observer coverage. The observers not only monitor for compliance with salmon retention requirements, but also collect biological information that can only be collected at sea. For hake, observer coverage was only meant to monitor and enumerate discard events. As EM program has been able to fill this role in the hake fishery under an EFP, observer coverage no longer exists. Even if an EM program was implemented, AFA pollock catcher vessels would continue to need some amount of at-sea observer coverage to collect haul-specific biological data.

Because the hake fishery has been prosecuted for the last four years under an EFP, it has been possible to modify the EM program on an annual basis. In the first years of this EFP, the data from the fishery were used to revise the retention requirements, improve the EM system performance, better define the amount and type of data that needed to be collected, and alter EFP participant behavior in relation to catch retention standards. Such an iterative process would not be possible if EM was implemented by regulation in the pollock fishery, given the difficult and time consuming nature of changing regulatory requirements.

Central Gulf of Alaska (CGOA) rockfish fishery
In 2005, NMFS conducted a pilot study aboard the vessels that fish for rockfish in the CGOA management area. This study tested the use of EM to identify discarded bycatch, with a focus on the identification of

halibut, a mandatory discard. The results of this pilot study found that in order for EM to function efficiently and accurately, discards would need to be limited to a single location, and all species other than halibut would have to be retained. In 2007 an EFP was conducted on a single vessel to compare EM systems ability to estimate the quantity of halibut discard when compared with a full census of halibut made by a trained sea-sampler. The EFP demonstrated on a quantitative level that EM was a viable method for generating sufficiently accurate and precise haul-level estimates of halibut discard under comparatively controlled conditions. In 2008, a primarily qualitative project was conducted to test larger scale implementation in a real world environment and to explore the regulatory, cost, fleet management, catch accounting, and infrastructural issues that need to be addressed prior to effective implementation. A final report of this project will be presented at the October 2009 Council meeting, but preliminary results indicate that EM can monitor for 100% retention and provide consistent and acceptable estimates of halibut discarded at sea in the RPP over one co-op and one RPP season.

In many ways, this application of EM in the CGOA rockfish fishery is the most demanding one that has been investigated to date, because it seeks to use EM not only to monitor a single location discard policy, but also to accurately quantify the amount of halibut PSC actually discarded. There are many differences between the Bering Sea pollock and GOA fleets. Pollock catcher vessels are often significantly larger and may have multiple decks where fish may be sorted. Some are designed with on deck or below deck belt systems for efficient at-sea sorting. This ability to sort in multiple locations and the generally larger trawl decks would increase the complexity of an appropriate EM system. The CGOA rockfish vessels currently use three to four cameras to cover all areas where fish may be discarded. As the pollock vessels tend to be larger, with several areas where discard may occur, more cameras would most likely be needed.

Again, NMFS and the fishing industry have approached the potential use of EM in the CGOA rockfish fishery in a methodical manner that will have involved three years of study and two EFPs to test the effectiveness, enforceability, and affordability of this type of system prior to mandating its use through regulations.

EM for bin monitoring –Amendment 80 catcher/processors

NMFS OLE has documented deliberate biasing of observer samples on catcher/processors participating in head-and-gut fisheries. In most of these cases, crewmembers sorted out limiting species inside the live tanks, outside of the view of the observer. A limiting species is a species that may, if its catch limit is reached first, result in a target fishery being closed prior to its catch limit being completely caught. Presorting resulted in an under-representation of the limiting species in observers' samples. With the implementation of a quota-based fishery under Amendment 80, incentives to bias observer samples have increased. For NMFS to obtain a credible estimate of total quota harvested, it was necessary to ensure that observers had full access to unsorted catch. This required the implementation of a bin monitoring program so that observers could ensure that presorting was not occurring in the live tanks. One option under this program is to allow vessels to install cameras and a display to allow an observer a view of all the areas where crew might be sorting fish. Other options exist under this program and half of vessel operators selected another option, rather than installing EM inside their vessel's live tanks.

In this situation, EM is being used for a comparatively undemanding application and is primarily a "real time" tool to assist the observer in ensuring that presorting is not occurring in the live tanks. In the event that the equipment fails to operate properly, the observer is present and can inform vessel crew to remedy the situation immediately. The vessel may not allow crew inside the bin until the problem is remedied.

There are significant differences between the Bering Sea pollock catcher vessel fleet and the Amendment 80 catcher/processors. EM onboard Amendment 80 vessels is used in real-time for compliance monitoring, not for post-trip verification of compliance. If EM failed aboard AFA pollock catcher vessels, no observer would be present to inform the vessel's crew of EM failure or malfunction.

Prior to implementation of the bin monitoring regulations, Amendment 80 vessels interested in using EM for bin monitoring agreed to carry the system voluntarily. This allowed industry and the agency to work out problems prior to regulatory implementation. The pre-implementation research resulted in a multitude of adjustments to the EM systems in order to create an effective, enforceable program. Had these vessels not been able to test the EM systems, many would have not met the standards defined in the regulations and may not have been able to participate in the fishery.

NMFS recommendations for EM in the Bering Sea Pollock Fishery

All of the EM programs described above have operated under experimental conditions prior to regulatory implementation, or continue to be operated under EFPs. In order to ensure that EM would be an effective tool for monitoring compliance with a no discard requirement in the AFA pollock catch vessel fleet, NMFS would need to answer numerous questions concerning operational issues specific to this particular fleet and fishery. However, given the similarities between this potential application of EM and other, better researched, EM applications the amount of pre-implementation testing may be comparatively minimal.

An EFP would not only need to verify EM as an effective tool for monitoring compliance with a no discard requirement, it would need to answer other operational issues. These issues include the level of review necessary to ensure compliance, the costs associated with implementing and managing a comprehensive EM program, the appropriate cost distribution between NMFS and the fleet, the amount of observer coverage at the processor needed to obtain salmon numbers when a vessel observer is no longer present at the plant, and adequate enforcement procedures to ensure a functional program. Even if an EFP verified EM was an effective tool in lieu of observers for monitoring compliance with a no discard requirement, some level of observer coverage would continue to be necessary to obtain haul-specific biological samples on catcher vessels.

If NMFS were to adopt EM for inshore CV in the AFA pollock fishery, a multi-year, iterative EFP would need to be conducted to test whether vessels could comply with a no discard policy, to test whether video equipment could withstand the elements in the Bering Sea during the winter, and to ensure that NMFS had the infrastructure to enforce compliance with EM and no discard requirements. As previously discussed, NMFS already is experimenting with the use of EM in the Alaska Region. NMFS is willing to work with the fishing industry to develop EFPs to test EM as a salmon bycatch monitoring tool in the Bering Sea pollock fishery.

An Electronic Monitoring workshop was sponsored by the AFSC’s Fisheries Monitoring and Analysis Division, the NMFS Alaska Region, North Pacific Research Board, and the Council. It was held in Seattle, Washington on July 29 and 30, 2008. The goal of the workshop was to assess the current state of video monitoring technology in fisheries, the applicability of EM to research and management of North Pacific fisheries, the future potential of EM, and research and development needs. Workshop materials and findings are posted at the NMFS Alaska Region website.[63]

6.3.6 Other Recordkeeping and Reporting Costs

Transfers and Rollovers: NMFS would process and approve Chinook salmon bycatch allocation transfer applications. NMFS would incur increased administrative costs associated with conducting transfers, issuing salmon allocations on an annual basis, and, for NOAA OLE and NOAA GC, enforcing quota overages. The burden on the agency would increase proportionally with the number of inter-sector transfers that industry chose to request during a given season. Participants in the pollock fishery would face additional costs associated with preparing and submitting Chinook salmon bycatch allocation transfer applications to NMFS. Pollock cooperatives also would have an increased administrative burden associated with managing their annual salmon allocations and conducting transfers.

[63] http://www.alaskafisheries.NMFS.gov/scales/default.htm

NMFS would incur increased administrative costs to manage the online account system for conducting transfers. Administrative costs for online transfers are less than costs associated with paper transfers because NMFS does not need to physically process applications and update account balances. However, the online system does have costs associated with online application programming and support. Application development and support is currently conducted by NMFS and an outside contractor. The amount of software support required is proportional to the complexity of the salmon bycatch transfer options selected. However, unlike paper transfers, the time required to administer an online service would likely decline after initial implementation. Transfers applications would be available online and transfers would be required to be made electronically. NMFS would develop the computer programs necessary to conduct electronic transfers similar to how transfers are made under Amendment 80, the Rockfish Pilot Program, the CDQ Program, and the Crab Rationalization Program. As long as the electronic forms are filled out completely and correctly and the transferring entity has available Chinook salmon bycatch to transfer, the transfers will be completed in a very short period of time with minimal administrative costs.

The industry also will incur costs associated with transferring Chinook salmon bycatch allocations. However, transfers are voluntary and no entity receiving an allocation will be required to transfer. NMFS estimates that up to 15 transfers could occur each year at a cost of $25 per transfer, for a total estimated cost to industry of $375.

Rollovers among sectors, cooperative and CDQ groups in a season under Alternatives 2 and 3, Component 3, Option 2 would require additional agency resources to monitor and carry out. These would require NMFS to assess the amount of Chinook salmon a sector may catch to complete its harvest of pollock and what salmon bycatch may be remaining to rollover to another sector. The process would require considerable effort to monitor catch rates for pollock and bycatch rates for salmon, coordinate with the pollock industry, and project pollock and salmon usage for specific periods of time. NMFS would use the best available data to maximize the amount of salmon allocation available to the different pollock sectors. However, there could be some time delay between when salmon bycatch appeared to be available to other sectors and when an in-season action to reapportion that salmon bycatch could be effective.

Alternative 2, 4, and 5 would also allow the “rollover” of unused Chinook salmon bycatch from the A season to the B season. Under Alternative 5, NMFS would rollover 100% of a sector’s, cooperative’s, or CDQ group’s unused salmon bycatch from it’s A season account it’s B season account. No rollover would occur from the B season to the A season. No rollover would occur under the backstop cap. Under Alternative 4, only 80% of the unused salmon would be rolled over. Under Alternative 2, a variety of options were analyzed for different levels of rollovers. This type of rollover would be less difficult to administer than rollovers within a season and could be accomplished with information in the CAS. Cost estimates for developing this component of the CAS are included in the overall CAS estimates.

The burden on NMFS to monitor additional salmon caps would depend on whether sector level caps could be reapportioned between seasons or transferred between sectors. The administrative difference with the rollover option is the increased amount of time that NMFS would have to expend on monitoring and closing additional sectors on a seasonal basis, versus the additional agency resources that would be spent processing inter-sector salmon allocation transfers. Rollovers would require more NMFS resources than would transfers, particularly if transfers are done electronically, as we expect them to be in the future. Under either the rollover or the transfer options, NMFS would have to monitor an incrementally greater number of salmon bycatch caps in the pollock fishery.

Intercooperative Agreements: The pollock industry has incurred significant costs associated with developing incentive plan concepts under Alternatives 4 and 5 through the Council process and will continue to incur costs associated with finalizing any incentive plan agreements that will be submitted to NMFS under the preferred alternative. These costs are associated with the industry staff coordinating development of the incentive plans, economists hired to develop various types of incentive plans, and legal advice to industry on the incentive plan agreements. Pollock industry representatives estimate that they will spend about $700,000 on development of the IPAs by the time an IPA is submitted in the fall of 2010 under regulations implementing Alternative 5.[64]

Annual reports on the incentive plan agreement: Both Alternative 4 and 5 include requirements for annual reports to the Council about any incentive plan agreement approved by NMFS. Under Alternative 5, each IPA representative would be required to submit an annual report to the Council. This annual report would include: (1) a comprehensive explanation of incentive measures in effect in the previous year, (2) a discussion of how incentive measures affect individual vessels, and (3) an evaluation of whether incentive measures were effective in achieving salmon savings beyond levels that would have been achieved in the absence of the measures. The industry will incur costs associated with preparing and presenting these annual reports to the Council. NMFS estimates that an annual report on an incentive plan agreement will take 120 hours to complete at $25 per hour, for a total of $3,000 per year.

Revisions to current annual reporting requirements: Additional requirements to report information about salmon bycatch were added to the annual AFA cooperative reports under Amendment 84 (72 FR 61070; October 29, 2007). Amendment 84 implemented the exemption from existing Chinook and chum salmon savings area closures for AFA cooperatives and CDQ groups that participated in the VRHS ICA. Under Amendment 84, the AFA cooperatives are required to report (1) the number of salmon taken by species and season; (2) estimate the number of salmon avoided as demonstrated by the movement of fishing effort away from salmon savings areas, (3) include the results of the compliance audit; and (4) list each vessel's number of appearances on the weekly dirty 20 lists for both salmon species. Under Alternative 2, 3, 4, or 5, the annual reports about the current VRHS ICA would be required to cover only non-Chinook salmon.

Since implementation of these reporting requirements, NMFS has realized that some of this information is appropriate for the AFA cooperatives to include in their annual cooperative reports, but others are more appropriately reported in a single report from the representative of the VRHS ICA representative. Therefore, under Alternative 5, NMFS would remove two requirements from § 679.61(f)(vi) and move these to the requirements governing the ICA at § 679.21(g). These requirements are: (1) “estimate the number of salmon avoided as demonstrated by the movement of fishing effort away from the salmon savings area”, and (2) “include the results of the compliance audit”. These two requirements are information about the performance of the VRHS ICA as a whole. The estimate of the number of salmon avoided by actions taken under the ICA is made for all participants in the ICA as a whole and not for individual vessels or cooperatives. Similarly, the compliance audit is an evaluation of the ICA as a whole. Therefore, the annual report of this information is more appropriately contained in single report to the Council by the ICA representative for all ICA participants as a whole.

These revisions to the annual reporting requirements will reduce the information collection burden on the AFA cooperatives and will not increase the information collection burden on the ICA, because, in 2009, the ICA representative prepared a single annual report about these two elements of the IPA (salmon saved and the compliance audit), and the AFA cooperatives referenced this separate report in their individual annual reports. Although this revision would simplify annual reporting requirements, it would not reduce the costs to the industry of preparing these annual reports because the regulatory revisions would reflect existing practices.

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[64] Joe Plesha, Trident Seafoods, personal communication, October 21, 2009 and John Gruver, United Catcher Boats, personal communication, October 23, 2009.

Additional Costs: NMFS will incur administrative costs associated with (1) review of applications by the catcher/processor and mothership sector to be recognized as an entity eligible to receive transferable allocations of Chinook salmon bycatch; (2) review of any incentive plan agreements submitted; and (3) any administrative appeals that may occur in the unlikely event that NMFS disapproves a proposed IPA. These tasks will be accomplished with existing staff at no additional cost to NMFS, other than the fact that the time needed to conduct these administrative tasks will not be available to be spent on tasks related to the management of existing programs.

6.3.7 Enforcement Costs

In general, the more the Chinook salmon allocation is divided among sectors and seasons, the more difficult it becomes for NMFS to detect a violation, particularly if salmon is allowed to be transferred between entities. This also may have a bearing on how effectively and successfully alleged violations may be investigated and prosecuted. Allocations to sector entities would incrementally increase the number of fishery closures that NOAA OLE would monitor, compared to a CDQ and non-CDQ hard cap. The same basic principles apply: fishing vessels in the Bering Sea would be monitored to ensure that vessels within a sector were not directed fishing for pollock after the sector had reached its salmon hard cap for a season or for the year. Logbooks, VMS, vessel boardings, and observer information would be used by NOAA OLE to determine if a vessel was directed fishing for pollock. In addition, NMFS would continue to monitor observer information to manage groundfish catch limits and prohibited species catch limits. Thus, NMFS could refer some potential directed fishing violations to NOAA OLE.

Changing from a system of Chinook Salmon Savings Area closures to pollock directed fishing closures by sector (Alternative 2 with no transferable bycatch allocations) would require NOAA OLE to monitor the fishing activities of trawl vessels operating in the Bering Sea to ensure that no vessels were directed fishing for pollock after a sector's fishery had been closed. This is similar to the existing practice of monitoring the Bering Sea fisheries to ensure that vessels are not pollock fishing in a closed area, but would have to occur at a larger spatial scale.

Under Alternative 2 (components with transferable bycatch allocations) Alternative 4, or Alternative 5, NOAA OLE also would be responsible for investigating any violations associated with exceeding transferable Chinook salmon bycatch allocations. Alternatives 4 or 5 would add up to 30 new seasonal Chinook salmon bycatch caps. The enforcement implications of these alternatives include all of those noted below for managing transferable hard caps, but are somewhat more complicated because of the existence of the backstop cap. NOAA OLE would have to monitor the fishing activities of trawl vessels operating in the Bering Sea to ensure that such vessels were not directed fishing for pollock after their entity's Chinook salmon bycatch allocation had been reached or, for those vessels subject to the backstop cap, that that cap had been reached.

NMFS would monitor the catch of each sector's Chinook salmon bycatch allocation. Each sector would be prohibited from exceeding its Chinook salmon bycatch allocation and would have to manage its pollock fishery to stay within its Chinook salmon bycatch allocation or be subject to enforcement action. NOAA OLE may enforce prohibitions against exceeding salmon hard caps and NOAA General Counsel Enforcement would prosecute such violations. Prosecution of a Chinook salmon bycatch allocation overage would require additional enforcement and NOAA General Counsel resources and would depend upon the observer being willing to provide testimony regarding their data and observations. This would increase the resource and personnel burden on these two agency components.

Transferable allocations would allow the salmon allocation holder to obtain more salmon within an allocation period (e.g., the A season) or to transfer salmon to another sector, cooperative or CDQ group in a season. The transfer process would require the different pollock entities to monitor their respective members' salmon bycatch to ensure the sector's collective salmon allocation was not exceeded. An entity could be subject to enforcement actions if its sector exceeded its annual salmon bycatch cap. NOAA OLE would be responsible for enforcing annual salmon allocation overages, but it is difficult to estimate the additional resources that it would take to monitor compliance with transfer provisions.

Additionally, there could be enforcement considerations associated with the requirement that all inshore catcher vessels have 100 percent observer coverage and NMFS's intent to require improvements in shoreside and at-sea monitoring. NOAA OLE personnel potentially would be required to oversee additional activities associated with salmon bycatch monitoring. This would involve enforcement personnel determining whether inshore catcher vessels had sufficient observer coverage, if such catcher vessels were complying with "no discard" requirements, and if shoreside and at-sea processors were complying with additional monitoring and operational requirements intended to facilitate salmon bycatch monitoring. A higher level of salmon bycatch accountability is required in order to carry out entity to entity transfers or seasonal rollovers; thus, enforcement costs would be greater for transferable allocations and rollovers than for fishery level caps.

Salmon allocated to a cooperative would require the NOAA OLE to monitor, detect, and investigate salmon bycatch allocation overages. The enforcement of this level of allocations would require cooperative-specific catch monitoring and accounting. Thus, without vessel and trip based specific catch salmon bycatch monitoring improvements, the agency would likely not be able to enforce salmon bycatch overages. Bycatch rates from observed vessels are not a sufficiently robust means to track salmon bycatch or prosecute alleged violations of exceeding salmon allocations on non-observed vessels. NMFS cannot estimate the potential number of salmon allocation overages that cooperatives may incur, or the associated enforcement costs that the agency would incur in investigating, settling, or prosecuting violations against a cooperative exceeding its salmon allocation.

Under these alternatives, cooperatives/vessels/processors will have strong incentives to not count salmon. NMFS's allocations of salmon bycatch to sectors (and understanding the likelihood of industry within-sector sub-allocations) could increase industry incentives to interfere with observer sampling procedures, or to harass observers. The likelihood of this occurring increases with increased observer coverage. Methods used to accomplish the objective of reduced Chinook salmon counts are limited only by the imagination of industry participants, and can range from hiding salmon, gear tampering, failure to notify of a haulback, bribing observers, to seduction of an observer in order to undermine either his or her data or his or her acceptability as a witness. In addition to industry sectors attempting to bias observer sampling or the data associated with quantifying salmon bycatch, the high stakes and the potential for forgone income associated with Chinook salmon hard caps may lead to situations that could corrupt observers, such as observers cooperating in schemes to not count salmon or report reduced numbers. Obviously, both types of fraud are a high enforcement priority.

These cases are challenging to investigate and prosecute and, with the increasing incentives for hiding salmon, it is expected that this program will likely result in an increase in observer interference/harassment or data bias investigations and prosecutions.

The general enforcement issues associated with Alternative 3 include the detection and investigation of non-compliance with area closures by vessels targeting pollock. This is similar to existing practices associated with monitoring fishing activity in closed areas. Under the components considered for Alternative 3, closing areas becomes increasingly complex. NMFS's ability to detect salmon allocation overages and violations of area closures is decreased with greater area closure complexity. The enforcement implications of this component are similar to those discussed under Alternative 2, Alternative 4, and Alternative 5. NOAA OLE would need to continually determine which sector and vessels are prohibited pollock fishing in a closed area, even though this determination could change after a Chinook salmon bycatch transfer.

6.4 Pollock Fishery Gross Revenue Under Alternative 1: Status Quo

The analysis of potential effects on pollock industry revenue uses a retrospective analysis of fishery conditions during the 2003 through 2007 seasons. Constraints, in the form of fishery closures, are applied in each year, by season and sectors. Thus, the constraints are applied to calculate potentially forgone gross revenue as that portion of revenue that was actually earned, as reported by industry, up to the date of the closure. The actual total first wholesale gross revenue values that the industry earned during the 2003-2007 time-frame (i.e. under Alternative 1, the status quo) are presented below. Their use in calculating prices used in the impact analysis is detailed in the next section.

Harvest tonnages were valued using annual round weight equivalent first wholesale prices derived from the catch accounting system (Hiatt 2007). The first wholesale prices were estimated by dividing the total wholesale value of pollock production by estimated retained tons of pollock, to yield a round weight per ton of catch equivalent value. First wholesale prices are the prices received by the first level of inshore processors, or by catcher-processors and motherships. They reflect the value added by the initial processor of the raw catch. They are not, therefore, equivalent to ex-vessel prices. The first wholesale values by species group, fishing gear, and area for the catcher-processor fleet used in this analysis are summarized in the tables below.

Table 6-2 First wholesale value of retained pollock by sector, 2003-2007 ($ millions)

Sector	Season	2003		2004		2005		2006		2007	
		CDQ	non-CDQ	CDQ	non-CDQ	CDQ	non-CDQ	CDQ	non-CDQ	CDQ	non-CDQ
CP	A	$61.0	$200.7	$58.2	$253.9	$57.7	$282.1	$63.0	$258.8	Conf	$250.1
	B	$55.4	$172.9	$46.0	$188.2	$62.3	$244.2	$60.5	$241.1	Conf	$255.4
	Total	**$116.4**	**$373.6**	**$104.2**	**$442.0**	**$120.0**	**$526.3**	**$123.5**	**$499.8**	**Conf**	**$505.5**
M	A	$6.0	$36.7	$6.7	$44.1	$6.9	$28.4	$6.2	$50.7	Conf	$46.6
	B	$5.4	$32.4	$5.0	$33.2	$5.5	$24.1	$5.0	$43.9	Conf	$47.9
	Total	**$11.3**	**$69.1**	**$11.8**	**$77.3**	**$12.4**	**$52.5**	**$11.1**	**$94.6**	**Conf**	**$94.6**
S	A	$0.0	$206.3	$0.0	$220.9	$0.0	$262.4	$0.0	$249.2	0	$249.7
	B	$0.0	$249.3	$0.0	$225.4	$0.0	$273.6	$0.0	$268.6	0	$250.6
	Total	**$0.0**	**$455.6**	**$0.0**	**$446.3**	**$0.0**	**$535.9**	**$0.0**	**$517.8**	**0**	**$500.3**
All	A	$66.9	$443.7	$64.9	$518.9	$64.6	$572.9	$69.2	$558.7	$68.0	$546.5
	B	$60.8	$454.6	$51.1	$446.7	$67.8	$541.9	$65.4	$553.6	$70.4	$554.0
	Total	**$127.7**	**$898.3**	**$116.0**	**$965.6**	**$132.4**	**$1,114.8**	**$134.6**	**$1,112.3**	**$138.4**	**$1,100.4**

Sources: Terry Hiatt: Alaska Fisheries Science Center, from data compiled for the Economic Status and Fishery Evaluation Report, 2007, and round weight of retained pollock by sector, season, year, and CDQ vs. non-CDQ from NMFS Alaska Region e-landings catch accounting system.
Note: Conf: Confidential due to fewer than three entities reported and/or the reporting of a sector split and the total for the category would violate confidentiality, thus the total is reported but not the sector data.

Table 6-3 First wholesale value of retained pollock by sector, CDQ and non-CDQ combined, 2003-2007

Sector	Season	2003 Total	2004 Total	2005 Total	2006 Total	2007 Total
CP	A	$261.7	$312.1	$339.7	$321.8	**Conf**
	B	$228.3	$234.2	$306.5	$301.5	**Conf**
	Total	**$490.0**	**$546.2**	**$646.3**	**$623.3**	**Conf**
M	A	$42.6	$50.8	$35.3	$56.9	**Conf**
	B	$37.8	$38.2	$29.6	$48.8	**Conf**
	Total	**$80.4**	**$89.0**	**$64.9**	**$105.8**	**Conf**
CP+M	A	$304.3	$362.9	$375.0	$378.7	$249.7
	B	$266.1	$272.4	$336.2	$350.4	$250.6
	Total	**$570.4**	**$635.3**	**$711.2**	**$729.1**	**$500.3**
S	A	$206.3	$220.9	$262.4	$249.2	$249.7
	B	$249.3	$225.4	$273.6	$268.6	$250.6
	Total	**$455.6**	**$446.3**	**$535.9**	**$517.8**	**$500.3**
All	A	$510.6	$583.8	$637.4	$627.9	$614.5
	B	$515.4	$497.8	$609.7	$619.0	$624.4
	Total	**$1,026.0**	**$1,081.6**	**$1,247.2**	**$1,246.9**	**$1,238.9**

Sources: Terry Hiatt: Alaska Fisheries Science Center, from data compiled for the Economic Status and Fishery Evaluation Report, 2007, and round weight of retained pollock by sector, season, year, and CDQ vs. non-CDQ from NMFS Alaska Region e-landings catch accounting system.
Note: Conf: Confidential due to fewer than three entities reported and/or the reporting of a sector split and the total for the category would violate confidentiality, thus the total is reported but not the sector data.

6.5 Calculation of Potentially Forgone Pollock Revenue and Pollock Revenue at Risk

The analysis of potential forgone gross revenue has used the estimated date on which the pollock fishery would have hit the various Chinook salmon bycatch caps in each of the years 2003-2007 in order to conduct a retrospective analysis to answer the question of what would have happened had the proposed action been in place in those years. The estimate of potentially forgone pollock harvest that results is then multiplied by a price to estimate potentially forgone gross revenue. Since the impact estimate is calculated in terms of the metric tons of pollock catch potentially forgone, it is necessary to use a price that is reflective of the total value of that catch. This process is necessarily complicated by the fact that pollock is processed into several product forms and is processed both at sea (on CPs and Motherships) and in shoreside processing facilities that receive deliveries from Catcher Vessels. Thus, reported values in the offshore sector (CPs and Motherships) are inclusive of all processing value added to the first wholesale level, which is also the point of departure for export of pollock products. Effects in export markets are not an appropriate consideration in a RIR. Thus, this is a logical level at which to value potential impacts because exports and effects on export markets lie outside this level of valuation. Further, potential welfare impacts in domestic markets cannot be determined with available data. Thus, first wholesale value is an appropriate value by which to capture the total quantifiable domestic market effect on potential forgone pollock harvest and revenue.

The analysis is complicated by the fact that deliveries to shoreside plants by Catcher Vessels are paid an ex-vessel price that is considerably less than, and thus not comparable to, the first wholesale value. To provide comparable first wholesale values for both the offshore and inshore sectors, the analysis does not use ex-vessel value and, instead, calculates a shoreside sector price that is inclusive of all processed value added. This is done by annually aggregating the total value of all pollock products processed by shoreside processors, as reported by industry to NMFS in the COAR report and compiled by the Alaska Fisheries Science Center, and dividing that value by the total round weight of retained metric tons of pollock harvested by Catcher Vessels in the Bering Sea pollock fishery as reported in the e-landings catch accounting system.

This calculation provides a round weight equivalent first wholesale value for the shoreside sector that can be multiplied by estimates of potentially forgone pollock harvest, in round metric tons, to determine potentially forgone gross revenue at the first wholesale level. This is done annually from 2003 through 2007 in the RIR for each of the sectors and these prices are reported in
Table 6-4 and Table 6-5. These are the prices that are applied by year for each year from 2003 through 2007.

NMFS disagrees with the assertion, leveled in public comments, that the prices used are outdated and underreport pollock impacts. The total valuation used in the analysis is that provided by industry. Further, it accounts for the first wholesale value of all product forms, not just the highest valued product forms. Finally, it is applied at a level that is consistent across sectors and complies with agency obligations under Executive Order 12866.[65]

Table 6-4 Round weight equivalent first wholesale value of retained pollock by sector, 2003-2007 ($/mt)

Sector	Season	**2003**		**2004**		**2005**		**2006**		**2007**	
		CDQ	non-CDQ	CDQ	non-CDQ	CDQ	non-CDQ	CDQ	non-CDQ	CDQ	non-CDQ
CP	A	$1,180	$921	$1,126	$1,145	$1,089	$1,284	$1,165	$1,172	Conf	$1,283
	B	$712	$533	$591	$591	$766	$768	$748	$748	Conf	$871
	Total	**$899**	**$689**	**$804**	**$818**	**$893**	**$979**	**$915**	**$920**	**Conf**	**$1,035**
M	A	$716	$706	$806	$850	$1,101	$552	$963	$982	Conf	$957
	B	$428	$412	$403	$429	$566	$304	$514	$550	Conf	$660
	Total	**$543**	**$529**	**$564**	**$598**	**$777**	**$402**	**$693**	**$720**	**Conf**	**$780**
CP+M	A	$1,116	$880	$1,081	$1,089	$1,090	$1,145	$1,144	$1,136	Conf	$1,217
	B	$672	$509	$565	$559	$745	$675	$723	$709	Conf	$829
	Total	**$849**	**$658**	**$771**	**$776**	**$881**	**$866**	**$892**	**$881**	**Conf**	**$984**
S	A	$0	$797	$0	$849	$0	$1,018	$0	$947	0	$1,023
	B	$0	$633	$0	$596	$0	$700	$0	$700	0	$763
	Total	**$0**	**$698**	**$0**	**$699**	**$0**	**$827**	**$0**	**$800**	**0**	**$874**
All	A	$1,116	$839	$1,081	$972	$1,090	$1,083	$1,144	$1,043	1,221	$1,120
	B	$672	$570	$565	$577	$745	$688	$723	$704	842	$798
	Total	**$849**	**$677**	**$771**	**$738**	**$881**	**$847**	**$892**	**$842**	**994**	**$931**

Sources: Terry Hiatt: Alaska Fisheries Science Center, from data compiled for the Economic Status and Fishery Evaluation Report, 2007, and round weight of retained pollock by sector, season, year, and CDQ vs. non-CDQ from NMFS Alaska Region e-landings catch accounting system.
Note: Conf: Confidential due to fewer than three entities reported and/or the reporting of a sector split and the total for the category would violate confidentiality, thus the total is reported but not the sector data.

[65] Response to public comment 10-71 in EIS Chapter 9, the Comment Analysis Report.

Table 6-5 Round weight equivalent first wholesale value of retained pollock by sector, CDQ and non-CDQ combined, 2003–2007

Sector	Season	2003 Total	2004 Total	2005 Total	2006 Total	2007 Total
CP	A	$971	$1,141	$1,246	$1,170	**Conf**
	B	$567	$591	$767	$748	**Conf**
	Total	**$729**	**$816**	**$962**	**$919**	**Conf**
M	A	$708	$844	$612	$980	**Conf**
	B	$414	$425	$333	$546	**Conf**
	Total	**$531**	**$593**	**$443**	**$717**	**Conf**
CP+M	A	$923	$1,088	$1,135	$1,137	**Conf**
	B	$539	$560	$688	$711	**Conf**
	Total	**$693**	**$775**	**$869**	**$883**	**Conf**
S	A	$797	$849	$1,018	$947	**$1,023**
	B	$633	$596	$700	$700	**$763**
	Total	**$698**	**$699**	**$827**	**$800**	**$874**
All	A	$867	$983	$1,084	$1,053	**$1,131**
	B	$581	$576	$694	$706	**$803**
	Total	**$695**	**$742**	**$850**	**$847**	**$938**

Sources: Terry Hiatt: Alaska Fisheries Science Center, from data compiled for the Economic Status and Fishery Evaluation Report, 2007, and round weight of retained pollock by sector, season, year, and CDQ vs. non-CDQ from NMFS Alaska Region e-landings catch accounting system. Note: Conf: Confidential due to fewer than three entities reported and/or the reporting of a sector split and the total for the category would violate confidentiality, thus the total is reported but not the sector data.

The analysis of revenue impacts of the alternatives on the pollock industry was conducted in terms of two gross revenue categories. The first is the potential forgone gross revenues that could have been generated under various Chinook salmon bycatch hard caps contained within Alternative 2 and Alternative 4. This is simply the gross revenue that would have been generated by the pollock TACs, and their allocations among sectors, that have historically been caught after the projected closure date under the hard cap scenarios. These differ between the alternatives depending upon the sector, cap amount, seasonal split options, and historic allocation options.

The second general category is gross revenues at risk under the triggered closure area options contained in Alternative 3. The affected fishing fleets may or may not have been able to make up the displaced catch and the gross revenues that would have been lost because of these restrictions, by fishing outside of the closure area. Because some sectors may potentially have been able to recover some or all of these gross revenues, the gross income from these catches cannot, strictly speaking, be described as lost. Instead, they have been described here as “at risk.”

Only if it is assumed that harvest foreclosed to a fleet sector in one area by Alternative 3 could not have been made up elsewhere by that fleet sector would at-risk gross revenues be an estimate of lost gross revenues. Accurate estimates of the abilities of fleets to make up a reduction in harvests in one area, due to closures under Alternative 3, by fishing in another require information on the following: (1) the volume of catch (and resulting production) affected by the Alternative 3 closure areas, (2) the extent to which each fleet sector would have redirected its operations into other fishing areas, and (3) the comparative productivity of the fleet sectors in the new areas. Currently, it is possible to quantitatively estimate only the first of these, (i.e., the volume of catch coming from areas that would no longer have been available to fishermen under each triggered closure scenario contained within Alternative 3.

As noted above, gross revenues at risk are forgone **only** if a fishing fleet is unable to modify its operation to accommodate the imposed limits and, thus, cannot make up displaced catches elsewhere (either in remaining open fishing areas or during alternative open fishing periods). Having estimated the maximum gross revenues that might be lost to each sector, on the assumption that the fleet is unable to make up the affected harvests, it is possible to incrementally relax this assumption and assess the effects. If one assumes that the underlying behavioral model is linear in its parameters, evaluating an alternative assumption about the total forgone catch is straightforward. For example, if one assumes that a given sector is able to make up 10 percent of the harvest elsewhere, the estimated at risk gross revenue impact would be multiplied by 0.90; if the assumption is that, say, 20 percent is made up elsewhere, the total is multiplied by a factor of 0.80, and so forth. This is done without specifying where (or when) the sector might operate, or at what cost. With total gross revenue at risk information available for each fleet segment, the reader may apply his or her own assumptions about the extent to which each fleet segment would be able to make up its catch elsewhere, thus producing his or her own estimates of the gross revenues that might be forgone.

6.6 Potentially Forgone Gross Revenue Under Alternative 2

Under the Chinook salmon bycatch hard cap scenarios included in Alternative 2, the pollock trawl fishery, and/or specific sectors that participate in it (depending on apportionments of hard caps) would be required to stop fishing once a specific hard cap is reached. In such a circumstance, any remaining TAC that is not harvested when the cap is reached would remain unharvested unless specific provisions of the hard cap alternative dealing with transfers, rollovers, and/or cooperative level management are applied. These may in mitigate potential losses in revenue due to unharvested pollock TAC. This section specifically details the impacts on gross revenue that could result from an unmitigated closure of the pollock fishery, or sectors within it, due to hard caps. This analysis provides hypothetical estimates of potentially forgone pollock first wholesale gross revenue by year and season under Chinook bycatch option for fleet wide caps, and for the CDQ fishery and non-CDQ fishery.

Table 6-6 provides hypothetical estimates of potentially forgone pollock first wholesale gross revenue, by year and season, under the options for fleet wide caps, and for the CDQ fishery and the non-CDQ fishery. As expected, the greatest adverse economic impact would have occurred in the highest bycatch year (2007) and under the most restrictive bycatch cap of 29,300 Chinook salmon. In the A season, the greatest adverse effect occurs under the 50/50 split because of the higher roe pollock price in the A season. The maximum estimated A season economic impact on the pollock fleet was $568.3 million in 2007 under the 50/50 season split and the 29,300 cap. That gross value is composed of $518.4 million from the non-CDQ pollock fisheries and $49.8 million from CDQ pollock fisheries. In the B season, the maximum impact is $137.4 million in 2007; with the 29,300 cap and the 70/30 season split. In percentage terms (Table 6-7), the A season maximum impact represents 92 percent of total gross revenue and the B season total impact is 23 percent of total B season gross revenue, all things being equal.

As is expected, as the hard cap amount increases, the adverse economic impacts on the pollock fisheries decrease, all else being equal. However, in the 2007 year, when bycatch was highest, even the 87,500 Chinook salmon cap would have resulted in total potentially forgone gross revenue of $346.5 million in the pollock A season, although with no CDQ impact. The gross impact would have been $57.8 million in the B season, with CDQ impact accruing only under the 70/30 season split. These values are 56 percent and 23 percent of pollock fishery total gross revenue for the A and B seasons, respectively. Thus, in a high bycatch year, even the highest cap has significant potential adverse impacts on the revenues accruing to the pollock fishery. Also evident is the increase, as the cap amount increases, of the distribution effect of the season split.

Impacts estimated for 2004, which ranks among the lowest bycatch year, are considerably smaller than those estimated for 2007, but are still significant in some respects. In the 2004 A season, total gross revenue impact under the 29,300 cap is estimated at $128 million in gross receipts under the 50/50 season split, nearly all coming from non-CDQ fishery participation. Under the 70/30 season split that amount drops to $64.3 million. With the exception of $200,000 in estimated gross revenue impacts under the 50/50 season split and a 48,700 Chinook cap, none of the other caps would have caused forgone gross revenue impacts in 2004. In the B season, 2004 forgone gross revenue estimates are greatest under the 29,300 cap and 70/30 season split, where $82.7 million is the estimated gross revenue impact.

Overall, the impacts on the pollock fleet of the hard caps are greatest in the A season, when roe value is highest and in the years when bycatch has been largest. Further, the seasonal split definitely affects the impacts on pollock gross revenue. Even in the second highest bycatch year of 2006, A season impacts under even the largest cap of 87,500 Chinook salmon are estimated at $183.6 million, which is 29 percent of total first wholesale gross receipts in the pollock fishery. However, in the lower bycatch years of 2003, 2004, and 2005, there was very little A season impact at the 68,100 Chinook cap level, and in percentage terms, this is also true of the B season.

The following tables break down the fleet wide data, discussed above, by sector (CDQ, CP, CV, and motherships), season, option, and year, in order to show estimated forgone gross revenue and percent of total gross revenue on a more refined scale. These tables show how the effects of the Alternative 2 cap levels vary by season, sector, and year, under the various options. Unfortunately, there does not appear to be a consistent pattern with which to rank the options, as the comparative impacts by option appear to vary both by level of the hard cap and between years. Thus, these tables are provide as “lookup tables” so that the interested reader can review what the estimated impacts would have been under a particular combination of cap, split, season, sector, and year, to see how a particular combination of the various elements of the alternative set would affect pollock fishery gross revenue.

Table 6-6 Hypothetical forgone pollock gross revenue, by year and by season, under the Alternative 2 options for fleet-wide caps. ($ Millions)

			2003			2004			2005			2006			2007		
Seas	Cap	Sect	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A	87,500	CDQ	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		NonCDQ	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$183.6	$117.3	$1.1	$346.5	$272.1	$144.8
	87,500 Total		$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$183.6	$117.3	$1.1	$346.5	$272.1	$144.8
	68,100	CDQ	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$10.4	$1.1	$0.0
		NonCDQ	$2.5	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$261.4	$188.6	$179.0	$422.5	$350.6	$274.9
	68,100 Total		$2.5	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$261.4	$188.6	$179.0	$432.9	$351.7	$274.9
	48,700	CDQ	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$37.7	$24.1	$10.4
		NonCDQ	$154.7	$109.6	$2.5	$0.2	$0.0	$0.0	$117.3	$0.1	$0.0	$339.2	$334.5	$261.3	$431.0	$427.6	$422.5
	48,700 Total		$154.7	$109.6	$2.5	$0.2	$0.0	$0.0	$117.3	$0.1	$0.0	$339.2	$334.5	$261.3	$468.7	$451.7	$432.9
	29,300	CDQ	$24.9	$22.9	$1.0	$0.4	$0.0	$0.0	$3.7	$0.0	$0.0	$22.3	$10.9	$1.2	$49.8	$49.3	$38.6
		NonCDQ	$263.2	$208.8	$204.0	$127.6	$122.2	$64.3	$330.2	$263.7	$191.9	$424.1	$348.2	$343.9	$518.4	$515.7	$511.6
	29,300 Total		$288.1	$231.7	$205.0	$128.0	$122.2	$64.3	$333.9	$263.7	$191.9	$446.5	$359.1	$345.1	$568.3	$565.0	$550.3
B	87,500	CDQ	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$2.0
		NonCDQ	$0.0	$0.0	$0.0	$0.0	$0.0	$1.0	$0.0	$1.2	$16.9	$0.0	$0.0	$0.0	$13.4	$15.8	$55.8
	87,500 Total		$0.0	$0.0	$0.0	$0.0	$0.0	$1.0	$0.0	$1.2	$16.9	$0.0	$0.0	$0.0	$13.4	$15.8	$57.8
	68,100	CDQ	$0.0	$0.0	$0.0	$0.0	$0.0	$1.9	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$1.8	$2.3
		NonCDQ	$0.0	$0.0	$0.0	$0.0	$0.7	$10.7	$9.1	$16.2	$30.1	$0.0	$0.0	$15.8	$35.7	$55.1	$74.1
	68,100 Total		$0.0	$0.0	$0.0	$0.0	$0.7	$12.6	$9.1	$16.2	$30.1	$0.0	$0.0	$15.8	$35.7	$57.0	$76.4
	48,700	CDQ	$0.0	$0.0	$0.0	$0.0	$1.9	$8.6	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$2.1	$2.3	$4.4
		NonCDQ	$0.0	$0.0	$0.0	$5.6	$10.6	$27.2	$29.0	$30.1	$69.2	$2.1	$15.8	$57.1	$56.3	$74.1	$89.7
	48,700 Total		$0.0	$0.0	$0.0	$5.6	$12.6	$35.8	$29.0	$30.1	$69.2	$2.1	$15.8	$57.1	$58.4	$76.4	$94.1
	29,300	CDQ	$0.0	$0.0	$16.1	$8.6	$16.0	$25.6	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$4.4	$4.5	$6.2
		NonCDQ	$0.0	$1.5	$11.5	$27.1	$28.0	$57.1	$69.2	$96.0	$126.0	$57.1	$59.2	$118.1	$89.7	$107.7	$131.2
	29,300 Total		$0.0	$1.5	$27.6	$35.8	$44.0	$82.7	$69.2	$96.0	$126.0	$57.1	$59.2	$118.1	$94.1	$112.3	$137.4

Table 6-7 Hypothetical forgone pollock gross revenue in percent of total gross revenue, by year and by season, under the Alternative 2 options for fleet-wide caps.

			2003			2004			2005			2006			2007		
Seas	Cap	Sect	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A	87,500	CDQ	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
		NonCDQ	0%	0%	0%	0%	0%	0%	0%	0%	0%	33%	21%	0%	63%	50%	27%
	87,500 Total		0%	0%	0%	0%	0%	0%	0%	0%	0%	29%	19%	0%	56%	44%	24%
	68,100	CDQ	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	15%	2%	0%
		NonCDQ	1%	0%	0%	0%	0%	0%	0%	0%	0%	47%	34%	32%	77%	64%	50%
	68,100 Total		0%	0%	0%	0%	0%	0%	0%	0%	0%	42%	30%	29%	70%	57%	45%
	48,700	CDQ	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	55%	35%	15%
		NonCDQ	35%	25%	1%	0%	0%	0%	20%	0%	0%	61%	60%	47%	79%	78%	77%
	48,700 Total		30%	21%	0%	0%	0%	0%	18%	0%	0%	54%	53%	42%	76%	74%	70%
	29,300	CDQ	37%	34%	2%	1%	0%	0%	6%	0%	0%	32%	16%	2%	73%	72%	57%
		NonCDQ	59%	47%	46%	25%	24%	12%	58%	46%	34%	76%	62%	62%	95%	94%	94%
	29,300 Total		56%	45%	40%	22%	21%	11%	52%	41%	30%	71%	57%	55%	92%	92%	90%
B	87,500	CDQ	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3%
		NonCDQ	0%	0%	0%	0%	0%	0%	0%	0%	3%	0%	0%	0%	2%	3%	10%
	87,500 Total		0%	0%	0%	0%	0%	0%	0%	0%	3%	0%	0%	0%	2%	3%	9%
	68,100	CDQ	0%	0%	0%	0%	0%	4%	0%	0%	0%	0%	0%	0%	0%	3%	4%
		NonCDQ	0%	0%	0%	0%	0%	2%	2%	3%	6%	0%	0%	3%	6%	10%	13%
	68,100 Total		0%	0%	0%	0%	0%	3%	1%	3%	5%	0%	0%	3%	6%	9%	13%
	48,700	CDQ	0%	0%	0%	0%	4%	17%	0%	0%	0%	0%	0%	0%	3%	4%	7%
		NonCDQ	0%	0%	0%	1%	2%	6%	5%	6%	13%	0%	3%	10%	10%	13%	16%
	48,700 Total		0%	0%	0%	1%	3%	7%	5%	5%	11%	0%	3%	9%	10%	13%	15%
	29,300	CDQ	0%	0%	26%	17%	31%	50%	0%	0%	0%	0%	0%	0%	7%	7%	9%
		NonCDQ	0%	0%	3%	6%	6%	13%	13%	18%	23%	10%	11%	21%	16%	19%	24%
	29,300 Total		0%	0%	5%	7%	9%	17%	11%	16%	21%	9%	10%	19%	15%	18%	23%

Table 6-8 Hypothetical forgone pollock gross revenue, by season and sector, under Alternative 2 for 2003.

2003			opt1(AFA)			opt2a			opt2d		
Seas	Cap	Sect	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A	87,500	CDQ	$0.0	$0.0	$0.0	$22.5	$8.7	$0.0	$0.0	$0.0	$0.0
		M	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		P	$0.0	$0.0	$0.0	$88.8	$71.2	$19.8	$20.4	$0.0	$0.0
		S	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
	87,500 Total		$0.0	$0.0	$0.0	$111.3	$79.9	$19.8	$20.4	$0.0	$0.0
	68,100	CDQ	$0.0	$0.0	$0.0	$41.6	$23.9	$9.3	$0.0	$0.0	$0.0
		M	$0.0	$0.0	$0.0	$7.2	$1.7	$0.0	$0.0	$0.0	$0.0
		P	$20.7	$0.0	$0.0	$91.8	$90.1	$87.6	$88.0	$70.5	$0.0
		S	$1.1	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
	68,100 Total		$21.8	$0.0	$0.0	$140.6	$115.7	$96.9	$88.0	$70.5	$0.0
	48,700	CDQ	$0.0	$0.0	$0.0	$53.6	$53.3	$41.6	$0.9	$0.0	$0.0
		M	$2.0	$0.0	$0.0	$15.7	$15.4	$7.2	$11.4	$5.4	$0.0
		P	$89.4	$87.3	$20.7	$117.1	$115.6	$91.8	$92.1	$90.5	$88.0
		S	$71.8	$30.2	$1.1	$0.0	$0.0	$0.0	$11.4	$0.7	$0.0
	48,700 Total		$163.2	$117.5	$21.8	$186.4	$184.3	$140.6	$115.8	$96.6	$88.0
	29,300	CDQ	$9.1	$0.0	$0.0	$57.9	$54.3	$54.0	$49.5	$24.8	$22.3
		M	$20.2	$15.6	$11.4	$26.3	$20.9	$20.4	$20.7	$20.3	$15.6
		P	$116.8	$115.2	$91.5	$143.4	$142.6	$118.6	$118.8	$117.6	$115.7
		S	$126.4	$100.5	$98.1	$72.8	$48.2	$11.0	$99.3	$97.4	$48.4
	29,300 Total		$272.5	$231.3	$201.0	$300.5	$265.9	$203.9	$288.3	$260.1	$201.9
B	87,500	CDQ	$0.0	$0.0	$0.0	$0.0	$0.0	$1.4	$0.0	$0.0	$0.0
		M	$0.0	$0.0	$0.0	$0.0	$0.0	$0.5	$0.0	$0.0	$0.0
		P	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		S	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
	87,500 Total		$0.0	$0.0	$0.0	$0.0	$0.0	$1.9	$0.0	$0.0	$0.0
	68,100	CDQ	$0.0	$0.0	$0.0	$0.0	$0.0	$16.5	$0.0	$0.0	$0.0
		M	$0.0	$0.0	$0.0	$0.0	$0.4	$1.4	$0.0	$0.0	$0.5
		P	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		S	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
	68,100 Total		$0.0	$0.0	$0.0	$0.0	$0.5	$17.9	$0.0	$0.0	$0.5
	48,700	CDQ	$0.0	$0.0	$0.0	$7.3	$16.5	$34.8	$0.0	$0.0	$0.0
		M	$0.0	$0.0	$1.3	$1.2	$1.4	$1.6	$0.0	$0.5	$1.5
		P	$0.0	$0.0	$0.0	$0.0	$0.0	$0.2	$0.0	$0.0	$0.0
		S	$0.0	$0.0	$1.1	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
	48,700 Total		$0.0	$0.0	$2.4	$8.5	$17.9	$36.7	$0.0	$0.5	$1.5
	29,300	CDQ	$0.0	$0.0	$0.0	$34.8	$35.4	$36.3	$0.0	$1.3	$17.0
		M	$1.3	$1.5	$1.7	$1.6	$3.2	$3.4	$1.5	$1.6	$3.2
		P	$0.0	$0.0	$0.1	$0.2	$2.0	$12.2	$0.0	$0.0	$2.1
		S	$1.1	$9.2	$18.3	$0.0	$0.0	$1.5	$0.0	$0.6	$9.6
	29,300 Total		$2.4	$10.7	$20.1	$36.7	$40.6	$53.4	$1.5	$3.5	$31.9

Table 6-9 Hypothetical forgone pollock revenue in percent of total gross revenue, by season and sector, under Alternative 2 for 2003.

2003			opt1(AFA)			opt2a			opt2d		
Seas	Cap	Sect	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A	87,500	CDQ	0%	0%	0%	34%	13%	0%	0%	0%	0%
		M	0%	0%	0%	0%	0%	0%	0%	0%	0%
		P	0%	0%	0%	44%	35%	10%	10%	0%	0%
		S	0%	0%	0%	0%	0%	0%	0%	0%	0%
	87,500 Total		0%	0%	0%	22%	16%	4%	4%	0%	0%
	68,100	CDQ	0%	0%	0%	62%	36%	14%	0%	0%	0%
		M	0%	0%	0%	20%	5%	0%	0%	0%	0%
		P	10%	0%	0%	46%	45%	44%	44%	35%	0%
		S	1%	0%	0%	0%	0%	0%	0%	0%	0%
	68,100 Total		4%	0%	0%	28%	23%	19%	17%	14%	0%
	48,700	CDQ	0%	0%	0%	80%	80%	62%	1%	0%	0%
		M	5%	0%	0%	43%	42%	20%	31%	15%	0%
		P	45%	44%	10%	58%	58%	46%	46%	45%	44%
		S	35%	15%	1%	0%	0%	0%	6%	0%	0%
	48,700 Total		32%	23%	4%	37%	36%	28%	23%	19%	17%
	29,300	CDQ	14%	0%	0%	87%	81%	81%	74%	37%	33%
		M	55%	43%	31%	72%	57%	56%	56%	55%	43%
		P	58%	57%	46%	71%	71%	59%	59%	59%	58%
		S	61%	49%	48%	35%	23%	5%	48%	47%	23%
	29,300 Total		53%	45%	39%	59%	52%	40%	56%	51%	40%
B	87,500	CDQ	0%	0%	0%	0%	0%	2%	0%	0%	0%
		M	0%	0%	0%	0%	0%	1%	0%	0%	0%
		P	0%	0%	0%	0%	0%	0%	0%	0%	0%
		S	0%	0%	0%	0%	0%	0%	0%	0%	0%
	87,500 Total		0%	0%	0%	0%	0%	0%	0%	0%	0%
	68,100	CDQ	0%	0%	0%	0%	0%	27%	0%	0%	0%
		M	0%	0%	0%	0%	1%	4%	0%	0%	2%
		P	0%	0%	0%	0%	0%	0%	0%	0%	0%
		S	0%	0%	0%	0%	0%	0%	0%	0%	0%
	68,100 Total		0%	0%	0%	0%	0%	3%	0%	0%	0%
	48,700	CDQ	0%	0%	0%	12%	27%	57%	0%	0%	0%
		M	0%	0%	4%	4%	4%	5%	0%	2%	5%
		P	0%	0%	0%	0%	0%	0%	0%	0%	0%
		S	0%	0%	0%	0%	0%	0%	0%	0%	0%
	48,700 Total		0%	0%	0%	2%	3%	7%	0%	0%	0%
	29,300	CDQ	0%	0%	0%	57%	58%	60%	0%	2%	28%
		M	4%	5%	5%	5%	10%	10%	5%	5%	10%
		P	0%	0%	0%	0%	1%	7%	0%	0%	1%
		S	0%	4%	7%	0%	0%	1%	0%	0%	4%
	29,300 Total		0%	2%	4%	7%	8%	10%	0%	1%	6%

Table 6-10 Hypothetical forgone pollock gross revenue, by season and sector, under Alternative 2 for 2004.

2004			opt1(AFA)			opt2a			opt2d		
Seas	Cap	Sect	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A	87,500	CDQ	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		M	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		P	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		S	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
	87,500 Total		$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
	68,100	CDQ	$0.0	$0.0	$0.0	$4.2	$0.0	$0.0	$0.0	$0.0	$0.0
		M	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		P	$0.0	$0.0	$0.0	$33.6	$5.8	$0.0	$0.0	$0.0	$0.0
		S	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
	68,100 Total		$0.0	$0.0	$0.0	$37.8	$5.8	$0.0	$0.0	$0.0	$0.0
	48,700	CDQ	$0.0	$0.0	$0.0	$14.6	$5.5	$4.2	$0.0	$0.0	$0.0
		M	$0.0	$0.0	$0.0	$4.4	$1.4	$0.0	$0.3	$0.0	$0.0
		P	$0.0	$0.0	$0.0	$65.6	$63.3	$33.6	$34.2	$6.5	$0.0
		S	$11.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
	48,700 Total		$11.0	$0.0	$0.0	$84.6	$70.2	$37.8	$34.5	$6.5	$0.0
	29,300	CDQ	$0.0	$0.0	$0.0	$26.7	$26.0	$15.4	$4.7	$0.4	$0.0
		M	$9.6	$4.3	$0.0	$22.3	$15.9	$9.8	$15.6	$9.7	$4.2
		P	$65.1	$62.7	$32.9	$146.6	$144.9	$115.2	$115.6	$66.4	$63.5
		S	$85.9	$56.8	$31.3	$12.0	$0.4	$0.0	$55.1	$12.6	$0.4
	29,300 Total		$160.6	$123.8	$64.2	$207.6	$187.1	$140.4	$191.0	$89.1	$68.2
B	87,500	CDQ	$0.0	$0.0	$0.0	$2.6	$8.6	$16.6	$0.0	$0.0	$1.5
		M	$0.0	$0.0	$0.0	$0.0	$0.0	$0.4	$0.0	$0.0	$0.0
		P	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		S	$0.7	$8.6	$17.1	$0.0	$0.0	$4.0	$0.0	$0.5	$9.1
	87,500 Total		$0.7	$8.6	$17.1	$2.6	$8.6	$21.0	$0.0	$0.5	$10.6
	68,100	CDQ	$0.0	$0.0	$0.0	$15.6	$16.3	$25.8	$0.0	$0.0	$2.5
		M	$0.0	$0.0	$0.0	$0.0	$0.0	$1.3	$0.0	$0.0	$0.4
		P	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		S	$9.0	$16.8	$22.6	$0.0	$0.7	$9.4	$0.7	$8.6	$17.1
	68,100 Total		$9.0	$16.8	$22.6	$15.6	$17.0	$36.6	$0.7	$8.6	$20.0
	48,700	CDQ	$0.0	$0.0	$2.1	$16.8	$25.8	$26.7	$1.8	$2.5	$15.9
		M	$0.0	$0.0	$0.5	$0.4	$1.3	$3.9	$0.0	$0.4	$1.6
		P	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		S	$17.2	$22.6	$39.7	$8.4	$9.4	$22.3	$9.5	$17.1	$22.7
	48,700 Total		$17.2	$22.6	$42.4	$25.7	$36.5	$52.9	$11.3	$20.0	$40.2
	29,300	CDQ	$2.1	$8.2	$16.2	$26.7	$34.1	$34.4	$15.9	$16.5	$26.0
		M	$0.5	$1.6	$4.0	$3.9	$4.1	$10.0	$1.6	$3.8	$7.5
		P	$0.0	$0.0	$0.0	$0.0	$1.0	$14.6	$0.0	$0.0	$2.3
		S	$39.7	$40.2	$54.8	$22.3	$22.7	$39.9	$22.7	$30.1	$54.1
	29,300 Total		$42.4	$49.9	$75.0	$52.9	$61.9	$99.0	$40.2	$50.4	$89.9

Table 6-11 Hypothetical forgone pollock revenue in percent of total gross revenue, by season and sector, under Alternative 2 for 2004.

2004			opt1(AFA)			opt2a			opt2d		
Seas	Cap	Sect	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A	87,500	CDQ	0%	0%	0%	0%	0%	0%	0%	0%	0%
		M	0%	0%	0%	0%	0%	0%	0%	0%	0%
		P	0%	0%	0%	0%	0%	0%	0%	0%	0%
		S	0%	0%	0%	0%	0%	0%	0%	0%	0%
	87,500 Total		0%	0%	0%	0%	0%	0%	0%	0%	0%
	68,100	CDQ	0%	0%	0%	7%	0%	0%	0%	0%	0%
		M	0%	0%	0%	0%	0%	0%	0%	0%	0%
		P	0%	0%	0%	13%	2%	0%	0%	0%	0%
		S	0%	0%	0%	0%	0%	0%	0%	0%	0%
	68,100 Total		0%	0%	0%	6%	1%	0%	0%	0%	0%
	48,700	CDQ	0%	0%	0%	22%	8%	7%	0%	0%	0%
		M	0%	0%	0%	10%	3%	0%	1%	0%	0%
		P	0%	0%	0%	26%	25%	13%	13%	3%	0%
		S	5%	0%	0%	0%	0%	0%	0%	0%	0%
	48,700 Total		2%	0%	0%	14%	12%	6%	6%	1%	0%
	29,300	CDQ	0%	0%	0%	41%	40%	24%	7%	1%	0%
		M	22%	10%	0%	51%	36%	22%	35%	22%	10%
		P	26%	25%	13%	58%	57%	45%	46%	26%	25%
		S	39%	26%	14%	5%	0%	0%	25%	6%	0%
	29,300 Total		28%	21%	11%	36%	32%	24%	33%	15%	12%
B	87,500	CDQ	0%	0%	0%	5%	17%	32%	0%	0%	3%
		M	0%	0%	0%	0%	0%	1%	0%	0%	0%
		P	0%	0%	0%	0%	0%	0%	0%	0%	0%
		S	0%	4%	8%	0%	0%	2%	0%	0%	4%
	87,500 Total		0%	2%	3%	1%	2%	4%	0%	0%	2%
	68,100	CDQ	0%	0%	0%	31%	32%	51%	0%	0%	5%
		M	0%	0%	0%	0%	0%	4%	0%	0%	1%
		P	0%	0%	0%	0%	0%	0%	0%	0%	0%
		S	4%	7%	10%	0%	0%	4%	0%	4%	8%
	68,100 Total		2%	3%	5%	3%	3%	7%	0%	2%	4%
	48,700	CDQ	0%	0%	4%	33%	51%	52%	4%	5%	31%
		M	0%	0%	2%	1%	4%	12%	0%	1%	5%
		P	0%	0%	0%	0%	0%	0%	0%	0%	0%
		S	8%	10%	18%	4%	4%	10%	4%	8%	10%
	48,700 Total		3%	5%	9%	5%	7%	11%	2%	4%	8%
	29,300	CDQ	4%	16%	32%	52%	67%	67%	31%	32%	51%
		M	2%	5%	12%	12%	12%	30%	5%	11%	23%
		P	0%	0%	0%	0%	1%	8%	0%	0%	1%
		S	18%	18%	24%	10%	10%	18%	10%	13%	24%
	29,300 Total		9%	10%	15%	11%	12%	20%	8%	10%	18%

Table 6-12 Hypothetical forgone pollock gross revenue, by season and sector, under Alternative 2, for 2005.

2005			opt1(AFA)			opt2a			opt2d		
Seas	Cap	Sect	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A	87,500	CDQ	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		M	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		P	$0.0	$0.0	$0.0	$54.8	$0.0	$0.0	$0.0	$0.0	$0.0
		S	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
	87,500 Total		$0.0	$0.0	$0.0	$54.8	$0.0	$0.0	$0.0	$0.0	$0.0
	68,100	CDQ	$0.0	$0.0	$0.0	$12.6	$3.1	$0.0	$0.0	$0.0	$0.0
		M	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		P	$0.0	$0.0	$0.0	$91.3	$57.6	$22.8	$23.7	$0.0	$0.0
		S	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
	68,100 Total		$0.0	$0.0	$0.0	$103.9	$60.7	$22.8	$23.7	$0.0	$0.0
	48,700	CDQ	$0.0	$0.0	$0.0	$24.6	$23.3	$12.6	$0.0	$0.0	$0.0
		M	$0.0	$0.0	$0.0	$6.3	$2.4	$0.0	$0.0	$0.0	$0.0
		P	$56.1	$1.9	$0.0	$155.4	$121.8	$91.2	$119.1	$58.3	$23.7
		S	$94.5	$34.3	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
	48,700 Total		$150.6	$36.2	$0.0	$186.3	$147.4	$103.9	$119.2	$58.3	$23.7
	29,300	CDQ	$0.0	$0.0	$0.0	$37.3	$27.1	$25.9	$22.1	$3.6	$0.0
		M	$10.8	$6.2	$0.0	$18.5	$14.7	$10.9	$14.6	$10.9	$2.6
		P	$154.9	$121.3	$90.7	$195.5	$193.9	$158.1	$158.5	$156.3	$122.0
		S	$162.2	$132.3	$129.9	$96.3	$61.6	$0.0	$131.2	$129.1	$61.9
	29,300 Total		$327.8	$259.8	$220.6	$347.5	$297.3	$194.9	$326.3	$299.9	$186.5
B	87,500	CDQ	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		M	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		P	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		S	$15.3	$25.7	$37.1	$1.0	$9.2	$25.2	$13.9	$14.9	$26.1
	87,500 Total		$15.3	$25.7	$37.1	$1.0	$9.2	$25.2	$13.9	$14.9	$26.1
	68,100	CDQ	$0.0	$0.0	$0.0	$0.0	$0.0	$0.1	$0.0	$0.0	$0.0
		M	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		P	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		S	$26.0	$26.7	$49.4	$14.2	$15.2	$26.3	$15.3	$25.7	$37.1
	68,100 Total		$26.0	$26.7	$49.4	$14.2	$15.2	$26.4	$15.3	$25.7	$37.1
	48,700	CDQ	$0.0	$0.0	$0.0	$0.0	$0.1	$4.1	$0.0	$0.0	$0.0
		M	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		P	$0.0	$0.0	$0.0	$0.0	$0.0	$21.5	$0.0	$0.0	$0.0
		S	$37.3	$49.4	$62.3	$25.6	$26.3	$37.6	$26.4	$37.1	$49.7
	48,700 Total		$37.3	$49.4	$62.3	$25.6	$26.4	$63.1	$26.4	$37.1	$49.7
	29,300	CDQ	$0.0	$0.0	$0.0	$4.1	$7.1	$10.3	$0.0	$0.0	$0.2
		M	$0.0	$0.0	$0.0	$0.0	$0.0	$2.7	$0.0	$0.0	$0.7
		P	$0.0	$0.0	$21.1	$21.4	$37.4	$56.3	$0.0	$10.7	$37.7
		S	$62.3	$87.7	$104.0	$37.6	$49.6	$74.1	$49.7	$62.1	$87.9
	29,300 Total		$62.3	$87.7	$125.2	$63.1	$94.2	$143.4	$49.7	$72.8	$126.5

Table 6-13 Hypothetical forgone pollock revenue in percent of total gross revenue, by season and sector, under Alternative 2, for 2005.

2005			opt1(AFA)			opt2a			opt2d		
Seas	Cap	Sect	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A		CDQ	0%	0%	0%	0%	0%	0%	0%	0%	0%
		M	0%	0%	0%	0%	0%	0%	0%	0%	0%
		P	0%	0%	0%	19%	0%	0%	0%	0%	0%
	87,500	S	0%	0%	0%	0%	0%	0%	0%	0%	0%
	87,500 Total		0%	0%	0%	9%	0%	0%	0%	0%	0%
		CDQ	0%	0%	0%	20%	5%	0%	0%	0%	0%
		M	0%	0%	0%	0%	0%	0%	0%	0%	0%
		P	0%	0%	0%	32%	20%	8%	8%	0%	0%
	68,100	S	0%	0%	0%	0%	0%	0%	0%	0%	0%
	68,100 Total		0%	0%	0%	16%	10%	4%	4%	0%	0%
		CDQ	0%	0%	0%	38%	36%	20%	0%	0%	0%
		M	0%	0%	0%	22%	8%	0%	0%	0%	0%
		P	20%	1%	0%	55%	43%	32%	42%	21%	8%
	48,700	S	36%	13%	0%	0%	0%	0%	0%	0%	0%
	48,700 Total		24%	6%	0%	29%	23%	16%	19%	9%	4%
		CDQ	0%	0%	0%	58%	42%	40%	34%	6%	0%
		M	38%	22%	0%	65%	52%	39%	51%	38%	9%
		P	55%	43%	32%	69%	69%	56%	56%	55%	43%
	29,300	S	62%	50%	50%	37%	23%	0%	50%	49%	24%
	29,300 Total		51%	41%	35%	55%	47%	31%	51%	47%	29%
B		CDQ	0%	0%	0%	0%	0%	0%	0%	0%	0%
		M	0%	0%	0%	0%	0%	0%	0%	0%	0%
		P	0%	0%	0%	0%	0%	0%	0%	0%	0%
	87,500	S	6%	9%	14%	0%	3%	9%	5%	5%	10%
	87,500 Total		3%	4%	6%	0%	2%	4%	2%	2%	4%
		CDQ	0%	0%	0%	0%	0%	0%	0%	0%	0%
		M	0%	0%	0%	0%	0%	0%	0%	0%	0%
		P	0%	0%	0%	0%	0%	0%	0%	0%	0%
	68,100	S	10%	10%	18%	5%	6%	10%	6%	9%	14%
	68,100 Total		4%	4%	8%	2%	2%	4%	3%	4%	6%
		CDQ	0%	0%	0%	0%	0%	6%	0%	0%	0%
		M	0%	0%	0%	0%	0%	0%	0%	0%	0%
		P	0%	0%	0%	0%	0%	9%	0%	0%	0%
	48,700	S	14%	18%	23%	9%	10%	14%	10%	14%	18%
	48,700 Total		6%	8%	10%	4%	4%	10%	4%	6%	8%
		CDQ	0%	0%	0%	6%	11%	15%	0%	0%	0%
		M	0%	0%	0%	0%	0%	11%	0%	0%	3%
		P	0%	0%	9%	9%	15%	23%	0%	4%	15%
	29,300	S	23%	32%	38%	14%	18%	27%	18%	23%	32%
	29,300 Total		10%	14%	21%	10%	15%	24%	8%	12%	21%

Table 6-14 Hypothetical forgone pollock gross revenue, by season and sector, under Alternative 2, for 2006.

2006			opt1(AFA)			opt2a			opt2d		
Seas	Cap	Sect	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A		CDQ	$0.0	$0.0	$0.0	$10.7	$1.3	$0.0	$0.0	$0.0	$0.0
		M	$7.5	$2.4	$0.0	$19.1	$9.4	$8.1	$8.9	$7.8	$2.4
		P	$0.8	$0.0	$0.0	$88.1	$59.2	$9.7	$10.1	$7.9	$0.0
	87,500	S	$155.1	$123.9	$88.4	$85.4	$0.5	$0.0	$90.7	$86.8	$11.1
	87,500 Total		$163.4	$126.3	$88.4	$203.2	$70.4	$17.8	$109.7	$102.6	$13.5
		CDQ	$0.0	$0.0	$0.0	$22.7	$11.6	$1.7	$0.0	$0.0	$0.0
		M	$9.3	$8.3	$6.8	$27.1	$26.6	$18.7	$26.3	$9.6	$8.3
		P	$10.4	$8.2	$0.0	$118.1	$89.5	$60.3	$60.8	$58.3	$8.9
	68,100	S	$159.2	$156.9	$124.9	$92.0	$88.3	$33.8	$155.2	$124.0	$88.5
	68,100 Total		$178.9	$173.4	$131.6	$259.8	$216.0	$114.5	$242.3	$191.8	$105.7
		CDQ	$0.0	$0.0	$0.0	$24.2	$23.6	$22.7	$0.0	$0.0	$0.0
		M	$26.9	$26.3	$9.3	$27.9	$27.6	$27.1	$27.4	$27.0	$26.3
		P	$88.8	$60.0	$10.4	$152.9	$151.2	$118.1	$118.4	$89.9	$60.8
	48,700	S	$163.3	$161.7	$159.2	$157.6	$155.0	$91.9	$160.4	$158.3	$155.1
	48,700 Total		$278.9	$248.0	$178.9	$362.6	$357.4	$259.8	$306.3	$275.2	$242.2
		CDQ	$1.6	$0.0	$0.0	$37.0	$36.4	$35.6	$23.1	$22.3	$10.5
		M	$37.3	$27.8	$27.4	$47.4	$37.9	$37.4	$37.7	$37.4	$27.8
		P	$152.6	$150.8	$117.7	$184.9	$156.1	$154.6	$154.8	$153.5	$151.4
	29,300	S	$202.3	$201.3	$199.7	$164.0	$162.4	$160.1	$200.5	$164.5	$162.5
	29,300 Total		$393.7	$379.9	$344.8	$433.2	$392.8	$387.7	$416.2	$377.6	$352.3
B		CDQ	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		M	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		P	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
	87,500	S	$1.7	$11.8	$35.9	$0.0	$0.0	$11.0	$0.0	$1.1	$22.1
	87,500 Total		$1.7	$11.8	$35.9	$0.0	$0.0	$11.0	$0.0	$1.1	$22.1
		CDQ	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		M	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		P	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
	68,100	S	$22.0	$23.2	$52.7	$0.0	$1.5	$22.5	$1.7	$11.8	$35.9
	68,100 Total		$22.0	$23.2	$52.7	$0.0	$1.5	$22.5	$1.7	$11.8	$35.9
		CDQ	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		M	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		P	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
	48,700	S	$36.4	$52.7	$71.8	$11.5	$22.5	$36.8	$22.7	$35.9	$70.4
	48,700 Total		$36.4	$52.7	$71.8	$11.5	$22.5	$36.8	$22.7	$35.9	$70.4
		CDQ	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		M	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
		P	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
	29,300	S	$71.8	$86.7	$96.3	$36.8	$53.1	$86.4	$70.4	$71.4	$87.0
	29,300 Total		$71.8	$86.7	$96.3	$36.8	$53.1	$86.4	$70.4	$71.4	$87.0

Table 6-15 Hypothetical forgone pollock revenue in percent of total gross revenue, by season and sector, under Alternative 2, for 2006.

2006			opt1(AFA)			opt2a			opt2d		
Seas	Cap	Sect	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A		CDQ	0%	0%	0%	15%	2%	0%	0%	0%	0%
		M	15%	5%	0%	38%	19%	16%	18%	15%	5%
		P	0%	0%	0%	34%	23%	4%	4%	3%	0%
	87,500	S	62%	50%	35%	34%	0%	0%	36%	35%	4%
	87,500 Total		26%	20%	14%	32%	11%	3%	17%	16%	2%
		CDQ	0%	0%	0%	33%	17%	3%	0%	0%	0%
		M	18%	16%	13%	53%	52%	37%	52%	19%	16%
		P	4%	3%	0%	46%	35%	23%	23%	23%	3%
	68,100	S	64%	63%	50%	37%	35%	14%	62%	50%	36%
	68,100 Total		28%	28%	21%	41%	34%	18%	39%	31%	17%
		CDQ	0%	0%	0%	35%	34%	33%	0%	0%	0%
		M	53%	52%	18%	55%	54%	53%	54%	53%	52%
		P	34%	23%	4%	59%	58%	46%	46%	35%	23%
	48,700	S	66%	65%	64%	63%	62%	37%	64%	64%	62%
	48,700 Total		44%	40%	28%	58%	57%	41%	49%	44%	39%
		CDQ	2%	0%	0%	53%	53%	51%	33%	32%	15%
		M	73%	55%	54%	93%	75%	74%	74%	74%	55%
		P	59%	58%	45%	71%	60%	60%	60%	59%	59%
	29,300	S	81%	81%	80%	66%	65%	64%	80%	66%	65%
	29,300 Total		63%	61%	55%	69%	63%	62%	66%	60%	56%
B		CDQ	0%	0%	0%	0%	0%	0%	0%	0%	0%
		M	0%	0%	0%	0%	0%	0%	0%	0%	0%
		P	0%	0%	0%	0%	0%	0%	0%	0%	0%
	87,500	S	1%	4%	13%	0%	0%	4%	0%	0%	8%
	87,500 Total		0%	2%	6%	0%	0%	2%	0%	0%	4%
		CDQ	0%	0%	0%	0%	0%	0%	0%	0%	0%
		M	0%	0%	0%	0%	0%	0%	0%	0%	0%
		P	0%	0%	0%	0%	0%	0%	0%	0%	0%
	68,100	S	8%	9%	20%	0%	1%	8%	1%	4%	13%
	68,100 Total		4%	4%	9%	0%	0%	4%	0%	2%	6%
		CDQ	0%	0%	0%	0%	0%	0%	0%	0%	0%
		M	0%	0%	0%	0%	0%	0%	0%	0%	0%
		P	0%	0%	0%	0%	0%	0%	0%	0%	0%
	48,700	S	14%	20%	27%	4%	8%	14%	8%	13%	26%
	48,700 Total		6%	9%	12%	2%	4%	6%	4%	6%	11%
		CDQ	0%	0%	0%	0%	0%	0%	0%	0%	0%
		M	0%	0%	0%	0%	0%	0%	0%	0%	0%
		P	0%	0%	0%	0%	0%	0%	0%	0%	0%
	29,300	S	27%	32%	36%	14%	20%	32%	26%	27%	32%
	29,300 Total		12%	14%	16%	6%	9%	14%	11%	12%	14%

Table 6-16 Hypothetical forgone pollock gross revenue, by season and sector, under Alternative 2, for 2007.

2007			opt1(AFA)			opt2a			opt2d		
Seas	Cap	Sect	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A		CDQ	$0.0	$0.0	$0.0	$39.4	$38.7	$37.7	$9.4	$0.0	$0.0
		M	$19.6	$6.1	$0.0	$33.6	$32.9	$20.0	$26.7	$19.8	$6.1
		P	$115.8	$90.4	$67.1	$156.6	$154.6	$151.5	$152.1	$117.3	$113.9
	87,500	S	$200.5	$168.9	$134.7	$102.6	$2.1	$0.0	$136.7	$133.3	$2.2
	87,500 Total		$336.0	$265.4	$201.7	$332.1	$228.3	$209.2	$324.8	$270.4	$122.2
		CDQ	$0.0	$0.0	$0.0	$50.1	$49.6	$39.0	$23.7	$10.4	$0.0
		M	$32.9	$20.2	$11.5	$34.4	$33.9	$33.2	$33.7	$33.0	$20.1
		P	$152.4	$117.6	$114.2	$189.8	$157.8	$155.4	$155.9	$153.7	$118.3
	68,100	S	$203.7	$201.9	$170.1	$168.0	$134.6	$22.2	$200.6	$169.0	$134.8
	68,100 Total		$389.0	$339.7	$295.8	$442.3	$375.9	$249.8	$413.8	$366.1	$273.2
		CDQ	$10.8	$9.4	$0.0	$51.0	$50.6	$50.1	$38.5	$37.7	$23.7
		M	$34.2	$33.7	$32.9	$43.1	$42.7	$34.4	$42.5	$34.3	$33.7
		P	$157.2	$155.2	$152.3	$236.6	$191.2	$189.8	$190.1	$158.1	$155.9
	48,700	S	$235.1	$233.7	$203.7	$202.5	$200.4	$168.0	$204.7	$203.1	$200.6
	48,700 Total		$437.3	$432.0	$389.0	$533.2	$484.9	$442.3	$475.8	$433.2	$413.7
		CDQ	$38.9	$38.1	$24.4	$59.3	$51.7	$51.3	$50.3	$49.8	$39.3
		M	$43.4	$43.0	$42.5	$44.1	$43.8	$43.5	$43.7	$43.4	$43.0
		P	$236.3	$191.0	$189.6	$240.4	$239.5	$238.1	$238.4	$237.1	$235.3
	29,300	S	$238.6	$237.8	$236.5	$235.7	$234.3	$204.5	$237.1	$236.0	$234.4
	29,300 Total		$557.2	$509.8	$492.9	$579.5	$569.4	$537.4	$569.5	$566.4	$552.0
B		CDQ	$0.0	$0.0	$0.0	$2.5	$4.4	$4.6	$0.0	$1.0	$2.2
		M	$0.0	$0.0	$0.0	$0.0	$0.0	$1.7	$0.0	$0.0	$0.0
		P	$0.0	$0.0	$0.0	$0.0	$0.0	$4.5	$0.0	$0.0	$0.0
	87,500	S	$30.0	$30.7	$40.9	$7.2	$18.5	$30.3	$18.7	$29.7	$40.1
	87,500 Total		$30.0	$30.7	$40.9	$9.7	$22.9	$41.1	$18.7	$30.7	$42.3
		CDQ	$0.0	$0.0	$1.9	$4.5	$4.5	$6.2	$1.0	$2.1	$2.5
		M	$0.0	$0.0	$1.5	$0.0	$1.6	$3.6	$0.0	$0.0	$1.8
		P	$0.0	$0.0	$0.0	$0.0	$0.2	$13.0	$0.0	$0.0	$4.2
	68,100	S	$40.1	$40.6	$54.5	$19.0	$30.0	$40.3	$30.1	$30.7	$40.9
	68,100 Total		$40.1	$40.6	$58.0	$23.5	$36.3	$63.1	$31.1	$32.8	$49.3
		CDQ	$1.0	$1.9	$2.4	$6.2	$6.2	$8.4	$2.3	$2.5	$4.5
		M	$0.0	$1.5	$3.5	$1.8	$3.6	$6.3	$1.5	$1.8	$3.7
		P	$0.0	$0.0	$4.8	$5.0	$13.0	$26.1	$0.0	$4.2	$13.1
	48,700	S	$41.1	$54.5	$65.3	$30.6	$40.3	$46.7	$40.4	$40.9	$54.7
	48,700 Total		$42.0	$58.0	$76.1	$43.5	$63.1	$87.5	$44.2	$49.3	$76.0
		CDQ	$2.4	$4.3	$4.5	$8.4	$8.5	$11.5	$4.5	$4.6	$6.3
		M	$3.5	$3.7	$8.2	$6.3	$8.3	$14.6	$3.7	$6.3	$11.9
		P	$4.8	$12.9	$26.0	$26.1	$32.7	$51.3	$13.1	$19.9	$32.8
	29,300	S	$65.3	$65.6	$66.0	$46.7	$54.7	$65.4	$54.7	$55.0	$65.7
	29300 Total		$76.1	$86.5	$104.7	$87.5	$104.2	$142.8	$76.0	$85.7	$116.7

Table 6-17 Hypothetical forgone pollock revenue in percent of total gross revenue, by season and sector, under Alternative 2, for 2007.

2007			opt1(AFA)			opt2a			opt2d		
Seas	Cap	Sect	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A	87,500	CDQ	0%	0%	0%	58%	57%	55%	14%	0%	0%
		M	42%	13%	0%	72%	71%	43%	57%	42%	13%
		P	46%	36%	27%	63%	62%	61%	61%	47%	46%
		S	80%	68%	54%	41%	1%	0%	55%	53%	1%
	87,500 Total		55%	43%	33%	54%	37%	34%	53%	44%	20%
	68,100	CDQ	0%	0%	0%	74%	73%	57%	35%	15%	0%
		M	70%	43%	25%	74%	73%	71%	72%	71%	43%
		P	61%	47%	46%	76%	63%	62%	62%	61%	47%
		S	82%	81%	68%	67%	54%	9%	80%	68%	54%
	68,100 Total		63%	55%	48%	72%	61%	41%	67%	60%	44%
	48,700	CDQ	16%	14%	0%	75%	74%	74%	57%	55%	35%
		M	73%	72%	70%	92%	92%	74%	91%	74%	72%
		P	63%	62%	61%	95%	76%	76%	76%	63%	62%
		S	94%	94%	82%	81%	80%	67%	82%	81%	80%
	48,700 Total		71%	70%	63%	87%	79%	72%	77%	71%	67%
	29,300	CDQ	57%	56%	36%	87%	76%	75%	74%	73%	58%
		M	93%	92%	91%	94%	94%	93%	94%	93%	92%
		P	94%	76%	76%	96%	96%	95%	95%	95%	94%
		S	96%	95%	95%	94%	94%	82%	95%	95%	94%
	29,300 Total		91%	83%	80%	94%	93%	87%	93%	92%	90%
B	87,500	CDQ	0%	0%	0%	4%	6%	7%	0%	1%	3%
		M	0%	0%	0%	0%	0%	4%	0%	0%	0%
		P	0%	0%	0%	0%	0%	2%	0%	0%	0%
		S	12%	12%	16%	3%	7%	12%	7%	12%	16%
	87,500 Total		5%	5%	7%	2%	4%	7%	3%	5%	7%
	68,100	CDQ	0%	0%	3%	6%	6%	9%	1%	3%	4%
		M	0%	0%	3%	0%	3%	8%	0%	0%	4%
		P	0%	0%	0%	0%	0%	5%	0%	0%	2%
		S	16%	16%	22%	8%	12%	16%	12%	12%	16%
	68,100 Total		6%	7%	9%	4%	6%	10%	5%	5%	8%
	48,700	CDQ	1%	3%	3%	9%	9%	12%	3%	4%	6%
		M	0%	3%	7%	4%	8%	13%	3%	4%	8%
		P	0%	0%	2%	2%	5%	10%	0%	2%	5%
		S	16%	22%	26%	12%	16%	19%	16%	16%	22%
	48,700 Total		7%	9%	12%	7%	10%	14%	7%	8%	12%
	29,300	CDQ	3%	6%	6%	12%	12%	16%	6%	7%	9%
		M	7%	8%	17%	13%	17%	30%	8%	13%	25%
		P	2%	5%	10%	10%	13%	20%	5%	8%	13%
		S	26%	26%	26%	19%	22%	26%	22%	22%	26%
	29300 Total		12%	14%	17%	14%	17%	23%	12%	14%	19%

6.7 Revenue at Risk Under Alternative 3

While the hard caps alternatives have the potential effect of fishery closure and resulting forgone pollock fishery revenue, the triggered closures do not directly create forgone gross revenue, but rather, they place revenue at risk of being forgone. When the closure is triggered, vessels must be relocated outside the closure areas and operators must attempt to catch their remaining allocation of pollock TAC outside the closure area. Thus, the revenue associated with remaining allocation is placed at risk of not being earned if the fishing outside the closure area is not sufficiently productive to offset any operational costs associated with relative harvesting inefficiencies outside the closure area. The previous discussion contained in the overview of costs and benefits provides a treatment of some of the implications and limitations of this “revenue at risk” analysis.

As was the case for forgone gross revenue, the revenue at risk estimate is the answer to the question of how much revenue they earned, in each of the years 2003-2007, from the projected date of the triggered closure (see EIS Chapter 4) through the end of the season. Thus, it is a retrospective assessment of actual revenue earned in those years from the projected triggered closure date forward. Presented here are the estimates of revenue at risk and the percent of total revenue that these estimates comprise.

It is also possible to take a further step with regard to analysis of triggered closure areas (Alternative 3). Having estimated the maximum gross revenues that might be lost by each fleet segment, on the assumption that the fleet is unable to make up reduced harvests by fishing in other areas, it is possible to gradually relax that analytical constraint by assuming the fleet component would have been able to make up some percentage of the revenue at risk by fishing in other areas not affected by Chinook salmon bycatch minimization measures. This is done without specifying where the fleet segment might otherwise have operated (or at what cost), except to assume that the effort would have been redistributed to remaining open areas, during remaining open periods, under existing management regulations. With this information available for each fleet segment, readers may apply their own assumptions about the extent to which each fleet segment would be able to make up its catch elsewhere, under the differing temporal and geographic constraints and limitations provided across competing Chinook salmon bycatch minimization alternatives, should these measures be applied to future fishing effort. In this way, individuals may produce their own estimates of the future gross revenues that might be forgone under each alternative.

To be precise, the gross revenues at risk were estimated using information about the following:
(1) projected fleet segment harvests for the 2003 through 2007 fishing years assuming the provisions of each Chinook salmon bycatch minimization alternative had been in place in that year; (2) the actual proportions of harvest of different allocations, by different sectors (e.g. CDQ, CP, CV, Motherships), based upon historical catch patterns in 2003 through 2007; and (3) estimated product mix and first wholesale product values for all pollock products by sector and year from 2001 through 2007.

Table 6-18 provides hypothetical revenue at risk and percent of total revenue for all vessels after A season closures under each trigger and split of that trigger. The data show that in the highest bycatch years and under the most restrictive trigger levels, revenue at risk would be about $520.2 million in the A season for all vessels combined. That represents 85 percent of the 2007 estimated total A season first wholesale revenue of the pollock fleet. As the trigger is increased, the impacts decrease; however, the least restrictive A season trigger (70/30 split) of 87,500 still results in $134.3 million in revenue at risk, or a bout 22 percent of the overall first wholesale revenue of all pollock vessels combined. In lower bycatch years (e.g. 2003, 2004, and 2005), the larger triggers of 87,500 and 68,100 do not cause triggers to be hit, and thus there is no revenue at risk. However, in the low bycatch year of 2004 even the lowest trigger of 29,300 would place $65.4 million (70/30) to $179.2 million (50/50) at risk. These values are 11 percent and 31 percent of total revenue respectively.

Table 6-19 through Table 6-21 provide the breakout of this data by sector. A review of these tables reveals patterns consistent with the combined totals presented above. In addition, while CPs bear the greatest amount of revenue at risk, their percentages of total revenue are slightly lower than shore based CVs.

Table 6-22 provides the hypothetical revenue at risk and percent of total revenue for all vessels after B-season closures would have been triggered. The revenue at risk in the B season is greatest under the 70/30 split and is as much as $117.38 million in the worst case (2006, 29,300, 70/30), or 19 percent of total B season revenue. At the 29,300 trigger, and 70/30 split, the B season revenue at risk remains above 15 percent in all years except 2003. Even under the 87,500 trigger with a 70/30 split, $57 million, or 98 percent of total first wholesale revenue, would have been placed at risk in 2007. Ignoring the 2007 year; however, only the 29,300 trigger generates revenue at risk in excess of 10 percent of total first wholesale value.

Table 6-23 through Table 6-25 break the B season revenue at risk estimates down by sector. A review of the data presented in these tables reveals that shore based CV have the majority of the revenue at risk and the greatest percentages of total B season total first wholesale revenue at risk. Another finding is that the impacts associated with the 48,700 trigger are, in percentage of total B season first wholesale revenue, much greater for shore based CVs and motherships than for CPs.

Table 6-18 Hypothetical Revenue At Risk (millions of dollars (upper) percent of total revenue (lower)) based on retained tons of pollock caught by all vessels after A-season closures would have been triggered.

Pollock Cap scenario	Option	CAP	Sector (All), A season 2003	2004	2005	2006	2007
87,500	1-1: 70/30	61,250	$0.0	$0.0	$0.0	$0.0	$134.4
	1-2: 58/42	50,750	$0.0	$0.0	$0.0	$77.5	$282.5
	1-3: 55/45	48,125	$0.0	$0.0	$0.0	$157.0	$289.7
	1-4: 50/50	43,750	$0.0	$0.0	$0.0	$234.9	$301.1
68,100	1-1: 70/30	47,670	$0.0	$0.0	$0.0	$168.1	$289.7
	1-2: 58/42	39,498	$0.0	$0.0	$0.0	$265.8	$337.4
	1-3: 55/45	37,455	$0.0	$0.0	$0.0	$276.1	$350.3
	1-4: 50/50	34,050	$0.0	$0.0	$0.0	$300.1	$369.9
48,700	1-1: 70/30	34,090	$0.0	$0.0	$0.0	$300.1	$369.9
	1-2: 58/42	28,246	$92.3	$0.0	$0.0	$376.9	$413.9
	1-3: 55/45	26,785	$108.3	$0.0	$40.6	$376.9	$423.7
	1-4: 50/50	24,350	$141.0	$0.0	$151.5	$399.8	$442.9
29,300	1-1: 70/30	20,510	$241.5	$65.4	$232.1	$432.8	$486.2
	1-2: 58/42	16,994	$266.0	$129.3	$320.5	$442.6	$520.2
	1-3: 55/45	16,115	$272.1	$137.9	$338.7	$442.6	$520.2
	1-4: 50/50	14,650	$285.2	$179.2	$350.5	$442.6	$520.2
Pollock Cap scenario	**Option**	**CAP**	**Sector (All), A season 2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	61,250	0%	0%	0%	0%	22%
	1-2: 58/42	50,750	0%	0%	0%	12%	46%
	1-3: 55/45	48,125	0%	0%	0%	25%	47%
	1-4: 50/50	43,750	0%	0%	0%	37%	49%
68,100	1-1: 70/30	47,670	0%	0%	0%	27%	47%
	1-2: 58/42	39,498	0%	0%	0%	42%	55%
	1-3: 55/45	37,455	0%	0%	0%	44%	57%
	1-4: 50/50	34,050	0%	0%	0%	48%	60%
48,700	1-1: 70/30	34,090	0%	0%	0%	48%	60%
	1-2: 58/42	28,246	18%	0%	0%	60%	67%
	1-3: 55/45	26,785	21%	0%	6%	60%	69%
	1-4: 50/50	24,350	28%	0%	24%	64%	72%
29,300	1-1: 70/30	20,510	47%	11%	36%	69%	79%
	1-2: 58/42	16,994	52%	22%	50%	70%	85%
	1-3: 55/45	16,115	53%	24%	53%	70%	85%
	1-4: 50/50	14,650	56%	31%	55%	70%	85%

Table 6-19 Hypothetical Revenue At Risk based on retained tons of pollock caught by catcher/processors after A-season closures would have been triggered (millions of dollars (upper) percent of total revenue (lower)).

Pollock Cap scenario	**Option**	CAP	**CPs, A season 2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	61,250	$0.0	$0.0	$0.0	$0.0	$73.6
	1-2: 58/42	50,750	$0.0	$0.0	$0.0	$38.0	$147.3
	1-3: 55/45	48,125	$0.0	$0.0	$0.0	$86.8	$151.1
	1-4: 50/50	43,750	$0.0	$0.0	$0.0	$119.9	$155.7
68,100	1-1: 70/30	47,670	$0.0	$0.0	$0.0	$91.5	$151.1
	1-2: 58/42	39,498	$0.0	$0.0	$0.0	$134.1	$170.7
	1-3: 55/45	37,455	$0.0	$0.0	$0.0	$139.5	$176.7
	1-4: 50/50	34,050	$0.0	$0.0	$0.0	$148.7	$187.2
48,700	1-1: 70/30	34,090	$0.0	$0.0	$0.0	$148.7	$187.2
	1-2: 58/42	28,246	$59.8	$0.0	$0.0	$187.9	$210.0
	1-3: 55/45	26,785	$67.7	$0.0	$15.2	$187.9	$218.1
	1-4: 50/50	24,350	$84.3	$0.0	$78.9	$196.7	$230.7
29,300	1-1: 70/30	20,510	$138.3	$33.2	$119.3	$213.2	$247.1
	1-2: 58/42	16,994	$149.0	$71.1	$167.3	$219.2	$263.4
	1-3: 55/45	16,115	$152.1	$74.6	$177.6	$219.2	$263.4
	1-4: 50/50	14,650	$157.7	$97.3	$183.7	$219.2	$263.4
Pollock Cap scenario	**Option**	**CAP**	**CPs, A season 2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	61,250	0%	0%	0%	0%	24%
	1-2: 58/42	50,750	0%	0%	0%	12%	47%
	1-3: 55/45	48,125	0%	0%	0%	27%	49%
	1-4: 50/50	43,750	0%	0%	0%	37%	50%
68,100	1-1: 70/30	47,670	0%	0%	0%	28%	49%
	1-2: 58/42	39,498	0%	0%	0%	42%	55%
	1-3: 55/45	37,455	0%	0%	0%	43%	57%
	1-4: 50/50	34,050	0%	0%	0%	46%	60%
48,700	1-1: 70/30	34,090	0%	0%	0%	46%	60%
	1-2: 58/42	28,246	23%	0%	0%	58%	68%
	1-3: 55/45	26,785	26%	0%	4%	58%	70%
	1-4: 50/50	24,350	32%	0%	23%	61%	74%
29,300	1-1: 70/30	20,510	53%	11%	35%	66%	80%
	1-2: 58/42	16,994	57%	23%	49%	68%	85%
	1-3: 55/45	16,115	58%	24%	52%	68%	85%
	1-4: 50/50	14,650	60%	31%	54%	68%	85%

Table 6-20 Hypothetical Revenue At Risk based on Retained tons of pollock caught by Inshore Catcher Vessels after A-season closures would have been triggered (millions of dollars (upper) percent of total revenue (lower)).

Pollock			**Inshore catcher vessels, A season**				
Cap scenario	**Option**	CAP	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	61,250	$0.0	$0.0	$0.0	$0.0	$54.1
	1-2: 58/42	50,750	$0.0	$0.0	$0.0	$34.7	$115.8
	1-3: 55/45	48,125	$0.0	$0.0	$0.0	$63.2	$117.8
	1-4: 50/50	43,750	$0.0	$0.0	$0.0	$100.0	$123.0
68,100	1-1: 70/30	47,670	$0.0	$0.0	$0.0	$68.7	$117.8
	1-2: 58/42	39,498	$0.0	$0.0	$0.0	$112.4	$139.3
	1-3: 55/45	37,455	$0.0	$0.0	$0.0	$116.0	$145.4
	1-4: 50/50	34,050	$0.0	$0.0	$0.0	$127.3	$153.6
48,700	1-1: 70/30	34,090	$0.0	$0.0	$0.0	$127.3	$153.6
	1-2: 58/42	28,246	$29.8	$0.0	$0.0	$158.7	$172.4
	1-3: 55/45	26,785	$37.4	$0.0	$24.9	$158.7	$173.9
	1-4: 50/50	24,350	$51.5	$0.0	$68.3	$169.5	$179.3
29,300	1-1: 70/30	20,510	$91.5	$28.9	$104.7	$182.2	$201.0
	1-2: 58/42	16,994	$103.5	$52.3	$139.2	$186.1	$215.5
	1-3: 55/45	16,115	$106.1	$56.4	$145.8	$186.1	$215.5
	1-4: 50/50	14,650	$113.2	$71.6	$151.0	$186.1	$215.5
Pollock			**Inshore catcher vessels, A season**				
Cap scenario	**Option**	**CAP**	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	61,250	0%	0%	0%	0%	22%
	1-2: 58/42	50,750	0%	0%	0%	14%	46%
	1-3: 55/45	48,125	0%	0%	0%	25%	47%
	1-4: 50/50	43,750	0%	0%	0%	40%	49%
68,100	1-1: 70/30	47,670	0%	0%	0%	28%	47%
	1-2: 58/42	39,498	0%	0%	0%	45%	56%
	1-3: 55/45	37,455	0%	0%	0%	47%	58%
	1-4: 50/50	34,050	0%	0%	0%	51%	62%
48,700	1-1: 70/30	34,090	0%	0%	0%	51%	62%
	1-2: 58/42	28,246	14%	0%	0%	64%	69%
	1-3: 55/45	26,785	18%	0%	10%	64%	70%
	1-4: 50/50	24,350	25%	0%	26%	68%	72%
29,300	1-1: 70/30	20,510	44%	13%	40%	73%	80%
	1-2: 58/42	16,994	50%	24%	53%	75%	86%
	1-3: 55/45	16,115	51%	26%	56%	75%	86%
	1-4: 50/50	14,650	55%	32%	58%	75%	86%

Table 6-21 Hypothetical Revenue At Risk based on retained tons of pollock caught by Mothership Processors after A-season closures would have been triggered (millions of dollars (upper) percent of total revenue (lower)).

Pollock Cap scenario	Option	CAP	Mothership operations, A season 2003	2004	2005	2006	2007
87,500	1-1: 70/30	61,250	$0.0	$0.0	$0.0	$0.0	$8.2
	1-2: 58/42	50,750	$0.0	$0.0	$0.0	$4.3	$20.9
	1-3: 55/45	48,125	$0.0	$0.0	$0.0	$8.0	$22.3
	1-4: 50/50	43,750	$0.0	$0.0	$0.0	$14.8	$23.7
68,100	1-1: 70/30	47,670	$0.0	$0.0	$0.0	$8.7	$22.3
	1-2: 58/42	39,498	$0.0	$0.0	$0.0	$18.7	$28.0
	1-3: 55/45	37,455	$0.0	$0.0	$0.0	$20.1	$28.7
	1-4: 50/50	34,050	$0.0	$0.0	$0.0	$23.0	$29.7
48,700	1-1: 70/30	34,090	$0.0	$0.0	$0.0	$23.0	$29.7
	1-2: 58/42	28,246	$5.2	$0.0	$0.0	$29.1	$32.4
	1-3: 55/45	26,785	$5.8	$0.0	$0.5	$29.1	$33.3
	1-4: 50/50	24,350	$7.9	$0.0	$5.7	$31.9	$35.9
29,300	1-1: 70/30	20,510	$14.9	$2.9	$9.6	$35.6	$39.2
	1-2: 58/42	16,994	$16.5	$6.5	$15.1	$35.7	$42.3
	1-3: 55/45	16,115	$16.9	$7.2	$16.3	$35.7	$42.3
	1-4: 50/50	14,650	$17.2	$10.8	$16.9	$35.7	$42.3
Pollock Cap scenario	**Option**	**CAP**	**Mothership operations, A season 2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	61,250	0%	0%	0%	0%	15%
	1-2: 58/42	50,750	0%	0%	0%	8%	39%
	1-3: 55/45	48,125	0%	0%	0%	14%	41%
	1-4: 50/50	43,750	0%	0%	0%	26%	44%
68,100	1-1: 70/30	47,670	0%	0%	0%	15%	41%
	1-2: 58/42	39,498	0%	0%	0%	33%	52%
	1-3: 55/45	37,455	0%	0%	0%	35%	53%
	1-4: 50/50	34,050	0%	0%	0%	40%	55%
48,700	1-1: 70/30	34,090	0%	0%	0%	40%	55%
	1-2: 58/42	28,246	12%	0%	0%	51%	60%
	1-3: 55/45	26,785	14%	0%	1%	51%	62%
	1-4: 50/50	24,350	19%	0%	16%	56%	66%
29,300	1-1: 70/30	20,510	35%	6%	27%	63%	72%
	1-2: 58/42	16,994	39%	13%	43%	63%	78%
	1-3: 55/45	16,115	40%	14%	46%	63%	78%
	1-4: 50/50	14,650	40%	21%	48%	63%	78%

Table 6-22 Hypothetical Revenue At Risk (millions of dollars (upper) percent of total revenue (lower)) based on retained tons of pollock caught by all vessels after B-season closures would have been triggered.

Pollock Cap scenario	Option	CAP	Sector (All), B season 2003	2004	2005	2006	2007
87,500	1-1: 70/30	26,250	$0.0	$3.1	$15.8	$0.0	$57.0
	1-2: 58/42	36,750	$0.0	$0.0	$0.4	$0.0	$17.2
	1-3: 55/45	39,375	$0.0	$0.0	$0.0	$0.0	$12.1
	1-4: 50/50	43,750	$0.0	$0.0	$0.0	$0.0	$2.1
68,100	1-1: 70/30	20,430	$0.0	$11.7	$24.2	$14.4	$67.7
	1-2: 58/42	28,602	$0.0	$1.2	$9.9	$0.0	$48.2
	1-3: 55/45	30,645	$0.0	$0.0	$6.7	$0.0	$42.8
	1-4: 50/50	34,050	$0.0	$0.0	$1.5	$0.0	$25.0
48,700	1-1: 70/30	14,610	$0.0	$22.7	$35.2	$40.6	$89.7
	1-2: 58/42	20,454	$0.0	$11.7	$24.2	$14.4	$67.7
	1-3: 55/45	21,915	$0.0	$9.1	$22.6	$7.2	$64.8
	1-4: 50/50	24,350	$0.0	$4.8	$19.2	$0.0	$62.0
29,300	1-1: 70/30	8,790	$16.1	$79.8	$104.9	$117.3	$122.8
	1-2: 58/42	12,306	$7.1	$34.5	$54.4	$68.0	$104.0
	1-3: 55/45	13,185	$0.0	$23.7	$48.2	$61.7	$94.4
	1-4: 50/50	14,650	$0.0	$22.7	$35.2	$40.6	$89.7

Pollock Cap scenario	Option	CAP	Sector (All), B season 2003	2004	2005	2006	2007
87,500	1-1: 70/30	26,250	0%	1%	3%	0%	9%
	1-2: 58/42	36,750	0%	0%	0%	0%	3%
	1-3: 55/45	39,375	0%	0%	0%	0%	2%
	1-4: 50/50	43,750	0%	0%	0%	0%	0%
68,100	1-1: 70/30	20,430	0%	2%	4%	2%	11%
	1-2: 58/42	28,602	0%	0%	2%	0%	8%
	1-3: 55/45	30,645	0%	0%	1%	0%	7%
	1-4: 50/50	34,050	0%	0%	0%	0%	4%
48,700	1-1: 70/30	14,610	0%	5%	6%	7%	14%
	1-2: 58/42	20,454	0%	2%	4%	2%	11%
	1-3: 55/45	21,915	0%	2%	4%	1%	10%
	1-4: 50/50	24,350	0%	1%	3%	0%	10%
29,300	1-1: 70/30	8,790	3%	16%	17%	19%	20%
	1-2: 58/42	12,306	1%	7%	9%	11%	17%
	1-3: 55/45	13,185	0%	5%	8%	10%	15%
	1-4: 50/50	14,650	0%	5%	6%	7%	14%

Table 6-23 Hypothetical Revenue At Risk based on retained tons of pollock caught by catcher/processors after B-season closures would have been triggered (millions of dollars (upper) percent of total revenue (lower)).

Pollock Cap scenario	Option	CAP	2003	2004	2005 (CPs, B season)	2006	2007
87,500	1-1: 70/30	26,250	$0.0	$0.0	$0.0	$0.0	$19.8
	1-2: 58/42	36,750	$0.0	$0.0	$0.0	$0.0	$5.9
	1-3: 55/45	39,375	$0.0	$0.0	$0.0	$0.0	$3.6
	1-4: 50/50	43,750	$0.0	$0.0	$0.0	$0.0	$0.3
68,100	1-1: 70/30	20,430	$0.0	$0.0	$0.0	$0.7	$23.0
	1-2: 58/42	28,602	$0.0	$0.0	$0.0	$0.0	$17.1
	1-3: 55/45	30,645	$0.0	$0.0	$0.0	$0.0	$15.5
	1-4: 50/50	34,050	$0.0	$0.0	$0.0	$0.0	$8.8
48,700	1-1: 70/30	14,610	$0.0	$1.6	$2.4	$9.6	$32.8
	1-2: 58/42	20,454	$0.0	$0.0	$0.0	$0.7	$23.0
	1-3: 55/45	21,915	$0.0	$0.0	$0.0	$0.0	$22.1
	1-4: 50/50	24,350	$0.0	$0.0	$0.0	$0.0	$21.2
29,300	1-1: 70/30	8,790	$1.0	$25.4	$37.5	$41.6	$47.2
	1-2: 58/42	12,306	$0.0	$6.8	$11.0	$22.4	$39.0
	1-3: 55/45	13,185	$0.0	$1.9	$9.1	$19.0	$34.7
	1-4: 50/50	14,650	$0.0	$1.6	$2.4	$9.6	$32.8
Pollock Cap scenario	**Option**	**CAP**	**2003**	**2004**	**2005 (CPs, B season)**	**2006**	**2007**
87,500	1-1: 70/30	26,250	0%	0%	0%	0%	8%
	1-2: 58/42	36,750	0%	0%	0%	0%	2%
	1-3: 55/45	39,375	0%	0%	0%	0%	1%
	1-4: 50/50	43,750	0%	0%	0%	0%	0%
68,100	1-1: 70/30	20,430	0%	0%	0%	0%	9%
	1-2: 58/42	28,602	0%	0%	0%	0%	7%
	1-3: 55/45	30,645	0%	0%	0%	0%	6%
	1-4: 50/50	34,050	0%	0%	0%	0%	3%
48,700	1-1: 70/30	14,610	0%	1%	1%	3%	13%
	1-2: 58/42	20,454	0%	0%	0%	0%	9%
	1-3: 55/45	21,915	0%	0%	0%	0%	9%
	1-4: 50/50	24,350	0%	0%	0%	0%	8%
29,300	1-1: 70/30	8,790	0%	11%	12%	14%	18%
	1-2: 58/42	12,306	0%	3%	4%	7%	15%
	1-3: 55/45	13,185	0%	1%	3%	6%	14%
	1-4: 50/50	14,650	0%	1%	1%	3%	13%

Table 6-24 Hypothetical Revenue At Risk based on retained tons of pollock caught by Inshore Catcher Vessels after B-season closures would have been triggered (millions of dollars (upper) percent of total revenue (lower)).

Pollock Cap scenario	Option	CAP	Inshore catcher vessels, B season 2003	2004	2005	2006	2007
87,500	1-1: 70/30	26,250	$0.0	$1.9	$13.5	$0.0	$28.7
	1-2: 58/42	36,750	$0.0	$0.0	$0.5	$0.0	$7.8
	1-3: 55/45	39,375	$0.0	$0.0	$0.0	$0.0	$5.8
	1-4: 50/50	43,750	$0.0	$0.0	$0.0	$0.0	$0.9
68,100	1-1: 70/30	20,430	$0.0	$10.1	$20.2	$10.6	$34.7
	1-2: 58/42	28,602	$0.0	$0.6	$9.1	$0.0	$23.2
	1-3: 55/45	30,645	$0.0	$0.0	$6.8	$0.0	$20.2
	1-4: 50/50	34,050	$0.0	$0.0	$1.5	$0.0	$12.0
48,700	1-1: 70/30	14,610	$0.0	$19.3	$29.0	$26.0	$44.1
	1-2: 58/42	20,454	$0.0	$10.1	$20.2	$10.6	$34.7
	1-3: 55/45	21,915	$0.0	$7.5	$19.1	$5.4	$33.5
	1-4: 50/50	24,350	$0.0	$3.2	$16.3	$0.0	$31.9
29,300	1-1: 70/30	8,790	$14.1	$41.5	$60.3	$64.7	$57.3
	1-2: 58/42	12,306	$6.4	$21.6	$39.3	$38.6	$48.9
	1-3: 55/45	13,185	$0.0	$19.5	$35.3	$36.0	$46.1
	1-4: 50/50	14,650	$0.0	$19.3	$29.0	$26.0	$44.1

Pollock Cap scenario	Option	CAP	Inshore catcher vessels, B season 2003	2004	2005	2006	2007
87,500	1-1: 70/30	26,250	0%	1%	5%	0%	11%
	1-2: 58/42	36,750	0%	0%	0%	0%	3%
	1-3: 55/45	39,375	0%	0%	0%	0%	2%
	1-4: 50/50	43,750	0%	0%	0%	0%	0%
68,100	1-1: 70/30	20,430	0%	4%	7%	4%	14%
	1-2: 58/42	28,602	0%	0%	3%	0%	9%
	1-3: 55/45	30,645	0%	0%	2%	0%	8%
	1-4: 50/50	34,050	0%	0%	1%	0%	5%
48,700	1-1: 70/30	14,610	0%	9%	11%	10%	18%
	1-2: 58/42	20,454	0%	4%	7%	4%	14%
	1-3: 55/45	21,915	0%	3%	7%	2%	13%
	1-4: 50/50	24,350	0%	1%	6%	0%	13%
29,300	1-1: 70/30	8,790	6%	18%	22%	24%	23%
	1-2: 58/42	12,306	3%	10%	14%	14%	20%
	1-3: 55/45	13,185	0%	9%	13%	13%	18%
	1-4: 50/50	14,650	0%	9%	11%	10%	18%

Table 6-25 Hypothetical Revenue At Risk based on Retained tons of pollock caught by Mothership Processors after A-season closures would have been triggered (millions of dollars (upper) percent of total revenue (lower)).

Pollock Cap scenario	Option	CAP	Mothership operations, B season 2003	2004	2005	2006	2007
87,500	1-1: 70/30	26,250	$0.0	$1.0	$1.2	$0.0	$7.1
	1-2: 58/42	36,750	$0.0	$0.0	$0.0	$0.0	$2.9
	1-3: 55/45	39,375	$0.0	$0.0	$0.0	$0.0	$2.2
	1-4: 50/50	43,750	$0.0	$0.0	$0.0	$0.0	$0.7
68,100	1-1: 70/30	20,430	$0.0	$2.8	$3.7	$4.1	$8.2
	1-2: 58/42	28,602	$0.0	$1.0	$0.8	$0.0	$6.6
	1-3: 55/45	30,645	$0.0	$0.0	$0.0	$0.0	$5.9
	1-4: 50/50	34,050	$0.0	$0.0	$0.0	$0.0	$3.5
48,700	1-1: 70/30	14,610	$0.0	$3.7	$3.7	$7.5	$10.8
	1-2: 58/42	20,454	$0.0	$2.8	$3.7	$4.1	$8.2
	1-3: 55/45	21,915	$0.0	$2.7	$3.3	$2.3	$7.6
	1-4: 50/50	24,350	$0.0	$2.4	$2.7	$0.0	$7.3
29,300	1-1: 70/30	8,790	$2.6	$21.9	$9.9	$17.5	$15.6
	1-2: 58/42	12,306	$1.5	$10.2	$4.9	$11.1	$13.7
	1-3: 55/45	13,185	$0.0	$4.5	$4.5	$10.3	$11.5
	1-4: 50/50	14,650	$0.0	$3.7	$3.7	$7.5	$10.8
Pollock Cap scenario	**Option**	**CAP**	**Mothership operations, B season 2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	26,250	0%	2%	4%	0%	12%
	1-2: 58/42	36,750	0%	0%	0%	0%	9%
	1-3: 55/45	39,375	0%	0%	0%	0%	7%
	1-4: 50/50	43,750	0%	0%	0%	0%	2%
68,100	1-1: 70/30	20,430	0%	7%	12%	8%	25%
	1-2: 58/42	28,602	0%	3%	3%	0%	20%
	1-3: 55/45	30,645	0%	0%	0%	0%	18%
	1-4: 50/50	34,050	0%	0%	0%	0%	11%
48,700	1-1: 70/30	14,610	0%	10%	13%	15%	33%
	1-2: 58/42	20,454	0%	7%	12%	8%	25%
	1-3: 55/45	21,915	0%	7%	11%	5%	23%
	1-4: 50/50	24,350	0%	6%	9%	0%	22%
29,300	1-1: 70/30	8,790	7%	57%	34%	36%	47%
	1-2: 58/42	12,306	4%	27%	16%	23%	42%
	1-3: 55/45	13,185	0%	12%	15%	21%	35%
	1-4: 50/50	14,650	0%	10%	13%	15%	33%

Alternative 3, ICA Management of triggered closures

Under Alternative 3, option 1 of Component 2 (Management) of the triggered closure alternative, a NMFS-approved salmon bycatch reduction ICA would manage any subdivision of the seasonal trigger caps at the sector level, inshore cooperative, or individual vessel level under its contract and would enforce the area closures to the designated group or entity when subdivided caps established by the ICA are reached. The specific provisions of this option are discussed in EIS Chapter 2.

In general terms, this option would allow the ICA to decide how to manage participating vessels to avoid reaching the trigger closures as long as possible during each season. The ICA would operate only under the fishery-level seasonal caps established under Component 1. Any CDQ group that participated in the ICA would bring to the ICA its portion of the trigger cap to be combined with the non-CDQ trigger cap for purposes of the area closures that would apply to all CDQ and non-CDQ vessels participating in the ICA.

The ICA provision would be similar in purpose to the current status quo VRHS system. A major benefit of such a system is its dynamic ability to impose closures and change them rapidly throughout the season, as is documented in the description of the pollock fishery section on the VRHS system (Section 2.3). Thus, the ICA may have the ability to define small area closures throughout the season in order to keep bycatch down to levels that prevent triggering the large area closures under Alternative 3 for their participants. In essence, this is a form of dynamic self-management where the ICA determines what if must do to prevent the trigger from being reached.

It is interesting to note that the VRHS system was actually in place, as an industry initiated bycatch reduction method, before the regulations associated with Amendment 84 created the specific exemptions from the Chinook salmon savings areas for participants in the VRHS system. It is possible, therefore, that some sort of ICA may continue to be employed by industry on a voluntary basis even under a hard cap and/or triggered closure measure. However, cooperatives work because participants have incentives to cooperate in order to improve efficiencies and they are most successful under rationalized or limited access fisheries (e.g., the AFA pollock fishery; the Alaska scallop fishery).

When there are incentives to not cooperate, such as in an open access race for fish, cooperatives have a more difficult time retaining members. As has been mentioned in the discussion of potential fleet operational effects, a race for fish is not an unrealistic possibility under threat of fishery closure or large area closures, even within the AFA rationalized fleet. Thus, there may be benefit to formalizing the ICA structure within the choice of a preliminary preferred alternative if a triggered closure is part of that preference. Doing so may provide needed incentives for vessel operators to join the ICA and not engage in a race for fish, with all its associated inefficiencies and safety issues, if a large area triggered closure is imminent. To the extent that the ICA can more dynamically manage bycatch under a rolling hotspot system and can thereby ensure that more allocated pollock is harvested, this method may further the goals of both National Standard 9 and National Standard 1. Note, however that the ICA management option is not presently a part of the Alternative 2 (Hard Caps) management option but may be employed voluntarily if the perceived benefits of doing so outweigh the considerable costs that could be imposed in high bycatch years under a binding hard cap.

6.8 Potentially Forgone Gross Revenue Under Alternative 4 and Alternative 5

As discussed under Alterative 2, the terminology used herein to describe potential impacts on the pollock fishery is “forgone revenue,” and simply means the amount of revenue that the fleet, or sectors within it, would not be allowed to earn under a binding hard cap. In other words, it is the answer to the question, how much revenue was earned, in each of the years 2003 through 2007, from the projected date of the closure (as calculated in EIS Section 4.3) through the end of the season? Thus, it is a retrospective assessment of actual revenue earned in those years, from the projected closure date forward. The methodology, including total value of the fishery and price data, has been treated in the discussion of the costs and benefits analysis, presented previously. What is presented here are the estimates of forgone first wholesale value, which is inclusive of shoreside processing value added for the shore based CV fleet, as well as the percent of total first wholesale value actually earned by sector, season, and year. Table 6-26 provides hypothetical estimates of forgone pollock first wholesale gross revenue, by year and season, under the annual scenarios of Alternative 4 and Alternative 5 and for CDQ versus non-CDQ. As expected, the greatest impact under the scenarios would have occurred in the highest bycatch year (2007) and under the most restrictive bycatch cap (Alt. 4 AS2, which is equivalent to Alt. 5 AS2 with full transferability and 100 percent rollover). This effect is driven by both the higher roe pollock price in the A season and the 70/30 split contained within the scenarios.

Table 6-26 provides estimates of potential forgone pollock revenue under the annual scenarios of Alternative 4 and Alternative 5, by sector, season, and year, from 2003-2007. Table 6-27 provides the percentage that the potential forgone gross revenue estimate represents of total revenue for the season, sector, and year. Percentage impacts are also provided for the A season and B season totals of all sectors combined as well as the annual total of all sectors combined. In this way, the percent of revenue impact for a sector, in a season and year, can be identified as can the percent affect on total A, B, and annual revenue of all sectors combined. In the discussion that follow, the impact numbers identified will be followed with their appropriate percentage impact in parentheses. Interpretive caution must be taken, however, as the percentage impacts by season, sector and year, do not add up to the percentage impacts for the total of the A season, B season, or annual as they are meant to depict the sector level impact relative to the sector's own revenue whereas the seasonal and annual impact percentages are meant to depict the seasonal/annual percentage impact on the revenue total for that season or year.

As shown in Table 6-26, both AS1 of Alternative 4 and AS1 of Alternative 5 had no effect on any sector in the A season from 2003-2005, as the bycatch amounts were below the high cap. However, the non-CDQ fishery would have been affected by AS1 under both alternatives in 2006 and 2007. In 2006, the potentially forgone A season pollock gross revenue under AS1 of Alternative 4, for the three non-CDQ sectors, would have totaled $138 million (22 percent of A season total revenue), $122 million (49 percent) of which is from the inshore sector.

In 2006, the potentially forgone A season pollock gross revenue under AS1 of Alternative 5, for the three non-CDQ sectors, would have totaled $155 million (25 percent), $130 million (52 percent) of which is from the inshore sector. The greatest A season effect of Alternative 5 AS1 would have occurred in 2007 when total forgone pollock gross revenues would have been $293 (48 percent) million with $145 million (58 percent), $12 million (51 percent), and $20 million (43 percent) coming from the inshore, catcher processor, and mothership sectors respectively. AS1 of Alternative 5 would have had no A season effect on the CDQ fishery from 2003-2007.

The greatest A season effect of Alternative 4 AS1 would have occurred in 2007 when total forgone pollock gross revenues would have been $252 million (41 percent) with $123 million(49 percent), $115 million (46 percent), and $12 million (31 percent) coming from the inshore, catcher processor, and mothership sectors respectively. AS1 of Alternative 4 would have had no A season effect on the CDQ fishery from 2003-2007. Note also that transferability in the A season lowers these impacts slightly and will be discussed further below.

The effect of AS2 in Alternative 4, without transferability, shows a similar pattern with $244 million (39 percent) and $367 million (60 percent) in total potentially forgone gross revenues in 2006 and 2007 A seasons, respectively. In 2006, $169 million (68 percent), $60 million (23 percent) , and $15 million (30 percent) of the total comes from the inshore, catcher processor, and mothership sectors respectively. In 2007, $172 million (69 percent), $154 million (61 percent), $28 million (60 percent), and $13 million (18 percent) of the total come from the inshore, catcher processor, mothership, and CDQ sectors, respectively. Thus, the only A season CDQ sector impact occurs under AS2, with the same impact of $13 million, regardless of transferability, and only in the 2007 year.

The B season effects of Alternative 4 would be felt mostly by the inshore and CP sectors. However, in contrast to the A season effect, the CDQ fishery would be affected in 2004 and 2007. Under AS1 of Alternative 4, the CDQ fishery would have had $9 million (19 percent) and $4 million (6 percent) in forgone pollock gross revenues in 2004 and 2007 respectively. Under AS2 of Alternative 4, the CDQ fishery would have had $21 million (41 percent) and $5 million (7 percent) in forgone pollock gross revenues in 2004 and 2007 respectively.

The B season effects of AS1 of Alternative 5 would, similar to Alternative 4, be felt mostly by the inshore and CP sectors. The inshore sector would have had impacts of $3 million (1 percent), $14 million (5 percent), and $39 million (16 percent) in 2005, 2006, and 2007 respectively. The shoreside sector would have had impacts of $24 million (9 percent) and only in 2007, which is the highest bycatch year. Motherships would have had impacts of $3 million (6 percent) only in 2007. Under AS1 of Alternative 5, the CDQ fishery would have only been affected in 2007 in the amount of $5 million (6 percent). That 2007 impact would have been the only impact to CDQ groups under Alternative 5, AS1.

Table 6-26 Hypothetical forgone pollock revenue by year and season under Alternative 4 Annual Scenario 1 and Annual Scenario 2, and Alternative 5 Annual Scenario 1 ($ Millions)

AS	A-season Transfer-Ability	Year	A-Season CDQ	A-Season M	A-Season P	A-Season S	A total	A-B Roll over	B-Season CDQ	B-Season M	B-Season P	B-Season S	B Total	Annual Total
5-1	Yes	2003	$0	$0	$0	$0	$0	100%	$0	$0	$0	$0	$0	$0
		2004	$0	$0	$0	$0	$0		$0	$0	$0	$0	$0	$0
		2005	$0	$0	$0	$0	$0		$0	$0	$0	$3	$3	$3
		2006	$0	$11	$15	$130	$155		$0	$0	$0	$14	$14	$169
		2007	$0	$20	$128	$145	$293		$5	$3	$24	$39	$70	$364
4-1	No	2003	$0	$0	$0	$0	**$0**	0%	$0	$0	$0	$0	**$0**	**$0**
		2004	$0	$0	$0	$0	**$0**		$9	$0	$0	$10	**$20**	**$20**
		2005	$0	$0	$0	$0	**$0**		$0	$0	$0	$20	**$20**	**$20**
		2006	$0	$8	$8	$122	**$138**		$0	$0	$0	$11	**$11**	**$149**
		2007	$0	$15	$115	$123	**$252**		$4	$2	$22	$36	**$64**	**$317**
	Yes	2003	$0	$0	$0	$0	**$0**		$0	$0	$0	$0	**$0**	**$0**
		2004	$0	$0	$0	$0	**$0**		$9	$0	$0	$10	**$20**	**$20**
		2005	$0	$0	$0	$0	**$0**		$0	$0	$0	$20	**$20**	**$20**
		2006	$0	$4	$0	$116	**$120**		$0	$0	$0	$11	**$11**	**$131**
		2007	$0	$12	$115	$123	**$249**		$4	$2	$22	$36	**$64**	**$314**
4-2	No	2003	$0	$0	$56	$0	**$56**		$0	$1	$0	$0	**$1**	**$57**
		2004	$0	$0	$0	$0	**$0**		$21	$1	$1	$18	**$41**	**$41**
		2005	$0	$0	$0	$0	**$0**		$0	$0	$29	$27	**$57**	**$57**
		2006	$0	$15	$60	$169	**$244**		$0	$0	$0	$27	**$27**	**$272**
		2007	$13	$28	$154	$172	**$367**		$5	$4	$30	$46	**$86**	**$452**
	Yes	2003	$0	$0	$22	$0	**$22**		$0	$1	$0	$0	**$1**	**$22**
		2004	$0	$0	$0	$0	**$0**		$21	$1	$1	$18	**$41**	**$41**
		2005	$0	$0	$0	$0	**$0**		$0	$0	$29	$27	**$57**	**$57**
		2006	$0	$15	$39	$162	**$216**		$0	$0	$0	$27	**$27**	**$243**
		2007	$13	$28	$154	$172	**$367**		$5	$4	$30	$46	**$86**	**$452**
4-1	No	2003	$0	$0	$0	$0	**$0**	80%	$0	$0	$0	$0	**$0**	**$0**
		2004	$0	$0	$0	$0	**$0**		$0	$0	$0	$0	**$0**	**$0**
		2005	$0	$0	$0	$0	**$0**		$0	$0	$0	$0	**$0**	**$0**
		2006	$0	$8	$8	$122	**$138**		$0	$0	$0	$9	**$9**	**$147**
		2007	$0	$15	$115	$123	**$252**		$4	$2	$20	$36	**$62**	**$315**
	Yes	2003	$0	$0	$0	$0	**$0**		$0	$0	$0	$0	**$0**	**$0**
		2004	$0	$0	$0	$0	**$0**		$0	$0	$0	$0	**$0**	**$0**
		2005	$0	$0	$0	$0	**$0**		$0	$0	$0	$0	**$0**	**$0**
		2006	$0	$4	$0	$116	**$120**		$0	$0	$0	$9	**$9**	**$129**
		2007	$0	$12	$115	$123	**$249**		$4	$2	$20	$36	**$62**	**$312**
4-2	No	2003	$0	$0	$56	$0	**$56**		$0	$0	$0	$0	**$0**	**$56**
		2004	$0	$0	$0	$0	**$0**		$0	$0	$0	$10	**$10**	**$10**
		2005	$0	$0	$0	$0	**$0**		$0	$0	$8	$21	**$29**	**$29**
		2006	$0	$15	$60	$169	**$244**		$0	$0	$0	$27	**$27**	**$272**
		2007	$13	$28	$154	$172	**$367**		$5	$4	$30	$46	**$86**	**$452**
	Yes	2003	$0	$0	$22	$0	**$22**		$0	$1	$0	$0	**$1**	**$22**
		2004	$0	$0	$0	$0	**$0**		$0	$0	$0	$10	**$10**	**$10**
		2005	$0	$0	$0	$0	**$0**		$0	$0	$8	$21	**$29**	**$29**
		2006	$0	$15	$39	$162	**$216**		$0	$0	$0	$27	**$27**	**$243**
		2007	$13	$28	$154	$172	**$367**		$5	$4	$30	$46	**$86**	**$452**

Table 6-27 Hypothetical forgone pollock revenue, in percent of total forgone pollock revenue, by sector and scenario (% of total wholesale revenue)

AS	A-season Transfer-Ability	Year	A-Season CDQ	A-Season M	A-Season P	A-Season S	**A total**	A-B Roll over	B-Season CDQ	B-Season M	B-Season P	B-Season S	**B Total**	**Annual Total**
5-1	Yes	2003	0%	0%	0%	0%	**0%**	**100%**	0%	0%	0%	0%	**0%**	**0%**
		2004	0%	0%	0%	0%	**0%**		0%	0%	0%	0%	**0%**	**0%**
		2005	0%	0%	0%	0%	**0%**		0%	0%	0%	1%	**0%**	**0%**
		2006	0%	21%	6%	52%	**25%**		0%	0%	0%	5%	**2%**	**14%**
		2007	0%	43%	51%	58%	**48%**		6%	6%	9%	16%	**11%**	**29%**
4-1	No	2003	0%	0%	0%	0%	**0%**	**0%**	0%	0%	0%	0%	**0%**	**0%**
		2004	0%	0%	0%	0%	**0%**		18%	1%	0%	4%	**4%**	**2%**
		2005	0%	0%	0%	0%	**0%**		0%	0%	0%	7%	**3%**	**2%**
		2006	0%	16%	3%	49%	**22%**		0%	0%	0%	4%	**2%**	**12%**
		2007	0%	31%	46%	49%	**41%**		6%	4%	9%	14%	**10%**	**26%**
	Yes	2003	0%	0%	0%	0%	**0%**		0%	0%	0%	0%	**0%**	**0%**
		2004	0%	0%	0%	0%	**0%**		18%	1%	0%	4%	**4%**	**2%**
		2005	0%	0%	0%	0%	**0%**		0%	0%	0%	7%	**3%**	**2%**
		2006	0%	8%	0%	47%	**19%**		0%	0%	0%	4%	**2%**	**10%**
		2007	0%	25%	46%	49%	**41%**		6%	4%	9%	14%	**10%**	**25%**
4-2	No	2003	0%	0%	28%	0%	**11%**		0%	2%	0%	0%	**0%**	**6%**
		2004	0%	0%	0%	0%	**0%**		41%	4%	0%	8%	**8%**	**4%**
		2005	0%	0%	0%	0%	**0%**		0%	0%	12%	10%	**9%**	**5%**
		2006	0%	30%	23%	68%	**39%**		0%	0%	0%	10%	**4%**	**22%**
		2007	18%	60%	61%	69%	**60%**		7%	8%	12%	18%	**14%**	**37%**
	Yes	2003	0%	0%	11%	0%	**4%**		0%	2%	0%	0%	**0%**	**2%**
		2004	0%	0%	0%	0%	**0%**		41%	4%	0%	8%	**8%**	**4%**
		2005	0%	0%	0%	0%	**0%**		0%	0%	12%	10%	**9%**	**5%**
		2006	0%	30%	15%	65%	**34%**		0%	0%	0%	10%	**4%**	**19%**
		2007	18%	60%	61%	69%	**60%**		7%	8%	12%	18%	**14%**	**37%**
4-1	No	2003	0%	0%	0%	0%	**0%**	**80%**	0%	0%	0%	0%	**0%**	**0%**
		2004	0%	0%	0%	0%	**0%**		0%	0%	0%	0%	**0%**	**0%**
		2005	0%	0%	0%	0%	**0%**		0%	0%	0%	0%	**0%**	**0%**
		2006	0%	16%	3%	49%	**22%**		0%	0%	0%	3%	**1%**	**12%**
		2007	0%	31%	46%	49%	**41%**		5%	4%	8%	14%	**10%**	**25%**
	Yes	2003	0%	0%	0%	0%	**0%**		0%	0%	0%	0%	**0%**	**0%**
		2004	0%	0%	0%	0%	**0%**		0%	0%	0%	0%	**0%**	**0%**
		2005	0%	0%	0%	0%	**0%**		0%	0%	0%	0%	**0%**	**0%**
		2006	0%	8%	0%	47%	**19%**		0%	0%	0%	3%	**1%**	**10%**
		2007	0%	25%	46%	49%	**41%**		5%	4%	8%	14%	**10%**	**25%**
4-2	No	2003	0%	0%	28%	0%	**11%**		0%	0%	0%	0%	**0%**	**5%**
		2004	0%	0%	0%	0%	**0%**		0%	0%	0%	4%	**2%**	**1%**
		2005	0%	0%	0%	0%	**0%**		0%	0%	3%	8%	**5%**	**2%**
		2006	0%	30%	23%	68%	**39%**		0%	0%	0%	10%	**4%**	**22%**
		2007	18%	60%	61%	69%	**60%**		7%	8%	12%	18%	**14%**	**37%**
	Yes	2003	0%	0%	11%	0%	**4%**		0%	2%	0%	0%	**0%**	**2%**
		2004	0%	0%	0%	0%	**0%**		0%	0%	0%	4%	**2%**	**1%**
		2005	0%	0%	0%	0%	**0%**		0%	0%	3%	8%	**5%**	**2%**
		2006	0%	30%	15%	65%	**34%**		0%	0%	0%	10%	**4%**	**19%**
		2007	18%	60%	61%	69%	**60%**		7%	8%	12%	18%	**14%**	**37%**

Table 6-28 shows the calculation of reduction in potentially forgone gross revenue that would have resulted if A season Chinook bycatch cap allocation transfers were allowed, and assumes full transferability would have occurred. Under AS1, transfers would have had the greatest effect in 2006, when total A season forgone gross revenue would have been reduced by $18 million, with CPs accounting for $8 million of the benefit and the inshore CV sector and motherships accounting for $6 million and $4 million respectively. In addition, in 2007 $3 million of reduction in forgone gross revenue would have accrued in the mothership sector.

Under AS2 which is equivalent to AS2 of Alternative 5 when full transferability is allowed, the greatest effect would have been in 2003, when total A season forgone gross revenue would have been reduced by $35 million, all from the CP sector. In 2006, the reduction in forgone gross revenue would have totaled $29 million with CPs accounting for $21 million of the benefit and the inshore CV sector accounting for $8 million.

Alternative 4 and Alternative 5 both allow a “rollover” from the A to the B season; 80 percent is allowed under Alternative 4 and 100 percent is allowed under Alternative 5. A rollover is a management action taken by NMFS to “reapportion” or move salmon bycatch from sector level cap to another. Rollovers are an alternative to, or possibly in addition to, allowing each sector to voluntarily transfer salmon bycatch to another sector. Under the rollover provision, NMFS would rollover unused Chinook salmon bycatch from a sector that has stopped fishing to the sectors still fishing in a season based on the proportion by sector of the total amount of pollock remaining for harvest by all sectors through the end of the season. Successive reapportionment actions would occur as each non-CDQ sector completes harvest of its pollock allocation.

Table 6-29 shows the effect that an 80 percent rollover, allowed under Alternative 4, would have on potentially forgone gross revenue under the annual scenarios without A season transfers. Under AS1, an 80 percent rollover has the greatest effect in 2004, and 2005 when it would have reduced forgone gross revenue by $20 million, mostly in the inshore CV sector. There would have been no effect in 2003 and the effect in 2006 and 2007 would have totaled $2 million. Under AS2, the effect increases to $31 million and $28 million in 2004 and 2005, respectively; however, in contrast to AS1, CDQ groups would have benefited most with a $21 million reduction in potentially forgone gross revenue in 2004. Catcher processors would have gained the most from the rollover in 2005. Interestingly, while there are some very small gross revenue differences when A season transfers are allowed, there is no difference in B season potentially forgone gross revenue at the million dollar rounding level.

Table 6-28 Reduction in potentially forgone pollock revenue due to transferability by Alternative 4 Scenario ($ millions)

Alt. 4		A-Season				**A total**
	Year	CDQ	M	P	S	
AS1	2003	$0	$0	$0	$0	**$0**
	2004	$0	$0	$0	$0	**$0**
	2005	$0	$0	$0	$0	**$0**
	2006	$0	$4	$8	$6	**$18**
	2007	$0	$3	$0	$0	**$3**
AS2	2003	$0	$0	$35	$0	**$35**
	2004	$0	$0	$0	$0	**$0**
	2005	$0	$0	$0	$0	**$0**
	2006	$0	$0	$21	$8	**$29**
	2007	$0	$0	$0	$0	**$0**

Table 6-29 Reduction in B season potentially forgone pollock revenue due to rollovers under Alternative 4 scenarios with no A season transfers ($ millions)

Alt. 4	Rollover Percent	Year	CDQ	M	P	S	**total**
AS1	80%	2003	$0	$0	$0	$0	**$0**
		2004	$9	$0	$0	$10	**$20**
		2005	$0	$0	$0	$20	**$20**
		2006	$0	$0	$0	$2	**$2**
		2007	$0	$0	$1	$0	**$2**
AS2		2003	$0	$1	$0	$0	**$1**
		2004	$21	$1	$1	$8	**$31**
		2005	$0	$0	$22	$6	**$28**
		2006	$0	$0	$0	$0	**$0**
		2007	$0	$0	$0	$0	**$0**

Another component of Alternative 4 is the opt-out and backstop cap provision. Under AS1 of Alternative 4, vessels, sectors or cooperatives would have the ability to opt out of the ICA and fish under the backstop cap of 32,482 Chinook salmon. Salmon bycatch would accrue to the backstop cap from all sectors operating both in and out of the ICA, however, only those who opt out of the ICA are required to cease fishing when the backstop cap is reached. Table 6-30 shows the hypothetical dates that fishing would have been constrained, by season, for CDQ and non-CDQ, under the backstop cap (32,482) that applies to parties who do not participate in the ICA.

Using these closure dates, salmon bycatch levels were calculated to estimate the relative amount of bycatch, by sector, should a sector have ceased fishing on that constraint date (i.e., operated under the backstop cap only and not participated in the ICA; Table 6-31). The amount of forgone pollock, by sector, is shown in Table 6-32, which provides a relative idea of the disincentive for a sector to opt out of the ICA and fish under the backstop cap. Alternative 5, AS1 does not include the ICA opt out provision and backstop cap but rather has a performance standard that will be discussed separately below.

Table 6-30 Hypothetical closure dates, by year and season, under the Alternative 4 backstop cap (32,482, assuming 70/30 A-B season split).

	A season		**B season**	
Year	**CDQ**	**Non-CDQ**	**CDQ**	**Non-CDQ**
2003	11-Mar	26-Feb	20-Sep	8-Oct
2004	--	16-Mar	11-Sep	16-Sep
2005	--	29-Feb	--	12-Sep
2006	15-Mar	6-Feb	--	20-Sep
2007	17-Feb	30-Jan	1-Oct	16-Sep

Table 6-31 Hypothetical Chinook salmon bycatch levels under the Alternative 4 backstop cap (32,482, assuming 70/30 A-B season split).

			A-Season					**B-Season**			**Annual**
Year	CDQ	M	P	S	**A-total**	CDQ	M	P	S	**B-total**	**Total**
2003	1,676	1,664	10,134	9,024	22,499	714	1,182	3,051	4,396	9,343	31,841
2004	1,167	1,819	8,164	10,435	21,585	701	511	2,392	6,095	9,699	31,284
2005	1,294	1,528	8,032	11,142	21,995	560	416	2,864	5,711	9,550	31,545
2006	1,702	1,416	4,410	13,034	20,562	157	108	857	7,687	8,809	29,371
2007	1,459	1,958	5,695	12,761	21,873	650	529	1,898	6,511	9,588	31,460

Table 6-32 Hypothetical forgone pollock levels under the Alternative 4 backstop cap (32,482, assuming 70/30 A-B season split).

	A-Season					B-Season					Annual
Year	CDQ	M	P	S	**A-total**	CDQ	M	P	S	**B-total**	**Total**
2003	11,691	12,384	87,190	93,530	204,795	20,099	3,214	1,166	20,346	44,826	249,621
2004	0	1,489	16,410	21,085	38,984	39,171	20,599	5,788	58,789	124,346	163,330
2005	0	9,710	68,518	85,732	163,960	0	16,014	33,092	83,730	132,836	296,797
2006	4,094	28,305	140,901	192,424	365,723	0	12,962	47,296	92,492	152,751	518,474
2007	35,699	33,625	147,942	196,449	413,716	7,314	16,052	48,598	72,901	144,865	558,580

6.9 Implications of Sector and Cooperative level Quota Share Allocation of Bycatch Caps

Under Alternative 2, if Chinook salmon bycatch is allocated among the sectors, under Component 2, and an allocation is made to the inshore sector then Component 4 (Cooperative provisions) would allow further allocation of transferable or non-transferable salmon bycatch allocations to the inshore cooperatives. Each inshore cooperative and the inshore limited access fishery (if the inshore limited access fishery existed in a particular year) would receive a salmon allocation managed at the cooperative level. If the cooperative or limited access fishery salmon cap is reached, the cooperative or limited access fishery must stop fishing for pollock. The initial allocation of salmon by cooperative within the inshore CV fleet or to the limited access fishery would be based upon the proportion of total sector pollock catch associated with the vessels in the cooperative or limited access fishery (see EIS Chapter 2).

Also under Alternative 2 are options to allow transfers among inshore cooperatives, provided that sector allocations are made and further allocated among the inshore cooperatives and the inshore limited access fishery (if the inshore limited access fishery existed in a particular year). These provisions would allow intercooperative leases of Chinook salmon bycatch allocations or industry initiated transfers with the suboptions of 50 percent, 70 percent and 90 percent as defined for sector transfers. Under these options, when a salmon cooperative cap is reached, the cooperative must stop fishing for pollock and may lease additional Chinook salmon bycatch allocation or arrange a voluntary transfer from another inshore cooperative. These provisions would provide additional opportunity for the inshore cooperatives to mitigate effects of Chinook salmon bycatch caps in essentially the same way that transfers provide that opportunity at the overall sector level.

Under Alternatives 4 and 5, each inshore cooperative and the inshore limited access sector would receive a transferable allocation of the inshore CV sector level cap and would be prohibited from exceeding its Chinook salmon bycatch allocation. Inshore cooperative allocations would be based on that cooperative's AFA pollock allocation percentage. The inshore limited access allocation would be based on the pollock history of those vessels participating in the limited access fishery. A cooperative could transfer its allocation to other cooperatives during a fishing season with no limits on the amount transferred.

Cooperative provisions under a binding hard cap have the potential to mitigate some of the potential for an induced race for fish, at least among the inshore cooperatives. Allocation of bycatch to the cooperative level converts the allocation by sector into smaller allocations at the inshore cooperative level. Each inshore cooperative would then have to manage the operations of its members to stay under their specific cap, or stop fishing. As such, there are clear economic incentives to avoid bycatch. At the larger sector level, those economic incentives are somewhat diminished as higher capacity operators may see an advantage in catching their pollock allocation quickly, with little regard for Chinook salmon bycatch so long as the sector level bycatch allocation is not exceeded. In such circumstances, the smallest or least capable catcher vessels may be adversely affected by the actions of the larger, more capable, vessels (i.e., the incentives to reopen the "race-for-fish," at least at the sector level. This reality, in turn, could affect the formation and membership of the inshore cooperatives themselves, resulting in "capital stuffing" within cooperatives. It is not clear at present to what extent this might become a reality; however, allocation at the inshore cooperative level may mitigate some of the risk associated with the implications of a sector level race for fish for the CV sector.

Alternative 4 and Alternative 5, the Preferred Alternative, contain transferable allocations for sectors and cooperatives, and the benefits of these provisions for reducing potentially forgone gross revenues are presented in the analysis above. If sectors form the required legal entities, they would receive transferable allocations of which they could request NMFS to move a specific amount of the transferable allocation from one entity's account to another entity's account during a fishing season. A cooperatives could request NMFS to move a specific amount of the cooperative's transferable allocation from its account to another cooperative's account during a fishing season.

As the Council's Scientific and Statistical Committee (SSC) correctly observed (October 2008), there is a fundamental difference between a target or retainable incidental catch "*allocation*," on the one hand, and a PSC limit "*allowance*," on the other. They state, in relevant part, *"The former imparts a harvest 'use privilege', while the latter must be regarded as a "prohibition" against harvest (to the maximum extent practicable), with an absolute cap. No "use privilege" is implied by a PSC …. Instead, every practicable effort is required to be made to avoid use of this PSC, and if avoidance is not possible, to minimize its occurrence."* In the former case, the allocation establishes a use-privilege and provides for conversion of the non-target catch to private ownership. In the case of a PSC allowance, no use-privilege authorizing removal of a specific amount of resource is conveyed and conversion of PSC to private ownership is strictly prohibited. These are crucial differences that should not be lost sight of. Indeed, this is so critical a distinction that it has been enshrined as National Standard 9 of the Magnuson-Stevens Act:

> (9) Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

This view of PSC limits appears to conflict with proposals that envision transfer, trading, or rolling-over of residual Chinook bycatch amounts, between AFA pollock entities or sectors. This is so, because a "sector transfer provision" conceptually suggests that, once a PSC hard cap level is chosen, it may be acceptable for Chinook salmon bycatch to *achieve* that level of removal. If that interpretation is adopted, then it may also be acceptable to allow sectors that do not remove all of their Chinook salmon bycatch allowance to transfer it to other sectors, in order to facilitate continued exploitation of the available pollock resource. Redistributing residual Chinook salmon bycatch, would, it is asserted, mitigate some portion of the forgone pollock revenues attributable to excessive bycatch of Chinook salmon by one or another AFA element. This interpretation of what the Chinook salmon bycatch cap constitutes seemingly reverses the SSC's referenced concept of PSC apportionment. That is, the language of Alternative 2, Component 3, option 1 would, in effect, establish Chinook PSC amounts as tradable incidental catch "*allocation*," with commercially negotiable use-privileges to removal (although not conversion to private ownership) of a specific quantity of Chinook salmon. This clearly changes the relationship of Chinook salmon PSC within the pollock industry, making it just another economic input to production that can be traded, sold, bartered, or withheld in the competitive prosecution of the Bering Sea pollock fishery. Alternative 4 and Alternative 2, option 1 of Component 3, promotes this approach as does Alternative 5, the Council's Preferred Alternative.

Alternatively, it may be preferable to define a hard cap amount as an upper bound on Chinook salmon bycatch with the intent to promote actions that minimize Chinook salmon bycatch under that cap. Such an action might be deemed appropriate in order to promote greater Chinook salmon conservation, than afforded under full transferability, up to the overall cap, while still affording some opportunity mitigate impact to the pollock fleet. Under Alternative 2, the suboption to Option 1 of Component 3 provides an opportunity for such measures. The suboption would limit transfers to a) 50 percent, b) 70 percent or c) 90 percent of the Chinook salmon that is available to the transferring entity at the time of transfer. Clearly, more Chinook salmon would be conserved with the 50 percent transferability than with 70 percent or 90 percent, although far fewer than without transferable allocations, and the reverse is true of mitigation of adverse impacts on pollock fleet gross revenue. Unlike Alternative 2, Alternative 4 does not contain a provision to limit the amount an allocation that can be transferred.

Interestingly, if no transfer provision were recommended under Alternative 2, the CDQ Chinook salmon sector level cap would continue to be managed as it is under status quo, with further allocation of the CDQ cap among the six CDQ groups, transferable allocations within the CDQ Program, and a prohibition against a CDQ group exceeding its Chinook salmon bycatch allocation. In other word, the CDQ groups already have transferable Chinook salmon bycatch caps and would continue to enjoy that flexibility in the absence of inclusion of transferability options for all sectors.

An important distinction should be made between voluntary transfers and rollovers. Voluntary transfers are industry initiated and fully voluntary. Meaning, the entity that represents a sector that has unused Chinook salmon bycatch must request the transfer. If that entity does not feel compelled to make a voluntary transfer, or an entity cannot be created or cannot reach consensus among members to make the transfer, then some Chinook salmon bycatch allocation could be unused and, potentially, some pollock that could otherwise have been harvested if the transfer hade been made would remain unharvested. In contrast, a rollover managed by NMFS is a somewhat automatic reapportionment that is not voluntary and, thus, does not suffer from the risks associated with voluntary transfers.

While this discussion has used terminology more appropriate to hard caps, it is also applicable to the triggered closures of Alternative 3, but in a slightly different way. Under the triggered closure, NMFS would not issue fishery closures once the trigger cap was reached for each sector. Rather, the trigger closures would be managed similar to current management of the trigger closures under the CDQ Program. Each sector would receive a transferable trigger cap allocation, and vessels participating in that sector would be prohibited from fishing inside an area selected under Component 5 after the sector's trigger cap is reached.

6.10 Potential Impacts on Pollock Fishery Dependent Communities

Many of the communities of coastal Alaska that are adjacent to the Bering Sea are engaged in, and highly dependent upon, the commercial fisheries in the adjacent EEZ. The nature of engagement varies from community to community and from fishery to fishery. Some communities have fish processing facilities, others are homeport to harvest vessels, and many have both processors and harvesters. Some of the larger communities also have relatively well-developed fishing support sectors. Other communities participate in the fisheries primarily through the CDQ program. The engagement of CDQ communities occurs in a variety of ways, including receipt of royalties, investment in commercial fishing harvest and/or processing entities, and direct participation in commercial fishing activities through owning/operating vessels. CDQ investments in community fisheries infrastructure, training, and vessels have resulted in additional employment and income for local residents. Sixty-five CDQ communities and numerous Alaska non-CDQ communities (including Unalaska/Dutch Harbor, Sand Point, King Cove, Chignik, Adak, and Kodiak) are most clearly and directly engaged in and dependent upon multiple BSAI fisheries.

In addition, Seattle, Washington (and the adjacent Puget Sound area) has a substantial and direct involvement in many of these fisheries. Harvest vessels from Oregon, especially from Newport, also account for a significant portion of the total catch in a number of the larger groundfish and crab fisheries.

For the dependent Alaska communities, there are very few economic opportunities available as an alternative to commercial fishing related activities, whether it be related to groundfish or salmon. For many of these communities (and especially the CDQ communities), unemployment is chronically high, well above the national average, and the potential for economic diversification of these largely remote, isolated, local economies is very limited. Indeed, it is this absence of economic opportunity, combined with the ebb and flow of fishery activity, that has historically resulted in a high level of transient, seasonal labor, and an unstable population base in many of the communities with processing facilities. Closure of the pollock fishery under a hard cap or closure of an area under a triggered closure could further reduce employment and business opportunities, especially in communities with significant investment in onshore groundfish processing capacity and fleet services, further destabilizing these rural coastal communities. At the same time, reduction in Chinook salmon bycatch may result in improved commercial Chinook salmon fishing and processing opportunities in communities that have historically depended on commercial Chinook salmon fisheries to infuse cash into a mixed cash-subsistence economy.

The structural changes in commercial fishing attributable to the Chinook salmon bycatch minimization measure actions would affect virtually every aspect of the fishery, from firms with direct and obvious linkages to the Bering Sea pollock fishery, such as maritime equipment purveyors, fuel pier operators, cold storage and bulk cargo transshipping firms to local hotels, restaurants, bars, grocery stores, and commercial air carriers serving the local fishing communities. While not readily amenable to quantitative estimation at present, overall, many of these relatively isolated, rural, fishery-dependent communities would likely experience some level of loss in economic and social welfare, as reflected through a general decline in the quality-of-life for their residents. Beyond the private sector effects, local government jurisdictions would likely be adversely affected as well. Most of these coastal fishing communities rely heavily upon tax revenues associated with fishing activities, in all its myriad forms, for operating and capital funds (e.g., fish landings taxes, business and property taxes, sales taxes).

As populations adjust to structural changes associated with some of the alternatives, emigration would likely impose burdens on local social service agencies. For example, school districts depend for economic support upon state and federal revenues based upon per capita enrollment. Because few, if any, viable alternative sources of economic activity exist in most of these rural coastal Alaska communities, the prospects for mitigating any adverse impacts do not appear promising, at least in the foreseeable future.

Fishing is the economic base in many of these communities. Moreover, these communities are generally very fragile, in the sense that they do not have well-developed secondary economic sectors. The cost of doing business in these communities is high and few retail or other firms find it economically advantageous to locate in them. As a result, local residents often have no choice but to spend a large part of their incomes outside their communities. In addition, many who work in the fishing and/or processing sector in these communities are transient laborers who take a large part of their incomes home with them at the end of the season.

Anything that tends to diminish economic activity in such a setting (e.g., reduction in seafood landings, fishing activity, and associated imports of goods and services for the fishing sectors and exports of fishery products) can cause disproportionate harm to an already limited infrastructure in these communities. Many of these communities may become vulnerable to loss of transportation service due to disruptions in key fisheries. While the relationship is likely not perfectly linear, the more significant the structural change associated with the final alternative adopted (e.g., the greater the increase in potentially forgone gross revenue and/or revenue at risk, especially those in proximity to these communities), the greater will likely be the adverse effects on community stability, social welfare, and quality of life.

Communities that support and depend upon these commercial fisheries may incur substantial adverse economic, socioeconomic, and cultural impacts as they adjust to changes in the total magnitude of fishery related activities, associated with newly imposed requirements of Chinook salmon bycatch management. Because much of the economic infrastructure of rural Alaska coastal communities has developed in support of commercial fishing, secondary adverse effects on businesses that supply goods and services to the fleet could also be widespread.

Table 6-33 below shows the ports of delivery for the Bering Sea pollock fishery in 2006, the number of vessels delivering to those ports, and the tonnage of pollock deliveries. This information identifies the Dutch Harbor/Akutan area as a primary processing port. Additionally, several floating processors operate in the Dutch Harbor area. Thus, the communities located within the Aleutian and Pribilof Islands Region, as defined by ADOLWD, are those most likely affected by pollock fishery contraction. The following section provides information on the scale of the commercial fisheries activity in the region, as tabulated by ADOLWD. Further, in the sections that follow, the potential impacts of the proposed action on tax revenues and shoreside value added processing are discussed.

Table 6-33 Bering Sea pollock fishery ports of delivery in 2006. (Ports with fewer than four processors are grouped into the “Other” category to preserve confidentiality.)

Port	Processors	Tons	Vessels
Dutch Harbor/Akutan	**7**	**615,768**	**139**
Catcher/Processors	**8**	**173,682**	**96**
Other (includes floating processors)	**80**	**678,174**	**80**

6.10.1 Aleutian and Pribilof Islands Region Dependence on Fisheries

Fig. 6-2 depicts the locations of the canneries and land based seafood processors in the region, and identifies the organizations that operate in each location. This information is reprinted with permission of the ADOLWD (Windish-Cole 2008).

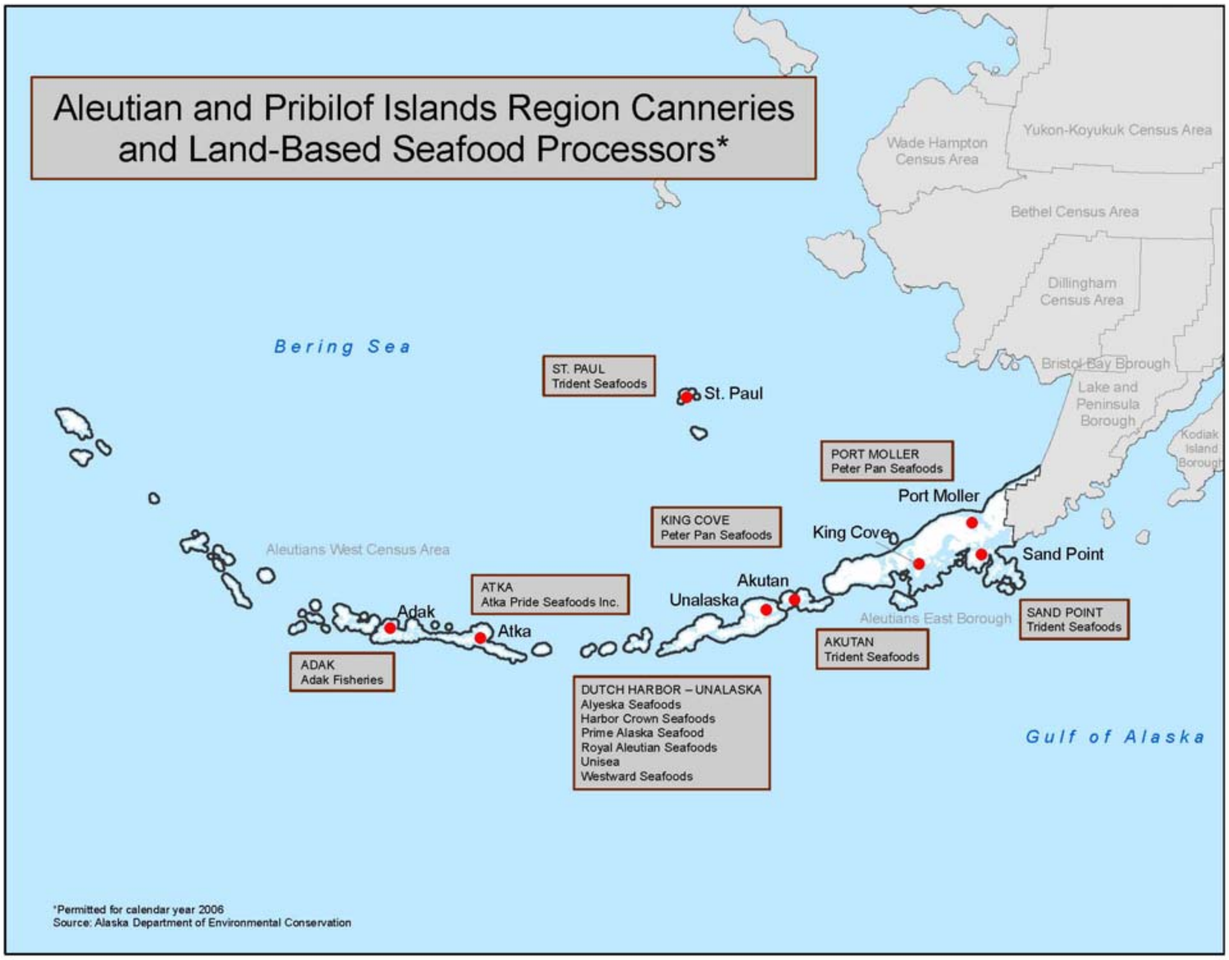

Fig. 6-2 Aleutian and Pribilof Islands Region canneries and land-based seafood processors
Source: ADOLWD

Table 6-34 is adapted from an ADOLWD (Windish-Cole 2008) analysis of local resident crew members, by census areas, with the region defined by ADOLWD as the Aleutian and Pribilof Islands Region. The Aleutian and Pribilof Islands Region includes the communities, Boroughs, and Census areas associated with the fisheries of the Bering Sea and Aleutian Islands. Overall, in the Aleutian and Pribilof Islands Region, 2505 crew licenses were purchased in 2005. ADOLWD estimates that 574 of those licenses were purchased by local residents the three boroughs in the region.

Table 6-34 Local resident crew members, Aleutian and Pribilof Islands Region, 2001 - 2006

Borough/Census Area	**Local Residents Who Bought Commercial Crew Licenses**					
	2000	**2001**	**2002**	**2003**	**2004**	**2005**
Aleutians East Borough	386	N/A	268	268	277	222
Aleutians West Census Area	187	N/A	207	246	244	243
Chignik and surrounding area	144	N/A	99	117	82	109
Local Resident Total	717	N/A	574	631	603	574
Region's Harvest Total	3404	3253	2897	2932	2787	2505

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.

ADOLWD has also tabulated data on fish harvesting employment and earnings by gear type in the Aleutian and Pribilof Islands Region, which is reprinted with permission (Windish-Cole 2008) in Table 6-35. The largest proportions of the total estimated workforce in this region have come from the Pot (crab) and longline (halibut, sablefish, Pacific cod) fisheries. However, in terms of earnings the trawl fisheries, including but not limited to pollock, are of the greatest value historically. The trawl fisheries also have the highest proportions of non-resident participation, followed by the pot and longline fisheries. Salmon fisheries (gillnet, seine, and set-net combined), while having lower overall value, contribute substantially to the overall workforce and generally have greater local resident participation. This information shows that the Aleutian and Pribilof Islands Region supports diverse commercial fishing activity inclusive of pot, longline, trawl and salmon fisheries upon which considerable numbers of local residents and non-residents depend.

Aleutian and Pribilof Islands Region fish harvesting employment numbers, by species and month, also tabulated by ADOLWD, are shown in Table 6-36. Harvesting employment in the region tends to be dominated by the groundfish fisheries, including but limited to the pollock fishery, and while spread across all months is greatest in the A season months of January, February and March.

Table 6-35 Fish harvesting employment and gross earnings by gear type, 2000-2005, Aleutian and Pribilof Islands Region[1]

Year	Gear Type	Vessels[2]	Total Estimated Workforce[3]	Total Gross Earning of Permit Holders[4]	Percent of Gross Earnings Earned by Nonresident Permit Holders
2000	Gillnet	162	486	$13,031,460	56.3
2001	Gillnet	141	421	3,660,962	58.7
2002	Gillnet	122	362	4,145,852	53.9
2003	Gillnet	118	350	4,996,797	56.7
2004	Gillnet	123	366	7,853,530	55.3
2005	Gillnet	121	363	10,798,350	56.7
2000	Longline	349	1,271	$80,554,177	57.6
2001	Longline	349	1,241	73,257,912	59.3
2002	Longline	345	1,183	80,477,716	57.4
2003	Longline	345	1,170	98,865,417	57.5
2004	Longline	309	1,051	83,513,203	56.1
2005	Longline	320	1,088	81,742,519	55.6
2000	Pot Gear	358	2,029	$140,752,277	74.6
2001	Pot Gear	348	1,949	114,761,446	79.2
2002	Pot Gear	322	1,830	140,116,515	75
2003	Pot Gear	339	1,906	176,729,360	76.1
2004	Pot Gear	349	1,960	161,472,660	75.1
2005	Pot Gear	275	1,495	152,212,665	75.7
2000	Seine	181	874	$19,284,224	17.7
2001	Seine	161	775	11,749,377	14.6
2002	Seine	92	450	8,568,590	6.1
2003	Seine	95	462	9,156,219	9.4
2004	Seine	74	362	10,633,851	9.5
2005	Seine	89	436	13,250,356	17
2000	Set-Net	-	214	$5,147,232	20
2001	Set-Net	-	184	1,957,668	19.4
2002	Set-Net	-	182	1,990,435	14
2003	Set-Net	-	176	2,771,342	14.1
2004	Set-Net	-	172	3,871,641	19.2
2005	Set-Net	-	184	4,903,490	12.8
2000	Trawl	172	858	$242,632,615	92.9
2001	Trawl	164	818	203,322,275	91.8
2002	Trawl	162	808	225,232,638	93.9
2003	Trawl	149	743	186,687,352	93.9
2004	Trawl	141	703	234,510,178	94.1
2005	Trawl	142	710	179,229,558	93.2

[1]For the purposes of this report, harvesting data from Chignik, Chignik Bay, Chignik Lagoon, and Chignik Lake are included in the Aleutian and Pribilof Islands Region.

[2]Skiffs and small vessels are usually not registered as commercial vessels and are therefore not included

[3]Workforce refers to the number of fisherman fishing permits plus the requisite crew members needed
[4]Gross earnings, or revenue, are currently the most reliable data available, but are not directly
Source: Commercial Fisheries Entry Commission

Table 6-36 Fish harvesting employment by species and month, 2000 - 2006, Aleutian and Pribilof Islands Region

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Monthly Average
All Species[1]													
2000	1,715	1,999	1,897	2,796	965	2,610	2,898	3,232	2,125	2,509	514	291	1,962
2001	1,361	2,721	1,754	1,233	1,055	2,047	3,003	3,239	2,135	2,755	645	351	1,858
2002	2,032	2,712	1,711	1,021	995	2,055	2,586	2,728	2,004	2,844	596	87	1,781
2003	2,061	2,051	1,547	982	955	2,146	2,520	2,645	2,046	2,758	646	64	1,702
2004	2,336	1,957	1,211	968	977	2,048	2,307	2,301	1,650	2,714	627	37	1,594
2005	2,492	1,700	1,148	895	805	2,297	2,457	2,192	1,641	1,690	933	396	1,554
2006[2]	1,687	1,767	1,687	1,058	658	2,057	2,433	2,414	1,795	1,603	902	160	1,518
Crab													
Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Monthly Average
2000	42	96	66	1,464	114	45	42	130	159	1,504	131	42	320
2001	246	1,260	132	84	81	50	45	153	153	1,513	90	60	322
2002	828	1,146	126	90	24	35	39	170	186	1,735	84	24	374
2003	798	552	54	18	21	16	53	174	181	1,730	138	36	314
2004	1,023	327	60	6	12	33	43	170	107	1,586	99	30	292
2005	1,236	204	21	6	3	16	40	73	88	476	510	162	236
2006	312	333	426	156	45	6	30	50	85	570	585	27	219
Groundfish													
Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Monthly Average
2000	1,673	1,903	1,808	1,127	310	403	629	945	940	717	290	249	916
2001	1,115	1,461	1,586	921	454	594	853	1,079	1,242	842	391	291	902
2002	1,204	1,563	1,539	706	373	464	830	1,039	1,075	792	363	63	834
2003	1,263	1,496	1,440	754	424	550	869	1,029	1,029	718	325	28	827
2004	1,311	1,621	1,049	812	488	591	781	975	975	885	358	7	821
2005	1,256	1,496	1,053	755	349	629	782	885	994	858	303	234	800
2006	1,371	1,434	1,182	734	241	640	814	931	1,039	658	195	129	781
Halibut[2]													
Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Monthly Average
2000	0	0	15	111	348	464	472	643	435	194	70	0	229
2001	0	0	17	136	356	527	549	701	424	315	114	0	262
2002	0	0	32	161	408	527	622	675	416	233	88	0	264
2003	0	0	34	159	308	470	454	619	418	171	120	0	229
2004	0	0	48	82	281	404	444	557	341	135	81	0	198
2005	0	0	51	74	294	447	384	526	321	247	69	0	201
2006[2]	0	0	70	116	267	377	451	556	356	284	82	0	213
Herring													
Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Monthly Average
2000	0	0	0	0	0	0	104	0	0	0	0	0	9
2001	0	0	0	0	0	18	85	0	0	0	0	0	9
2002	0	0	0	0	0	0	100	0	0	0	0	0	8
2003	0	0	0	0	0	0	76	0	0	0	0	0	6
2004	0	0	0	0	0	0	46	0	0	0	0	0	4
2005	0	0	0	0	21	0	16	0	0	0	0	0	3
2006	0	0	0	0	0	0	15	0	0	0	0	0	1

Miscellaneous Shellfish													
Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Monthly Average
2000	0	0	0	0	0	0	3	3	7	3	3	0	2
2001	0	0	0	3	0	0	0	2	2	2	3	0	1
2002	0	3	0	0	0	0	6	3	4	0	3	0	2
2003	0	3	0	0	0	0	3	0	0	0	0	0	1
2004	2	9	4	0	2	3	0	0	3	24	14	0	5
2005	0	0	0	4	0	0	0	0	5	8	0	0	1
2006	4	0	0	0	0	0	0	0	0	0	4	4	1
Sablefish													
Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Monthly Average
2000	0	0	8	94	193	210	155	151	117	91	20	0	86
2001	0	0	19	90	165	217	193	200	122	83	47	0	95
2002	0	0	14	64	191	175	159	195	156	82	58	0	91
2003	0	0	19	52	202	215	205	236	217	135	63	0	112
2004	0	0	50	68	195	170	174	181	145	84	75	0	95
2005	0	0	23	56	139	154	116	143	120	101	51	0	75
2006	0	0	9	52	105	111	146	162	107	91	36	0	68
Salmon													
Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Monthly Average
2000	0	0	0	0	0	1,488	1,493	1,360	467	0	0	0	401
2001	0	0	0	0	0	642	1,279	1,104	193	0	0	0	268
2002	0	0	0	0	0	854	830	647	168	2	0	0	208
2003	0	0	0	0	0	895	860	588	202	4	0	0	212
2004	0	0	0	0	0	848	820	419	79	0	0	0	180
2005	0	0	0	0	0	1,051	1,120	566	113	0	0	0	238
2006	0	0	0	0	0	923	977	715	209	0	0	0	235

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 Alaska Department of Labor and Workforce Development, Research and Analysis Section

Table 6-37 provides estimated seafood processing employment and percent of non-resident workers and percent of non-resident earnings in the Aleutian and Pribilof Islands Region. The total worker count in the Aleutian and Pribilof Islands Region seafood processing sector has ranged from 6,592 in 2000, to a high of 7,331 in 2003 and was 7,243 in 2005. Non-resident workers have made up a large proportion, more than 75 percent in all years. Total processing workforce wages in the Aleutian and Pribilof Islands Region were a period high of $115 million in 2005, nearly three quarters of which were earned by non-residents.

Table 6-37 Aleutian and Pribilof Islands Region seafood processing workforce and earnings, 2000–2005

Seafood Processing				
Year	**Total Worker Count**	**Percent Nonresident Workers**	**Wages**	**Percent Nonresident Wages**
2000	6,592	75.6	$74,218,617	62.3
2001	7,067	76.6	$81,734,163	65.0
2002	6,969	77.9	$90,271,050	68.4
2003	7,331	79.4	$108,397,216	72.5
2004	7,041	80.7	$108,021,030	73.5
2005	7,243	81.7	$114,786,581	74.4

Sources: Commercial Fisheries Entry Commission and ADOLWD, Research and Analysis Section, reprinted with permission (Windish-Cole 2008)

The information on employment, participation, and wages presented above for the Aleutian and Pribilof Islands Region is intended to provide an indication of the scale of fishing activity in the region as well as documentation of the relative importance of groundfish fisheries to the region. The boroughs and communities most likely affected by the proposed action on the pollock fishery are also identified. While a direct linkage of impacts of the alternatives on employment, both shoreside and among vessel crew, and on expenditures within communities dependent on these fisheries is not possible with presently available information, this information is intended to provide a qualitative treatment of the scale of the fishery activity within dependent communities. The analysis below provides additional information on potential shoreside value added processing impacts as well as potential impacts on State and local tax revenue.

6.10.2 Assessment of Potential Impact of Alternative 4 and Alternative 5 on Shoreside Value Added Processing

This assessment provides a breakout of the shoreside processing sector revenue (processing value added) by port group. **It is important to recognize that the dollar values in this assessment must not be added to the estimated effects on potentially forgone first wholesale gross revenue provided in the RIR for the aggregated shoreside (S) sector. The potential impact values shown here are a subset of the values provided in the RIR and are intended to highlight the potential effects on value added processing by port group.**

Confidentiality of data regulations necessitate the creation of two port groups. The two port groups that have been created are the Akutan and Dutch Harbor (AKU/DUT) group, and the “All Others” group. The AKU/DUT group denotes the aggregate of all processing facilities in the Akutan and Dutch Harbor areas, including some floating processors. The All Others group includes King Cove, Kodiak, Sand Point, and several floating processors. These combinations account for all shoreside processing of Bering Sea pollock.

Shown in the tables below are the breakout of ex-vessel and shoreside processing values, as well as their total, and the percent each group-season-year- category represents of the annual total value. These percentages are used to estimate the potential effects on each port group, in each year and season, by multiplying that percentage by estimated effects on the shoreside sector. This method “allocates” effects on each group-season-year, relative to their observed proportion of total first wholesale value. Thus, this is not an accounting of actual effects, but rather is a proportionality-based estimate of where the potential effects may accrue. This has been done, at least in part, to enhance the presentation of economic impact information, while maintaining confidentiality constraints.

Table 6-38 Bering Sea pollock ex-vessel value by port group and year ($millions)

Port Group	Season	2003	2004	2005	2006	2007
AKU/DUT	A	$68	$73	$85	$85	$78
	B	$82	$75	$88	$92	$78
	Total	**$149**	**$148**	**$173**	**$177**	**$156**
All Others	A	$4	$5	$7	$6	$6
	B	$5	$6	$7	$7	$6
	Total	**$9**	**$11**	**$13**	**$13**	**$12**
	Grand Total	**$158**	**$159**	**$186**	**$190**	**$168**

Sources: Terry Hiatt: Alaska Fisheries Science Center, from data compiled for the Economic Status and Fishery Evaluation Report, 2007.

Table 6-39 Bering Sea pollock shoreside processing value by port group and year ($millions)

Port Group	Season	2003	2004	2005	2006	2007
AKU/DUT	A	$132	$141	$167	$154	$160
	B	$160	$144	$175	$166	$161
	Total	**$292**	**$285**	**$342**	**$319**	**$322**
All Others	A	$3	$2	$4	$4	$5
	B	$3	$2	$4	$4	$5
	Total	**$6**	**$3**	**$8**	**$8**	**$9**
	Grand Total	**$297**	**$288**	**$350**	**$327**	**$331**

Sources: Terry Hiatt: Alaska Fisheries Science Center, from data compiled for the Economic Status and Fishery Evaluation Report, 2007.

Table 6-40 Bering Sea pollock total shoreside sector value (ex-vessel value plus shoreside processing value added) by port group and year ($millions)

Port Group	Season	2003	2004	2005	2006	2007
AKU/DUT	A	$200	$214	$252	$239	$238
	B	$241	$218	$263	$257	$239
	Total	**$441**	**$432**	**$515**	**$496**	**$478**
All Others	A	$7	$7	$10	$10	$10
	B	$8	$7	$11	$11	$10
	Total	**$15**	**$14**	**$21**	**$20**	**$21**
	Grand Total	**$456**	**$446**	**$536**	**$517**	**$498**

Sources: Terry Hiatt: Alaska Fisheries Science Center, from data compiled for the Economic Status and Fishery Evaluation Report, 2007.

Table 6-41 Bering Sea pollock processing value as a percent of total first wholesale value

Port Group	Season	2003	2004	2005	2006	2007
AKU/DUT	A	43.83%	47.93%	47.03%	46.22%	47.83%
	B	52.97%	48.90%	49.03%	49.82%	48.01%
	Total	**96.80%**	**96.83%**	**96.07%**	**96.05%**	**95.84%**
All Others	A	1.45%	1.57%	1.92%	1.90%	2.07%
	B	1.75%	1.60%	2.01%	2.05%	2.08%
	Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**
	Grand Total	43.83%	47.93%	47.03%	46.22%	47.83%

Sources: Terry Hiatt: Alaska Fisheries Science Center, from data compiled for the Economic Status and Fishery Evaluation Report, 2007.

Following the value tables are two tables that provide estimates of shoreside processing revenue (value added) effects, and the percentage of total processing revenue they represent, by port group, year, and season for Alternative 4 and Alternative 5 (the Preferred Alternative). These estimates are tabulated by multiplying the percentages discussed above, by the shoreside sector effects estimates provided for the in Table 6-26

As shown in Table 6-42, both AS1 of Alternative 4 and AS1 of Alternative 5 had no effect on any shoreside value added processing revenue in the A season from 2003-2005, as the bycatch amounts were below the bycatch cap. However, shoreside value added processing would have been affected by AS1 under both alternatives in 2006 and 2007.

The potentially forgone A season pollock shoreside value added processing revenue under AS1 of Alternative 5 would have totaled $62 million (40 percent), and $73 million (44 percent) in 2006 and 2007. Recall that these values are a subset of the shoreside total potential forgone pollock revenue of $130 million and $145 million and are not additional impacts to those already discussed. This treatment is solely intended to show the proportion of impact that might occur specifically to shoreside processing. Of note is that the vast majority of this impact is attributable to the Akutan and Dutch Harbor area. Also of note is that A season transferability (in Alternative 4) generally reduces the potential impacts; however, the effect of transferability, while shown in the tables, won’t be specifically discussed here. The interested reader may see the effects in the tables below.

The potentially forgone A season pollock gross revenue under AS1 of Alternative 4, without transferability, would have totaled $ 59 million (37 percent), and $61 million (37 percent) in 2006 and 2007, respectively. The effect of AS2 in Alternative 4, without transferability, shows a similar pattern with $82 million (52 percent) and $86 million (52 percent) in total potentially forgone shoreside value added processing gross revenues in 2006 and 2007 A seasons, respectively.

The B season effects of AS1 of Alternative 5 would have been smaller than the A season effects but would have additionally occurred in 2005. The potential shoreside value added revenue impacts would have been $1 million (1 percent), $7 million (4 percent), and $20 million (12 percent) in 2005, 2006, and 2007 respectively. The B season effects of AS1 of Alternative 4 would also have been smaller than the A season effects but would have additionally occurred in 2005 and 2006. The potential shoreside value added revenue impacts would have been $5 million (4 percent), $10 million (6 percent), $6 million (3 percent,), and $10 million (11 percent) in potentially forgone shoreside value added gross revenues in 2004, 2005, 2006, and 2007 respectively. Under AS2 of Alternative 4, the effects would have been $9 million (6 percent), $14 million (8 percent), $14 million (8 percent,), and $23 million (14 percent) in potentially forgone shoreside value added gross revenues in 2004, 2005, 2006, and 2007 respectively.

Table 6-42 Hypothetical potentially forgone shoreside value added pollock first wholesale processing revenue by year, season, and aggregated port group under Alternative 5 AS1, Alternative 4 AS1, and Alternative 4 AS2. ($ Millions)

AS	A-season Transfer-Ability	Year	A-Season AKU/ DUT	All Other	Processing Total	S Total	A-B Roll-over	B-Season AKU/ DUT	All Other	Processing Total	S Total	Pro-cessing Annual Total	Shore-side Annual Total
5-1	Yes	2003	$0	$0	$0	$0	100 %	$0	$0	$0	$0	$0	$0
		2004	$0	$0	$0	$0		$0	$0	$0	$0	$0	$0
		2005	$0	$0	$0	$0		$1	$0	$1	$3	$1	$3
		2006	$60	$2	$62	$130		$7	$0	$7	$14	$70	$144
		2007	$70	$3	$73	$145		$19	$1	$20	$39	$92	$185
4-1	No	2003	$0	$0	$0	$0	0%	$0	$0	$0	$0	**$0**	**$0**
		2004	$0	$0	$0	$0		$5	$0	$5	$10	**$5**	**$10**
		2005	$0	$0	$0	$0		$10	$0	$10	$20	**$10**	**$20**
		2006	$56	$2	$59	$122		$5	$0	$6	$11	**$64**	**$133**
		2007	$59	$3	$61	$123		$17	$1	$18	$36	**$80**	**$159**
	Yes	2003	$0	$0	$0	$0		$0	$0	$0	$0	**$0**	**$0**
		2004	$0	$0	$0	$0		$5	$0	$5	$10	**$5**	**$10**
		2005	$0	$0	$0	$0		$10	$0	$10	$20	**$10**	**$20**
		2006	$54	$2	$56	$116		$5	$0	$6	$11	**$61**	**$127**
		2007	$59	$3	$61	$123		$17	$1	$18	$36	**$80**	**$159**
4-2	No	2003	$0	$0	$0	$0		$0	$0	$0	$0	**$0**	**$0**
		2004	$0	$0	$0	$0		$9	$0	$9	$18	**$9**	**$18**
		2005	$0	$0	$0	$0		$13	$1	$14	$27	**$14**	**$27**
		2006	$78	$3	$82	$169		$14	$1	$14	$27	**$96**	**$197**
		2007	$82	$4	$86	$172		$22	$1	$23	$46	**$109**	**$218**
	Yes	2003	$0	$0	$0	$0		$0	$0	$0	$0	**$0**	**$0**
		2004	$0	$0	$0	$0		$9	$0	$9	$18	**$9**	**$18**
		2005	$0	$0	$0	$0		$13	$1	$14	$27	**$14**	**$27**
		2006	$75	$3	$78	$162		$14	$1	$14	$27	**$92**	**$189**
		2007	$82	$4	$86	$172		$22	$1	$23	$46	**$109**	**$218**
4-1	No	2003	$0	$0	$0	$0	80%	$0	$0	$0	$0	**$0**	**$0**
		2004	$0	$0	$0	$0		$0	$0	$0	$0	**$0**	**$0**
		2005	$0	$0	$0	$0		$0	$0	$0	$0	**$0**	**$0**
		2006	$56	$2	$59	$122		$4	$0	$5	$9	**$63**	**$131**
		2007	$59	$3	$61	$123		$17	$1	$18	$36	**$80**	**$159**
	Yes	2003	$0	$0	$0	$0		$0	$0	$0	$0	**$0**	**$0**
		2004	$0	$0	$0	$0		$0	$0	$0	$0	**$0**	**$0**
		2005	$0	$0	$0	$0		$0	$0	$0	$0	**$0**	**$0**
		2006	$54	$2	$56	$116		$4	$0	$5	$9	**$60**	**$125**
		2007	$59	$3	$61	$123		$17	$1	$18	$36	**$80**	**$159**
4-2	No	2003	$0	$0	$0	$0		$0	$0	$0	$0	**$0**	**$0**
		2004	$0	$0	$0	$0		$5	$0	$5	$10	**$5**	**$10**
		2005	$0	$0	$0	$0		$10	$0	$11	$21	**$11**	**$21**
		2006	$78	$3	$82	$169		$14	$1	$14	$27	**$96**	**$197**
		2007	$82	$4	$86	$172		$22	$1	$23	$46	**$109**	**$218**
	Yes	2003	$0	$0	$0	$0		$0	$0	$0	$0	**$0**	**$0**
		2004	$0	$0	$0	$0		$5	$0	$5	$10	**$5**	**$10**
		2005	$0	$0	$0	$0		$10	$0	$11	$21	**$11**	**$21**
		2006	$75	$3	$78	$162		$14	$1	$14	$27	**$92**	**$189**
		2007	$82	$4	$86	$172		$22	$1	$23	$46	**$109**	**$218**

Notes: AKU/DUT: Denotes the aggregate of all processing facilities in the Akutan and Dutch Harbor areas, including some floating processors.
All Others: May include King Cove, Kodiak, Sand Point, and several floating processors.

Table 6-43 Hypothetical potentially forgone shoreside value-added pollock first wholesale processing revenue, in percent of total forgone pollock revenue, by port group, season, year, Alternative 5 AS1, Alternative 4 AS1, and Alternative 4 AS2.(% of total wholesale revenue).

AS	A-season Transfer-Ability	Year	A-Season AKU/DUT	A-Season All Other	A-Season Processing Total	A-Season S Total	A-B Roll over	B-Season AKU/DUT	B-Season All Other	B-Season Processing Total	B-Season S Total	**Pro-cessing Annual Total**	**Shore side Annual Total**
5-1	Yes	2003	0%	0%	0%	0%	**100 %**	0%	0%	0%	0%	**0%**	**0%**
		2004	0%	0%	0%	0%		0%	0%	0%	0%	**0%**	**0%**
		2005	0%	0%	0%	0%		1%	1%	1%	1%	**0%**	**0%**
		2006	39%	66%	40%	52%		4%	7%	4%	5%	**21%**	**28%**
		2007	43%	66%	44%	58%		12%	18%	12%	16%	**28%**	**37%**
4-1	No	2003	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	**0%**
		2004	0%	0%	0%	0%		3%	10%	4%	4%	**2%**	**2%**
		2005	0%	0%	0%	0%		6%	10%	6%	7%	**3%**	**4%**
		2006	37%	62%	37%	49%		3%	5%	3%	4%	**20%**	**26%**
		2007	37%	56%	37%	49%		11%	17%	11%	15%	**24%**	**32%**
	Yes	2003	0%	0%	0%	0%		0%	0%	0%	0%	**0%**	**0%**
		2004	0%	0%	0%	0%		3%	10%	4%	4%	**2%**	**2%**
		2005	0%	0%	0%	0%		6%	10%	6%	7%	**3%**	**4%**
		2006	35%	59%	35%	47%		3%	5%	3%	4%	**19%**	**25%**
		2007	37%	56%	37%	49%		11%	17%	11%	15%	**24%**	**32%**
4-2	No	2003	0%	0%	0%	0%		0%	0%	0%	0%	**0%**	**0%**
		2004	0%	0%	0%	0%		6%	18%	6%	8%	**3%**	**4%**
		2005	0%	0%	0%	0%		8%	14%	8%	10%	**4%**	**5%**
		2006	51%	86%	52%	68%		8%	14%	8%	10%	**29%**	**38%**
		2007	51%	79%	52%	69%		14%	21%	14%	18%	**33%**	**44%**
	Yes	2003	0%	0%	0%	0%		0%	0%	0%	0%	**0%**	**0%**
		2004	0%	0%	0%	0%		6%	18%	6%	8%	**3%**	**4%**
		2005	0%	0%	0%	0%		8%	14%	8%	10%	**4%**	**5%**
		2006	49%	82%	49%	65%		8%	14%	8%	10%	**28%**	**37%**
		2007	51%	79%	52%	69%		14%	21%	14%	18%	**33%**	**44%**
4-1	No	2003	0%	0%	0%	0%	**80%**	0%	0%	0%	0%	**0%**	**0%**
		2004	0%	0%	0%	0%		0%	0%	0%	0%	**0%**	**0%**
		2005	0%	0%	0%	0%		0%	0%	0%	0%	**0%**	**0%**
		2006	37%	62%	37%	49%		3%	4%	3%	3%	**19%**	**25%**
		2007	37%	56%	37%	49%		11%	17%	11%	15%	**24%**	**32%**
	Yes	2003	0%	0%	0%	0%		0%	0%	0%	0%	**0%**	**0%**
		2004	0%	0%	0%	0%		0%	0%	0%	0%	**0%**	**0%**
		2005	0%	0%	0%	0%		0%	0%	0%	0%	**0%**	**0%**
		2006	35%	59%	35%	47%		3%	4%	3%	3%	**18%**	**24%**
		2007	37%	56%	37%	49%		11%	17%	11%	15%	**24%**	**32%**
4-2	No	2003	0%	0%	0%	0%		0%	0%	0%	0%	**0%**	**0%**
		2004	0%	0%	0%	0%		3%	10%	4%	4%	**2%**	**2%**
		2005	0%	0%	0%	0%		6%	11%	6%	8%	**3%**	**4%**
		2006	51%	86%	52%	68%		8%	14%	8%	10%	**29%**	**38%**
		2007	51%	79%	52%	69%		14%	21%	14%	18%	**33%**	**44%**
	Yes	2003	0%	0%	0%	0%		0%	0%	0%	0%	**0%**	**0%**
		2004	0%	0%	0%	0%		3%	10%	4%	4%	**2%**	**2%**
		2005	0%	0%	0%	0%		6%	11%	6%	8%	**3%**	**4%**
		2006	49%	82%	49%	65%		8%	14%	8%	10%	**28%**	**37%**
		2007	51%	79%	52%	69%		14%	21%	14%	18%	**33%**	**44%**

Notes: AKU/DUT: Denotes the aggregate of all processing facilities in the Akutan and Dutch Harbor areas, including some floating processors.
All Others: May include King Cove, Kodiak, Sand Point, and several floating processors.

6.10.3 Potential Effects on CDQ Royalties

This section provides an analysis of potential effects the alternatives would have on CDQ Royalties. Hypothetical forgone CDQ pollock catch, in mt, by season, from 2003-2007 is used to estimate royalty effects. However, insufficient aggregate royalty data is publicly available to estimate potentially forgone CDQ pollock royalties for 2006 and the estimate of the 2007 CDQ pollock royalty revenue ($310/mt) is not based on an average of all CDQ entities. The hypothetical forgone royalty revenues for all CDQ entities would be higher under both Alternative 4 AS 1 and Alternative 5 AS1 than under a 68,100 cap and the 70/30 seasonal split in bycatch allocations (alternative 2:option 2d). The hypothetical forgone royalty revenues for all CDQ entities would be higher under a 48,700 cap and the 70/30 seasonal split in bycatch allocations (alternative 2: option 2d) than under Alternative 4 AS2 (equivalent to Alt. 5 AS2). The hypothetical royalty revenue would only have been forgone in 2007 A season, in most allocation scenarios, except when the hypothetical cap was fewer than 87,500 Chinook salmon.

Forgone royalty revenue would hypothetically have occurred in the A season for all years with a hard cap of 29,300 Chinook salmon. Hypothetical forgone CDQ pollock royalties were consistently lower in the A season under an allocation split 50/50 and consistently lower under a 70/30 split; conversely, the hypothetical forgone pollock royalties were consistently higher in the B season under a 70/30 allocation split and consistently lower under a 50/50 split, in all years that data was available except for 2005.

A comparison of allowable rollover scenarios for Alternative 4 resulted in substantial forgone CDQ royalty revenues for CDQ groups under a hypothetical 0 percent A to B season rollover from in both 2004 and 2007. Analysis of the forgone royalty revenue by CDQ groups showed no difference in B Season forgone CDQ royalties due to A season transfers and rollovers options. Also, there are no hypothetical reductions in forgone CDQ royalties due to transferability by scenario over the time period 2003-2007.

Table 6-44 Hypothetical forgone CDQ royalties by year and season under Chinook bycatch options for fleet-wide caps, in millions of dollars

Seasonal		**2003**			**2004**			**2005**			**2006**			**2007**		
	Cap	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A	87,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	N/A	N/A	N/A	$ -	$ -	$ -
	68,100	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	N/A	N/A	N/A	$2.6	$0.3	$ -
	48,700	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	N/A	N/A	N/A	$9.6	$6.1	$2.6
	29,300	$6.4	$5.9	$0.3	$0.1	$ -	$ -	$1.1	$0.01	$ -	N/A	N/A	N/A	$12.7	$12.5	$9.8
B	87,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	N/A	N/A	N/A	$ -	$ -	$0.7
	68,100	$ -	$ -	$ -	$ -	$ -	$1.1	$ -	$ -	$ -	N/A	N/A	N/A	$ -	$0.7	$0.9
	48,700	$ -	$ -	$ -	$ -	$1.1	$4.7	$ -	$ -	$ -	N/A	N/A	N/A	$0.8	$0.9	$1.6
	29,300	$ -	$ -	$6.9	$4.7	$8.7	$13.9	$ -	$ -	$ -	N/A	N/A	N/A	$1.6	$1.7	$2.3

Table 6-45 Hypothetical forgone CDQ royalties by season under Chinook bycatch options for 2003 in millions of dollars.

2003		opt1(AFA)			opt2a			opt2d		
Season	Cap	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A	87,500	$ -	$ -	$ -	$ 5.8	$ 2.2	$ -	$ -	$ -	$ -
	68,100	$ -	$ -	$ -	$10.7	$ 6.2	$ 2.4	$ -	$ -	$ -
	48,700	$ -	$ -	$ -	$13.8	$13.7	$10.7	$ 0.2	$ -	$ -
	29,300	$ 2.3	$ -	$ -	$14.9	$14.0	$13.9	$12.7	$ 6.4	$ 5.7
B	87,500	$ -	$ -	$ -	$ -	$ -	$ 0.6	$ -	$ -	$ -
	68,100	$ -	$ -	$ -	$ -	$ 0.0	$ 7.1	$ -	$ -	$ -
	48,700	$ -	$ -	$ -	$ 3.1	$ 7.1	$14.9	$ -	$ -	$ -
	29,300	$ -	$ -	$ -	$14.9	$15.1	$15.5	$ -	$ 0.6	$ 7.2

Table 6-46 Hypothetical forgone CDQ royalties by season under Chinook bycatch options for 2004 in millions of dollars

2004		opt1(AFA)			opt2a			opt2d		
Season	Cap	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A	87,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	68,100	$ -	$ -	$ -	$ 1.2	$ -	$ -	$ -	$ -	$ -
	48,700	$ -	$ -	$ -	$ 4.1	$ 1.6	$ 1.2	$ -	$ -	$ -
	29,300	$ -	$ -	$ -	$ 7.6	$ 7.4	$ 4.4	$ 1.3	$ 0.1	$ -
B	87,500	$ -	$ -	$ -	$ 1.4	$ 4.7	$ 9.0	$ -	$ -	$ 0.8
	68,100	$ -	$ -	$ -	$ 8.5	$ 8.9	$14.0	$ -	$ -	$ 1.4
	48,700	$ -	$ -	$ 1.2	$ 9.1	$14.0	$14.5	$ 1.0	$ 1.4	$ 8.7
	29,300	$ 1.2	$ 4.4	$ 8.8	$14.5	$18.5	$18.7	$ 8.7	$ 9.0	$14.1

Table 6-47 Hypothetical forgone CDQ royalties by season under Chinook bycatch options for 2005 in millions of dollars.

2005		opt1(AFA)			opt2a			opt2d		
Season	Cap	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A	87,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	68,100	$ -	$ -	$ -	$ 3.8	$ 0.9	$ -	$ -	$ -	$ -
	48,700	$ -	$ -	$ -	$ 7.3	$ 6.9	$ 3.8	$ -	$ -	$ -
	29,300	$ -	$ -	$ -	$11.1	$ 8.0	$ 7.7	$ 6.6	$ 1.1	$ -
B	87,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	68,100	$ -	$ -	$ -	$ -	$ -	$ 0.0	$ -	$ -	$ -
	48,700	$ -	$ -	$ -	$ -	$ 0.0	$ 1.8	$ -	$ -	$ -
	29,300	$ -	$ -	$ -	$ 1.8	$ 3.1	$ 4.5	$ -	$ -	$ 0.1

Table 6-48 Hypothetical forgone CDQ royalties by season under Chinook bycatch options for 2007 in millions of dollars.

2007		opt1(AFA)			opt2a			opt2d		
Season	Cap	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A	87,500	$ -	$ -	$ -	$10.0	$ 9.8	$ 9.6	$ 2.4	$ -	$ -
	68,100	$ -	$ -	$ -	$12.7	$12.6	$ 9.9	$ 6.0	$ 2.6	$ -
	48,700	$ .8	$ 2.4	$ -	$12.9	$12.9	$12.7	$ 9.8	$ 9.6	$ 6.0
	29,300	$ 9.9	$ 9.7	$ 6.2	$15.1	$13.1	$13.0	$12.8	$12.7	$10.0
B	87,500	$ -	$ -	$ -	$ 0.9	$ 1.6	$ 1.7	$ -	$ 0.4	$ 0.8
	68,100	$ -	$ -	$ 0.7	$ 1.6	$ 1.7	$ 2.3	$ 0.4	$ 0.8	$ 0.9
	48,700	$ 0.4	$ .7	$ 0.9	$ 2.3	$ 2.3	$ 3.1	$ 0.8	$ 0.9	$ 1.7
	29,300	$ 0.9	$ 1.6	$ 1.7	$ 3.1	$ 3.1	$ 4.2	$ 1.7	$ 1.7	$ 2.3

Table 6-49. Hypothetical forgone CDQ royalties by sector and scenario assuming 0 percent, 80 percent, and 100 percent allowable rollover from A to B season, in millions of dollars.

AS	A-seas Transfer-Ability	Year	A-Seas CDQ	A-B Roll over	B-Seas CDQ	A-seas Transfer-Ability	Year	A-Seas CDQ	A-B Roll over	B-Seas CDQ	A-seas Transfer-Ability	Year	A-Seas CDQ	A-B Roll over	B-Seas CDQ
		2003	$ -		$ -		2003	$ -		$ -		2003	$ -		$ -
		2004	$ -		$4.9		2004	$ -		$ -		2004	$ -		$ -
		2005	$ -		$ -		2005	$ -		$ -		2005	$ -		$ -
		2006	$ -		$ -		2006	$ -		$ -		2006	$ -		$ -
1	No	2007	$ -		$1.45	No	2007	$ -		$1.36	No	2007	$ -		$1.36
		2003	$ -		$ -		2003	$ -		$ -		2003	$ -		$ -
		2004	$ -		$4.9		2004	$ -		$ -		2004	$ -		$ -
		2005	$ -		$ -		2005	$ -		$ -		2005	$ -		$ -
		2006	$ -		$ -		2006	$ -		$ -		2006	$ -		$ -
	Yes	2007	$ -	**0%**	$1.45	Yes	2007	$ -	**80%**	$1.36	Yes	2007	$ -	**100%**	$1.36
		2003	$ -		$ -		2003	$ -		$ -		2003	$ -		$ -
		2004	$ -		$11.5		2004	$ -		$ -		2004	$ -		$ -
		2005	$ -		$ -		2005	$ -		$ -		2005	$ -		$ -
		2006	$ -		$ -		2006	$ -		$ -		2006	$ -		$ -
2	No	2007	$3.2		$ 1.9	No	2007	$3.2		$1..9	No	2007	$ 3.2		$1.9
		2003	$ -		$ -		2003	$ -		$ -		2003	$ -		$ -
		2004	$ -		$11.5		2004	$ -		$ -		2004	$ -		$ -
		2005	$ -		$ -		2005	$ -		$ -		2005	$ -		$ -
		2006	$ -		$ -		2006	$ -		$ -		2006	$ -		$ -
	Yes	2007	$3.2		$1.9	Yes	2007	$ 3.2		$1.9	Yes	2007	$ 3.2		$ 1.9

6.10.4 Potential Forgone State and Local Tax Revenues

The State of Alaska charges both a landings tax and a fisheries business tax on the value of pollock landed and processed. Unfortunately, confidentiality restrictions prohibit reporting of the tax value by sector, by season, and/or at a community level. Thus, the Alaska Department of Revenue has provided annual tax revenue data aggregated for the entire Aleutian/Pribilof region and in statewide totals.

It is possible to make a crude estimate of the total tax revenue impacts, fisheries business tax and landings tax combined, that would have occurred under the various hard cap scenarios. This can be done by multiplying the forgone percentage of total annual pollock fishery gross revenue for each cap level by the total annual tax revenue collection. This calculation, however, ignores seasonal and sector level differences in pollock value, which would tend to increase revenue in the A season and for the offshore sectors. Still, it is an “average” tax impact estimate for the entire region and the entire pollock fishery.

Potential Forgone State and Local Tax Revenues under Alternative 2

Table 6-50 provides estimated potentially forgone state tax revenue calculations from 2003 through 2007 for the various cap levels and split options under Alternative 2. The largest tax revenue impact is nearly $6 million and would have occurred in 2007, the highest bycatch year, under the lowest cap and with the 70/30 season slit. In low bycatch years, the largest cap would result in no loss of tax revenue. As has been demonstrated in the potentially forgone gross revenue calculations and the salmon savings calculations under this alternative, there is a nearly continuous range of state tax revenue impacts from zero to nearly $6 million depending on cap level, option, and year. State of Alaska uses a formula sharing system for distributing a portion of State fishery tax revenue collections. However, State tax revenue sharing of pollock fishery tax revenue paid to local governments is highly confidential and cannot be divulged.

Table 6-50 Hypothetical forgone pollock state tax revenue under the Alternative 2 fleet-wide cap levels.

2003			
Cap	50/50	58/42	70/30
87,500	$0	$0	$0
68,100	$22,822	$0	$0
48,700	$1,390,051	$984,659	$22,551
29,300	$2,588,850	$2,095,675	$2,090,633
2004			
Cap	50/50	58/42	70/30
87,500	$0	$0	$20,037
68,100	$0	$6,072	$111,110
48,700	$51,057	$111,004	$315,645
29,300	$1,444,205	$1,465,423	$1,295,830
2005			
Cap	50/50	58/42	70/30
87,500	$0	$20,711	$299,903
68,100	$79,187	$141,158	$261,730
48,700	$1,271,194	$262,367	$601,543
29,300	$3,501,746	$3,124,620	$2,761,402
2006			
Cap	50/50	58/42	70/30
87,500	$3,395,290	$2,169,862	$20,814
68,100	$2,363,528	$1,705,486	$1,761,431
48,700	$3,086,755	$3,167,343	$2,879,551
29,300	$4,553,396	$3,782,593	$4,188,643
2007			
Cap	50/50	58/42	70/30
87,500	$6,198,274	$4,958,475	$3,489,429
68,100	$3,947,526	$3,442,470	$2,959,165
48,700	$4,439,726	$4,448,058	$4,439,072
29,300	$6,198,274	$4,958,475	$3,489,429

Potential Forgone State and Local Tax Revenues under Alternative 3

Table 6-51 provides estimated potentially forgone state tax revenue calculations from 2003 through 2007 for the various triggered closure options. The largest tax revenue impact is nearly $4.8 million and would have occurred in 2007, the highest bycatch year, under the lowest cap and with the 58/42splitt. In low bycatch years, the largest cap would result in no loss of tax revenue. As has been demonstrated in the potentially forgone gross revenue calculations and the salmon savings calculations under this alternative, there is a nearly continuous range of state tax revenue impacts from zero to nearly $5 million depending on cap level, option, and year. State of Alaska uses a formula sharing system for distributing a portion of State fishery tax revenue collections. However, State tax revenue sharing of pollock fishery tax revenue paid to local governments is highly confidential and cannot be divulged.

Table 6-51 Hypothetical forgone pollock state tax revenue under Chinook salmon bycatch options for triggered closures.

Pollock Cap scenario	Option	All Sectors All State Pollock Tax Impact Annual Totals 2003	2004	2005	2006	2007
87,500	1-1: 70/30	$0	$27,320	$137,593	$0	$1,611,937
0	1-2: 58/42	$0	$0	$3,904	$701,026	$2,524,344
0	1-3: 55/45	$0	$0	$0	$1,419,664	$2,541,925
0	1-4: 50/50	$0	$0	$0	$2,124,681	$2,553,787
68,100	1-1: 70/30	$0	$103,457	$210,236	$1,650,185	$3,010,121
0	1-2: 58/42	$0	$10,948	$86,109	$2,404,015	$3,248,183
0	1-3: 55/45	$0	$0	$58,400	$2,497,216	$3,311,109
0	1-4: 50/50	$0	$0	$13,050	$2,713,562	$3,326,158
48,700	1-1: 70/30	$0	$200,124	$305,527	$3,081,129	$3,871,281
0	1-2: 58/42	$829,678	$103,457	$210,236	$3,538,203	$4,056,537
0	1-3: 55/45	$973,458	$80,194	$549,656	$3,473,050	$4,114,558
0	1-4: 50/50	$1,267,004	$42,011	$1,482,947	$3,615,505	$4,252,444
29,300	1-1: 70/30	$2,314,688	$1,279,847	$2,927,657	$4,974,637	$5,129,486
0	1-2: 58/42	$2,454,887	$1,444,376	$3,257,130	$4,617,237	$5,258,337
0	1-3: 55/45	$2,444,996	$1,424,992	$3,360,936	$4,560,375	$5,177,422
0	1-4: 50/50	$2,562,989	$1,780,214	$3,350,047	$4,369,846	$5,137,816

Potential Forgone State and Local Tax Revenues under Alternative 4 and Alternative 5

Table 6-52 provides estimated potentially forgone state tax revenue calculations from 2003 through 2007 for Alternative 5 AS1, Alternative 4 AS1, and Alternative 4 AS2., with and without transfers and rollovers. The largest tax revenue impact is more than $3.8 million and would have occurred in 2007, the highest bycatch year, under the Alternative 4, AS2 with transfers (equivalent to Alt. 5 AS2). The largest impact under AS1 of Alternative 5 is nearly $3.1 million and also would have occurred in 2007. In low bycatch years, the largest cap would result in no loss of tax revenue. Also evident is the minimal effect of transfers and rollovers when considered in percent of total revenue terms. That result may be due to rounding to the millions in the underlying pollock total revenue calculations. The State of Alaska uses a formula sharing system for distributing a portion of State fishery tax revenue collections. However, State tax revenue sharing of pollock fishery tax revenue paid to local governments is highly confidential and cannot be divulged.

Table 6-52 Hypothetical forgone pollock state tax revenue under Chinook bycatch options under Alternative 5 AS1, Alternative 4 AS1, and Alternative 4 AS2.

AS	A-season Transferability	Year	A-B Rollover	Annual Total	A/P Tax Impact
5-1	Yes	2003	100%	0%	$0
5-1	Yes	2004	100%	0%	$0
5-1	Yes	2005	100%	0%	$22,339
5-1	Yes	2006	100%	14%	$1,531,247
5-1	Yes	2007	100%	29%	$3,082,511
4-1	No	2003	0%	0%	$0
4-1	No	2004	0%	2%	$173,346
4-1	No	2005	0%	2%	$175,671
4-1	No	2006	0%	12%	$1,346,659
4-1	No	2007	0%	26%	$2,685,310
4-1	Yes	2003	0%	0%	$0
4-1	Yes	2004	0%	2%	$173,346
4-1	Yes	2005	0%	2%	$175,671
4-1	Yes	2006	0%	10%	$1,183,035
4-1	Yes	2007	0%	25%	$2,659,598
4-2	No	2003	0%	6%	$512,115
4-2	No	2004	0%	4%	$362,425
4-2	No	2005	0%	5%	$492,139
4-2	No	2006	0%	22%	$2,455,520
4-2	No	2007	0%	37%	$3,835,410
4-2	Yes	2003	0%	2%	$201,303
4-2	Yes	2004	0%	4%	$362,425
4-2	Yes	2005	0%	5%	$492,139
4-2	Yes	2006	0%	19%	$2,196,496
4-2	Yes	2007	0%	37%	$3,835,410
4-1	No	2003	80%	0%	$0
4-1	No	2004	80%	0%	$0
4-1	No	2005	80%	0%	$3,942
4-1	No	2006	80%	12%	$1,330,376
4-1	No	2007	80%	25%	$2,668,472
4-1	Yes	2003	80%	0%	$0
4-1	Yes	2004	80%	0%	$0
4-1	Yes	2005	80%	0%	$3,942
4-1	Yes	2006	80%	10%	$1,166,752
4-1	Yes	2007	80%	25%	$2,642,759
4-2	No	2003	80%	5%	$506,762
4-2	No	2004	80%	1%	$89,332
4-2	No	2005	80%	2%	$249,970
4-2	No	2006	80%	22%	$2,455,520
4-2	No	2007	80%	37%	$3,834,257
4-2	Yes	2003	80%	2%	$201,303
4-2	Yes	2004	80%	1%	$89,332
4-2	Yes	2005	80%	2%	$249,970
4-2	Yes	2006	80%	19%	$2,196,496
4-2	Yes	2007	80%	37%	$3,834,257

7.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

This section provides a comparison of the potential effects of selected scenarios of Alternatives 4 and 5 with those of Alternative 2. This comparison uses impact analysis estimates from the 2007 year in order to compare the potential effects of the proposed action in the highest bycatch year. This section will first compare Chinook salmon savings under the scenarios and will then compare the potential impacts on pollock fishery gross revenue including a subsection on potential effects on CDQ royalties. This analysis is compiled from impact estimates presented previously in the document. It is provided to facilitate direct comparison of the likely effects of the scenarios under consideration when bycatch was historically high.

7.1 Comparison of Chinook Salmon Savings Under Alternative 2, Alternative 4, and Alternative 5

This section evaluates the number of Chinook salmon saved and the estimated AEQ Chinook salmon saved by year, for the Alternative 2, Alternative 4, and Alternative 5 cap levels, and season and sector options, compared to the actual Chinook salmon bycatch and AEQ Chinook salmon under Alternative 1, status quo. Table 7-1 compares the number of Chinook salmon that would have been saved in 2007, if Alternative 5 (AS1 and AS2), Alternative 4 (AS1 and AS2), or the highest and lowest caps of comparable seasonal and sector combinations of Alternative 2 had been in place.

Table 7-1 Total projected reduction of Chinook salmon bycatch and adult equivalent salmon bycatch from the actual 2007 bycatch estimate of 121,638 Chinook salmon. Compares Alternative 5 with Alternative 4, and the highest and lowest caps with comparable seasonal and sector combinations of Alternative 2.

	Alt 5 AS1	Alt 5 AS2	Alt 4 AS1 (note Alt 4 AS2 results identical to Alt 5 AS2)	Alt2 cap 87,500 Opt2d 70/30	Alt2 cap 29,300 Opt2d 70/30
Number of Chinook salmon saved	63,288	75,306	55,307	46,766	112,647
Adult equivalent Chinook salmon saved	27,130	40,851	26,420	22,417	65,476

Table 7-2 provides this summary comparison by indicating the percentage change in aggregate AEQ estimates of benefits under the alternatives analyzed compared to the estimated historical AEQ by year (2003-2007). This comparison shows that the AEQ benefits of the Alternative 4 and Alternative 5 scenarios (recall that Alt 4 AS2 is equivalent to Alt 4 AS2) range from a less than 1 percent change in AEQ Chinook salmon estimated for 2003, to a high of 52 percent additional AEQ salmon estimated for AS2 in 2007.

Four cap options for Alternative 2 with the same 70/30 seasonal splits and sector divisions (Option 2d) are compared against the annual scenarios of Alternatives 4 and 5. The Alternative 2 cap level considered closest to Alternative 4 AS1 is 68,100 Chinook salmon. Alternative 2 at this cap level would have a similar minor benefit in 2003 but in higher bycatch years, like 2007, it would have an estimated 64 percent increase in benefit compared with a 34 percent increase for Alternative 4 AS1. For comparison, the highest cap of 87,500 shows the lowest increase in benefits at 28 percent. As with the Alternative 4 scenarios, one can see the range of values that fall in between as bycatch levels generally increased from 2003 through 2007. The highest percentage change from status quo occurs with the lowest cap considered (29,300) in the highest bycatch year (2007) which results in an estimated 83 percent increase in the AEQ Chinook salmon savings in that year.

Table 7-2 Percentage change in adult equivalent Chinook salmon savings from Alternative 1, status quo, between Alternative 5, Alternatives 4-1 and 4-2, and closely comparable management options in Alternative 2, for the years 2003 to 2007.

	2003	2004	2005	2006	2007
Alt. 1 AEQ Chinook salmon	**33,215**	**41,047**	**47,268**	**61,737**	**78,814**
Alt. 5	<1%	7%	17%	24%	34%
Alt. 4-1	<1%	7%	16%	22%	34%
Alt 4-2	2%	11%	24%	40%	52%
87,500 70/30 opt2d	1%	7%	19%	21%	28%
68,100 70/30 opt2d	<1%	18%	29%	51%	64%
48,700 70/30 opt2d	12%	18%	29%	51%	64%
29,300 70/30 opt2d	42%	45%	51%	67%	83%

These results are for the total AEQ Chinook salmon saved by year to give an overall impression of the relative magnitude of effects for all river systems to compare against the constraints on the pollock fishery. Individual benefits of AEQ Chinook salmon returning to specific river systems is evaluated next, with a particular focus on river systems in western Alaska given our ability to resolve these river systems singularly. Our ability to provide results relating salmon saved to specific rivers of origin is limited by the aggregate genetic data employed in this analysis. Further discussion of this is included in EIS Chapter 3.

Table 7-3 Projected reduction of adult equivalent Chinook salmon bycatch, in number of salmon, by region of origin (based on genetic aggregations), using 2007 results. Compares Alternative 5 AS1 with Alternatives 4 AS1 and 4 AS2, and the Alternative 2 highest and lowest caps with comparable seasonal and sector combinations. Higher numbers indicate a greater salmon "savings," compared to Alternative 1, status quo ("No hard cap").

Stocks of Origin[66]	Alt 5-AS1	Alt.5 AS2	Alt.4 AS1 (note Alt 4 AS2 results identical to Alt 5 AS2)	Alt AS2 cap 87,500 Opt2d 70/30	Alt2 cap 29,300 Opt2d 70/30
Yukon	5,396	8,840	5,228	3,299	14,938
Kuskokwim	3,507	5,746	3,398	2,144	9,710
Bristol Bay	4,586	7,514	4,443	2,804	12,697
Pacific Northwest aggregate stocks (PNW)	8,444	11,135	8,489	9,581	15,507
Cook Inlet stocks	912	1,202	1,042	1,010	1,284
Transboundary aggregate stocks (TBR)	617	821	699	670	909
North Alaska Peninsula stocks (N.AK)	2,882	4,389	2,318	2,264	8,594
Aggregate 'other' stocks	592	1,203	803	646	1,837

Table 7-3 provides an overview of the stocks of origin and the relative reduction of AEQ Chinook salmon bycatch by region of origin for a snapshot of one year (2007) for Alternatives 4 and 5 as compared to two caps options under Alternative 2. Results for aggregate groupings for the Pacific Northwest stocks, the North Alaska Peninsula stocks, Cook Inlet stocks, and Transboundary stocks are shown in the analysis for comparison of their relative trends by alternative. Absolute impacts of aggregate AEQ savings as noted to these rivers systems is not estimable at this time due to the genetic limitations. However results are shown for inference of trends to various regions and areas.

As described in EIS Chapter 5, proportional break-outs were only possible for western Alaskan-origin Chinook. Thus results are shown individually for these river systems with comparison made as possible with relative catch by commercial, subsistence, and sport users over the analytical time period considered.

As with estimating the total changes in catches in the commercial Chinook salmon fisheries from AEQ salmon saved discussed above, it is not possible, with presently available information, to determine the proportions of river specific AEQ estimates of returning adult Chinook salmon that would be caught in commercial, subsistence, and sport fisheries in the various river systems of western Alaska. The personal use fishery in western Alaska is a very small component of the subsistence fishery information presented here.

While it is very difficult to retrospectively assess the specific impacts or management implications of additional AEQ Chinook salmon to a given river system, it is reasonable to assume that any additional fish would benefit escapement and harvest according to the priorities outlined above. However, management decisions in the lower Yukon and Kuskokwim Rivers must be made long before adequate information on escapements is available and if additional AEQs of unknown stock origin were spread throughout the run, how management actions might specifically provide for greater stock-specific escapements is uncertain. Regardless, any additional fish in the run would presumably help to achieve escapement goals, and there is demonstrable benefit even from missing the escapement goal by a smaller

[66] For specific information on stocks included in each stock of origin grouping, see Table 3.7 in EIS Chapter 3.

amount of fish. Similarly, it is difficult to predict the impacts of additional fish to particular subsistence fishermen or even to the subsistence harvest as a whole. If escapement goals are projected to be met, it is logical to assume that subsistence fishermen would directly benefit from increased run sizes of any magnitude.

Table 7-4 summarizes some management indices for the Yukon River, Kuskokwim River, and Bristol Bay, in conjunction with the restrictions that were imposed over the time period considered, and discusses what, if any, management changes could have been made given the projected changes in AEQ Chinook salmon returns indicated in this analysis. No subsistence fishery restriction occurred in the Kuskokwim, Yukon, or Bristol Bay from 2003 to 2007; however, some fishermen reported that it took them longer to catch their needed number of Chinook salmon. There are direct cost increases associated with the need for increased time, effort, and resources (fuel, equipment wear and tear) necessary to approach individual subsistence needs. Where increases in run size contribute to achieving escapement goals and satisfying subsistence needs, one would expect some benefit to the commercial fishery as well. In the Yukon-Kuskokwim Delta, commercial fishing represents an important economic impact to local communities and in many respects, facilitates the pursuit of subsistence living with needed cash for supplies and equipment. The predicted benefits of additional AEQs to commercial fishermen may depend greatly on when the fish recruit to the fishery in relation to managers' assessments of escapement and subsistence harvest.

Table 7-4 Summary of Chinook salmon escapement goals obtained, restrictions imposed, and potential management changes with additional AEQ Chinook salmon returns to rivers over the time period from 2003 to 2007.

River	**Escapement met from 2003-2007**	**Additional restrictions imposed from 2003-2007**			**Likely management changes if additional AEQ salmon had been available 2003-2007**
		Subsistence	**Commercial**	**Sport**	
Yukon	2006 some key goals not met	More conservative management plan imposed since 2001			2006-2007 additional fish would accrue towards meeting escapement; in all years increased potential for higher subsistence and commercial harvest
	2007 Treaty goal not met	2007 Canada	Below average 2005-2007	2007 Canada	
Kuskokwim	Most	More conservative management plan imposed 2001-2006			Potential for increased commercial harvests within market constraints
	2007 Most	No	No	No	
Bristol Bay (Nushagak)	2007 goals not met	No	No	2007	If sufficient additional to meet escapement then 2007 sport fish restriction would not have been imposed; In all years additional fish towards escapement, increased potential for higher subsistence and commercial harvest
Norton Sound subdistricts 5 and 6	2003-2006 Unalakleet goal not met	2003-2004; 2006-2007	2003-2007	2003-2004; 2006-2007	Additional fish would accrue to escapement

Kuskokwim River

In the Kuskokwim River, most escapement goals were met during the period from 2003 to 2007, and there were no restrictions to subsistence or sport fisheries beyond those provided for in state regulation. If additional fish had returned in these years, the commercial harvest may have been higher in some years, though poor chum salmon markets and lack of buyer capacity may have precluded more commercial fishing. Processor capacity is expected to increase with completion of a large facility in the area in 2009, so future additional AEQ Chinook salmon returns could directly benefit commercial fishermen.

Table 7-5 provides Kuskokwim area specific catch, by harvesting sector and by year, compared to AEQ Chinook salmon estimates for Alternative 4 and Alternative 5 annual scenarios, and for high and low caps under Alternative 2. The Kuskokwim AEQ estimates for the Alternative 4 annual scenarios range from -214[67] Chinook salmon under AS1 in 2003 to 5,746 Chinook salmon under AS2 (equivalent to Alt 5 AS2) in 2007. The Kuskokwim AEQ estimates for the Alternative 5 AS1 range from -36 Chinook salmon in 2003 to 3,507 Chinook salmon in 2007. This simply indicates that the greatest benefit, in terms of numbers of returning adult Chinook salmon, would occur for the lower bycatch cap in years with the highest Chinook salmon bycatch. This also holds for the cap examples shown for Alternative 2, with the lowest benefit of 365 more Chinook salmon returning occurring under the highest cap of 87,500 in 2003. The greatest benefit, in the Kuskokwim areas, under Alternative 2 would be 9,710 more Chinook salmon returning, which occurs under the lowest cap of 29,300 and in the high bycatch years of 2006 and 2007.

Comparing these numbers to subsistence catches, which have priority over all other uses once escapements have been met, reveals that historic Kuskokwim area subsistence catches are much larger than the estimated increases in AEQ Chinook salmon returns under Alternatives 2, 4, and 5. However, commercial and sport catches are smaller than many of the AEQ estimates, indicating potential benefits to commercial and sport fishermen in the area.

Table 7-5 Kuskokwim Area annual Chinook salmon catch, by sector, compared to AEQ Chinook salmon estimates for Alternatives 2, 4, and 5 (2003-2007).

Kuskokwim Area					
Catch and AEQ Estimates	Year				
	2003	2004	2005	2006	2007
Commercial Catch	158	2,300	4,784	2777	179
Subsistence Catch	67,788	80,065	70,393	63,177	72,097*
Sport Catch	401	857	1,092	572	2,543*
Total Catch	68,347	83,222	76,269	66,526	74,819
Alt. 5 AS1	-36	419	1,117	2,331	3,507
Alt. 4 AS 1	-214	384	1,269	2217	3,398
Alt. 5 AS 2, Alt. 4 AS2	-40	301	1,264	3,849	5,746
Alt. 2, 87,500, opt2d, 70/30	365	824	1,369	2,144	2,144
Alt. 2, 29,300, opt2d, 70/30	2,399	3,243	6,361	9,710	9,710

* Some 2007 data are preliminary

Yukon River

In the Yukon River, for the period 2003-2005, most escapement goals were met and there were no restrictions to subsistence or sport fisheries. Due to generally low run sizes, commercial fisheries were managed conservatively. Any additional fish would have likely increased escapements and contributed to subsistence and commercial harvests. Sport fish harvest is fairly stable and the harvest may be impacted more by water conditions than abundance, unless restricted to meet escapement goals. In 2006 and 2007, some key escapement goals were not met, but there were no restrictions to subsistence or sport fisheries. Additional fish in these years would most likely have accrued to escapement and some additional

[67] In years when the actual bycatch was below a given cap level, this could have resulted in negative AEQ salmon savings (i.e., more, not fewer, salmon were prevented from spawning than actually occurred). This can happen when the combined cumulative effect from prior years bycatch levels are low in some seasons and sectors and high in others.

subsistence harvest. Yukon River Chinook salmon command a high price in commercial markets, but their value to escapement and subsistence fishermen is inestimable.

Table 7-6 provides Alaska Yukon River specific catch, by harvesting sector and by year, compared to AEQ Chinook salmon estimates for Alternative 4 annual scenarios, and the Alternative 2 high and low caps. The Yukon AEQ estimates for the Alternative 4 annual scenarios range from -329 Chinook salmon under Alternative 4 AS1, in 2003, to 8,840 Chinook salmon under Alternative 4 AS2 (equivalent to Alt 5 AS2) in 2007. The Yukon AEQ estimates for the Alternative 5 AS1 range from -54 Chinook salmon under, in 2003, to 5,396 Chinook salmon in 2007. This indicates that the greatest benefit, in terms of numbers of returning adult Chinook salmon, would occur under the lower bycatch cap in years with the highest Chinook salmon bycatch. This also holds for the cap examples shown for Alternative 2, with the low being -2 Chinook salmon in 2004, and under the highest cap of 87,500. The greatest benefit, in the Yukon area, under Alternative 2 would be 14,938 fish, which occurs under the lowest cap of 29,300 and in the high bycatch year of 2007.

Comparing Yukon AEQ numbers to subsistence catches, which have priority over all other uses once escapements have been met, reveals that historic Yukon area subsistence catches are much larger than the projected estimates of AEQ Chinook salmon returns under Alternatives 2, 4, and 5. The same is true of historic Yukon commercial catches. However, the annual scenarios of both Alternatives 4 and 5 would result in AEQ Chinook salmon estimates that are more than 10 percent of the commercial catch in 2007, and considerably larger than sport catch in that year. In 2006, a similar result is seen, although with a slightly smaller percentage. Thus, it is difficult to interpret just how much benefit the projected changes to AEQ Chinook salmon would imply.

Table 7-6 Alaska Yukon River Area A annual Chinook salmon catch, by sector, compared to AEQ Chinook salmon estimates for Alternatives 2, 4, and 5 (2003-2007)

Yukon River (Alaska)					
Catch and AEQ Estimates	Year				
	2003	2004	2005	2006	2007
Commercial Catch	40,438	56,151	32,029	45829	33,634
Subsistence Catch	55,109	53,675	52,561	47710	59,242
Sport Catch	2,719	1,513	483	739	960
Total Catch	98,266	111,339	85,073	94278	92,876
Alt. 5 AS1	-54	645	1,718	3,586	5,396
Alt. 4 AS 1	-329	591	1,952	3409	5,228
Alt. 5 AS 2, Alt. 4 AS2	-61	463	1,944	5,921	8,840
Alt. 2, 87,500, opt2d, 70/30	561	-2	1,267	2,107	3,299
Alt. 2, 29,300, opt2d, 70/30	3,690	3,469	4,989	9,786	14,938

Bristol Bay

During the period 2003-2006, escapement goals were achieved and no restrictions were placed on any subsistence, sport, or commercial fisheries in Bristol Bay. Though additional AEQ Chinook salmon returns would not have changed any management decisions made in those years, additional fish would have benefited all uses while providing additional escapement. In 2007, the sport fish bag limit was reduced to a single fish after July 7 for the Nushagak River. The in-river escapement goal was not achieved despite this restriction. Increased AEQ Chinook salmon returns to Bristol Bay would have mainly accrued towards achieving the in-river escapement goal, and probably would have made the Nushagak sport fish restriction unnecessary. These restrictions have immediate and lasting economic impacts due to continued perception of poor fishing and possible future restrictions. Additional fish might have provided benefits to commercial fishermen, though specific impacts are highly dependent upon the run timing of these fish.

Table 7-7 provides Bristol Bay area catch, by harvesting sector and by year, compared to AEQ Chinook salmon estimates for the annual scenarios of Alternatives 4 and 5 as well as those for Alternative 2 high and low caps. The Bristol Bay AEQ estimates for the Alternative 4 annual scenarios range from -280 Chinook salmon under AS1 in 2003 to 7,514 Chinook salmon under AS2 (equivalent to Alt 5 AS2) in 2007. The Bristol Bay AEQ estimates for the Alternative 5 AS1 range from -47 Chinook salmon in 2003 to 4,586 Chinook salmon in 2007. This indicates that the greatest benefit, in terms of numbers of returning adult Chinook salmon, would occur under the lower bycatch cap in years with the highest Chinook salmon bycatch. This also holds for the cap levels shown for Alternative 2, with the low being -1 Chinook salmon in 2004, and under the highest cap of 87,500. The greatest benefit, in the Bristol Bay area, under Alternative 2 would be 12, 697 Chinook salmon, which occurs under the lowest cap of 29,300 and in the high bycatch year of 2007.

In the Bristol Bay area, in contrast to the Yukon and Kuskokwim areas, commercial fishing takes the largest proportion of harvestable surplus of Chinook salmon, possibly due to the presence of a large sockeye fishery. Comparing Bristol Bay AEQ numbers to catches reveals that historic Bristol Bay area subsistence and sport catches are larger than the Bristol Bay AEQ estimates across under Alternatives 2 and 4, but not by as great a margin as evident in the Kuskokwim and Yukon areas. In addition, historic Bristol Bay area commercial catches are considerably larger than the estimates of AEQ Chinook salmon returns to Bristol Bay. As was the case for the Yukon; however, the annual scenarios of both Alternatives 4 and 5 would result in AEQ Chinook salmon estimates that approach or exceed 10 percent of the commercial catch in 2007, and that are considerably larger than sport catch in that year. Thus, it is difficult to interpret just how much benefit the estimated changes in AEQ Chinook salmon returns to Bristol Bay would imply and it is variable by year and option.

Table 7-7 Bristol Bay Area annual Chinook salmon catch, by sector, compared to AEQ Chinook salmon estimates for Alternatives 2, 4, and 5 (2003-2007).

Bristol Bay Area					
Catch and AEQ Estimates	Year				
	2003	2004	2005	2006	2007
Commercial Catch	46,953	114,280	76,590	106962	62,670
Subsistence Catch	21,231	18,012	15,212	12617	16,002
Sport Catch	9,941	13,195	13,036	10749	15,200
Total Catch	78,125	145,487	104,838	119579	78,672
Alt. 5 AS1	-47	548	1,461	3,048	4,586
Alt. 4 AS 1	-280	503	1,659	2898	4,443
Alt. 5 AS 2, Alt. 4 AS2	-52	394	1,653	5,033	7,514
Alt. 2, 87,500, opt2d, 70/30	477	-1	1,077	1,791	2,804
Alt. 2, 29,300, opt2d, 70/30	3,137	2,948	4,241	8,318	12,697

Western Alaska combined

Table 7-8 combines the AEQ and catch estimates discussed above for each of the three major western Alaska river systems for which AEQ estimates are available in order to compare the aggregate effect of the alternatives on western Alaska Chinook salmon runs. Note; however, that genetic data necessary to provide separate AEQ estimates for the Norton Sound area rivers are not presently available. Thus, these estimates do not include Norton Sound.

The western Alaska total (excluding Norton Sound) AEQ estimates for the annual scenarios of Alternatives 4 range from -823 Chinook salmon under Alternative 4 AS1 in 2003 to 22,100 Chinook salmon under AS2 (equivalent to Alt 5 AS2) in 2007. The western Alaska total AEQ estimates for the Alternative 5 AS1 range from -134 Chinook salmon in 2003 to 13,085 Chinook salmon in 2007. Under the Alternative 2 cap of 87,500, the smallest increase in returns would have been 821 Chinook salmon in 2004. The greatest benefit, in the western Alaska area, under Alternative 2, would be an estimated increase in returns of 37,345 Chinook salmon under the lowest cap of 29,300 and in the high bycatch year of 2007.

Comparing the combined total of Chinook salmon catches for western Alaska with combined total AEQ estimates reveals that total catches, which are dominated by subsistence catches, are more than ten times larger than the largest estimate of AEQ Chinook salmon returns under Alternatives 2, 4, and 5, in all years except 2007. However, these AEQ estimates, when compared to sector level commercial harvests, can range between 10 percent and 40 percent of the total commercial catch in the highest bycatch year of 2007. Similarly, the AEQ estimates are, in some cases, comparable to sport catches. Thus, while these AEQ estimates appear small relative to the total catch, they may, nonetheless, represent measurable benefit to harvesters. The extent of that benefit is, of course dependent on which option is chosen and what level of bycatch occurred, as well as on the in-season management of the western Alaska salmon fisheries. Further, the aggregate AEQ estimates of all river systems combined produce numbers of AEQ Chinook salmon returns that are much larger than the western Alaska estimates, which represent a subset of the aggregate estimates presented in Table 7-1.

Table 7-8 Total western Alaska (excluding Norton Sound) annual Chinook salmon catch, by sector, compared to AEQ Chinook salmon estimates for Alternatives 2, 4, and 5 (2003-2007).

Total Kuskokwim, Alaska Yukon, and Bristol Bay					
Catch and AEQ Estimates	Year				
	2003	2004	2005	2006	2007
Commercial Catch	87,549	172,731	113,403	155,568	96,483
Subsistence Catch	144,128	151,752	138,166	123,504	147,341
Sport Catch	13,061	15,565	14,6	12,060	18,703
Total Catch	244,738	340,048	266,180	280,383	262,527
Alt. 5 AS1	-134	1,545	3,948	8,818	13,085
Alt. 4 AS 1	-823	1,478	4,880	8,524	13,069
Alt. 5 AS 2, Alt. 4 AS2	-153	1,158	4,861	14,803	22,100
A2, 87,500, opt2d, 70/30	1,403	821	3,713	6,042	8,247
A2, 29,300, opt2d, 70/30	9,226	9,660	15,591	27,814	37,345

7.2 Comparison of Potentially Forgone Gross Revenues Under Alternative 2, Alternative 4, and Alternative 5

This analysis assumes that past fleet behavior appropriately approximates operational behavior under the alternatives and does not estimate changes in behavior. While it is expected that the fleet would change its behavior to mitigate potential losses in pollock gross revenue, explicitly predicting changes in fleet behavior in a reasonable way would require data and analyses that are presently unavailable.

The terminology used herein to describe these impacts is "potentially forgone gross revenue," and simply means the amount of revenue that the fleet, or sectors within it, would potentially not be allowed to earn under a binding hard cap. In other words, it is the answer to the hypothetical question: how much gross revenue was earned in the pollock fishery, in each of the years 2003 through 2007, from the projected date of the given closure (provided in EIS Chapter 2) through the end of the season? Thus, it is a retrospective assessment of actual revenue earned in those years, from the projected closure date forward. The methodology, including total value of the fishery and price data, has been treated in the discussion of the costs and benefits analysis, presented previously. What is presented here are the estimates of potentially forgone first wholesale gross revenue, which is inclusive of shoreside processing value added for the shore based CV fleet, as well as the percent of total first wholesale gross value actually earned by sector, season, and year.

Impacts by hard cap alternative (Alternatives 2 and 4) are summarized by the different components and options that define them (Table 7-9). The components and options projected to cause the greatest changes to the pollock fishery gross revenues are the overall cap level, the sector specific cap allocation, and the seasonal split. Rollovers and transfers are analyzed in conjunction with the Alternative 4 scenarios only but comparative information is provided for evaluating rollover impacts under Alternative 2.

Table 7-9 Summary of main options under Alternative 2 and 4 and their relative scale of impact on pollock fishery gross revenues

Option	Relative economic impact on pollock industry
Cap level: 29,300-87,500	• Lowest cap leads to highest constraint on pollock fishery in all years. • In high bycatch years (e.g. 2007), even the highest cap (87,500) is constraining for the pollock fishery.
Sector allocation	• See Table ES2-20 and Table ES2-21
Seasonal allocation	• Higher forgone pollock revenue when seasonal allocations are lower in the A season (E.g. 50/50 and 58/42). • 70/30 seasonal split least constraining due to higher value roe season.
Rollover	• 80 percent rollover in Alternative 4 scenarios mitigates forgone gross revenue impacts in B season.
Transferability	• Full transferability mitigates forgone gross revenue impacts in the A season

Summarizing the relative impacts of sector allocations (comparing Alternative 2 with Alternative 4) is difficult due to the complexity of the sector allocation options in Alternative 2. In order to summarize some of the differences in the Alternative 2 sector splits options and the sector split in Alternative 4, a comparison is made with the Alternative 2 option 2d (midpoint between the AFA pollock allocations and the historical averages). Table 7-10 shows the different the sector split between the two alternatives.

Table 7-10 Comparison of sector allocations under Alternative 2, option 2d and Alternatives 4 and 5

Alternative	CDQ	Inshore CV	Mothership	Offshore CP
Alternative 2: option 2d (midpoint)	6.5%	57.5%	7.5%	28.5%
Alternative 4: A season	9.3%	49.8%	8.0%	32.9%
B season	5.5%	69.3%	7.3%	17.9%

Table 7-11 provides a comparison of potentially forgone gross revenue impacts for Alternative 2 cap levels of 68,100 Chinook salmon, with the 70/30 seasonal split and option 2d sector split, Alternative 4 AS1 and Alternative 5 AS1. Full A season transferability is assumed for Alternative 4 and 5; however, due to the breadth of the option set transferability was not incorporated in the analysis of Alternative 2. In this comparison, total potentially forgone gross revenue is less under Alternative 4 AS1 ($249 million); however, potentially forgone gross revenue for the pollock fleet varies by sector between the alternatives in terms of overall gains and losses. The CDQ sector has higher potentially forgone gross revenue under Alternative 5 AS1, due to the lower B season sector allocation. The inshore CV sector has lower annual forgone gross revenue under Alternative 4 AS1 and lower seasonal forgone gross revenue in both A and B seasons as compared with Alternative 2, option 2d and AS1 of Alternative 5. The Mothership sector also has slightly lower annual forgone gross revenue total under Alternative 4 AS1 than under the other alternative. This is driven by substantially lower A season forgone gross revenue under that scenario. The CP sector has higher forgone gross revenue under Alternative 4 AS1, driven primarily by the lower B season allocation.

Table 7-11 2007 estimated potentially forgone gross revenue by sector for Alternative 2, option 2d (70/30 season split, cap 68,100), compared with Alternative 4 AS1 (cap 68,392) and Alternative 5 AS1 (cap 68,000) (in millions of $).

Sector		CDQ	Inshore CV	Mothership	Offshore CP	Total
Alternative 2: option 2d						
	A season	$0	$135	$20	$118	$273
	B season	$3	$41	$2	$4	$49
Total Alternative 2		**$2.5**	**$176**	**$22**	**$123**	**$322**
Alternative 4: AS1						
	A season	$0	$123	$12	$115	$249
	B season	$4	$36	$2	$22	$64
Total Alternative 4: AS1		**$4**	**$159**	**$14**	**$137**	**$313**
Alternative 5: AS1						
	A season	$0	$145	$20	$128	$293
	B season	$5	$39	$3	$24	$70
Total Alternative 5: AS1		**$5**	**$184**	**$23**	**$152**	**$363**

Table 7-12 provides a comparison of potentially forgone gross revenue impacts for Alternative 2 cap levels of 48,700 Chinook salmon, with the 70/30 seasonal split and option 2d sector split, with Alternative 4 AS2. At lower cap levels, the CDQ sector has lower forgone gross revenue under Alternative 4 AS2, due to the higher relative A season sector allocation. The inshore CV sector has lower annual forgone gross revenue under Alternative 4 AS2 and lower seasonal forgone gross revenue in both A and B seasons as compared with Alternative 2, option 2d. The Mothership sector also has lower annual forgone gross revenue under Alternative 4 AS2, driven by the lower A season forgone gross revenue under Alternative

4 AS2. The CP sector has higher forgone gross revenue under Alternative 4 AS2, driven primarily by the lower B season allocation under the scenario.

Table 7-12 2007 estimated potentially forgone gross revenue for Alternative 2, option 2d (70/30 season split, cap 48,700) compared with Alternative 4 AS2 (cap 47,591) (in millions of $).

Sector		**CDQ**	**Inshore CV**	**Mothership**	**Offshore CP**	**Total**
Alternative 2: option 2d						
	A season	$24	$201	$34	$156	$414
	B season	$5	$55	$4	$13	$76
Total Alternative 2		**$29**	**$256**	**$38**	**$169**	**$490**
Alternative 4: AS2						
	A season	$13	$154	$28	$172	$367
	B season	$5	$46	$4	$30	$86
Total Alternative 4: AS2		**$18**	**$200**	**$32**	**$202**	**$453**

Table 7-13 provides a comparison, based on the 2007 high bycatch year, of the impacts of Alternative 5 at the 60,000 Chinook salmon hard cap (AS1) with the hard cap of 47,591 that would be invoked if the performance standard of Alternative 5 is not met. If all sectors failed to reach the performance standard the total potentially forgone pollock first wholesale gross revenue would have increased, in 2007, from $363 million to $453 million or about a 25 percent increase in impacts. On a sector level, the greatest impacts of not meeting the performance standard would have occurred in the CDQ sector where impacts would have increased from $5 million to $18 million, which is more than 2.5 times larger than the AS1 impact level. The Inshore CV sector would have had an increase from $184 to $200 million, or about 9 percent. Motherships would have had an increase from $23 million to $32 million, or about 39 percent. Finally, the Offshore CP sector would have had an increase from $152 to $202 million, or about 33 percent.

Within Alternative 5, the Council established an annual sector level performance standard combined with the 60,000 Chinook salmon hard cap with an IPA to incentivize Chinook salmon avoidance in all years with the goal encouraging actual salmon bycatch below the cap. This analysis shows that the penalty, in terms of the difference in potentially forgone gross revenue between the 60,000 cap level and the 47,591 cap level, from violating the performance standard would be considerable. This implies that the risk of bearing these impacts is likely to create the intended incentive for industry to avoid Chinook salmon bycatch by participating in a private contractual arrangement, called an incentive plan agreement (IPA) that establishes an incentive program to keep Chinook salmon bycatch below the 60,000 Chinook salmon cap.

Table 7-13 2007 estimated potentially forgone gross revenue for Alternative 5 AS1 (60,000 cap) compared with Alternative 4 AS2 (cap 47,591 and equivalent to Alt. 5 AS2) (in millions of $).

Sector		CDQ	Inshore CV	Mothership	Offshore CP	Total
Alternative 5: AS1						
	A season	$0	$145	$20	$128	$293
	B season	$5	$39	$3	$24	$70
Total Alternative 5: AS2		**$5**	**$184**	**$23**	**$152**	**$363**
Alternatives 4, 5: AS2						
	A season	$13	$154	$28	$172	$367
	B season	$5	$46	$4	$30	$86
Total Alt., 4 and 5: AS2		**$18**	**$200**	**$32**	**$202**	**$453**

7.3 Comparison of Effects on CDQ Royalties

This section provides a comparison of the potential impacts on the CDQ Program in lost royalty revenue attributable to the upper-bound estimates of potential reductions in pollock harvested as a result of a fishery closure under the proposed alternative and options. Hypothetical forgone CDQ pollock catch, in mt, by season, from 2003-2007, under Chinook salmon hard cap options are in Table 7-14 through Table 7-16.

Insufficient aggregate royalty data is publicly available to estimate potentially forgone pollock royalties for 2006. Although the estimate of pollock royalty revenue is not based on an average of all CDQ groups, the hypothetical forgone royalty revenues for all CDQ Programs would be higher under both Alternative 4 AS 1 and Alternative 5 AS1 than under a 68,100 cap and the 70/30 seasonal split in bycatch allocations (alternative 2:option 2d). Using similar royalty estimates for 2007 (The estimated pollock royalty rate in 2007 was $310/mt), the hypothetical forgone royalty revenues for all CDQ Programs would be higher under a 48,700 cap and the 70/30 seasonal split in bycatch allocations (alternative 2: option 2d) than under Alternative 4 AS2 (equivalent to Alt. 5 AS2).

Table 7-14 2007 hypothetical forgone pollock royalties to the CDQ Program for Alternative 2, option 2d (70/30 season split, cap 68,100), compared with Alternative 4 AS1 (cap 68,392).

2007 CDQ		**Forgone pollock (in mt)**	**Forgone royalty (millions of $)**	**% of total pollock royalties**	**% of total royalties**
Alternative 2: option 2d					
	A season	0	$ -	0%	0%
	B season	2,983	$0.9	2%	1%
Total Alternative 2		2,983	$0.9	2%	1%
Alternative 4: AS1					
	A season	0	$ -	0%	0%
	B season	4,415	$1.4	3%	2%
Total Alternative 4: AS1		4,415	$1.4	3%	2%

Table 7-15 2007 hypothetical forgone pollock royalties to the CDQ Program for Alternative 2, option 2d (70/30 season split, cap 68,100), compared with Alternative 5, AS1 (cap 68,000).

2007 CDQ		**Forgone pollock (in mt)**	**Forgone royalty (millions of $)**	**% of total pollock royalties**	**% of total royalties**
Alternative 2: option 2d					
	A season	0	$ -	0%	0%
	B season	2,983	$0.9	2%	1%
Total Alternative 2		2,983	$0.9	2%	1%
Alternative 5: AS1					
	A season	0	$ -	0%	0%
	B season	5,363	$1.66	4%	2%
Total Alternative 5: AS1		5,363	$1.66	4%	2%

Table 7-16 2007 hypothetical forgone pollock royalties to the CDQ Program for Alternative 2, option 2d (70/30 season split, cap 48,700) compared with Alternative 4 AS2 (cap 47,591).

2007 CDQ		**Forgone pollock (in mt)**	**Forgone royalty (millions of $)**	**% of total pollock royalties**	**% of total royalties**
Alternative 2: option 2d					
	A season	19,389	$6.0	14%	9%
	B season	5,335	$1.7	4%	2%
Total Alternative 2		24,724	$7.7	18%	11%
Alternatives 4 and 5 : AS2					
	A season	10,281	$3.2	7%	5%
	B season	6,057	$1.9	4%	3%
Total Alt 4 and Alt. 5: AS2		16,338	$5.1	12%	7%

7.4 Comparison of Impacts for 2008 and 2009

The primary analytical timeframe for impacts analysis is 2003-2007. However, given updated catch information it is possible to estimate some of the potential for fleet impacts in 2008 and 2009. Table 7-17 compares actual catch by sector and season in 2008 and 2009 with the cap levels by season and sector of the 47,591 Chinook salmon cap in Alternatives 4 and 5 and the lowest cap under consideration, the Alternative 2 cap of 29,300 Chinook salmon with the 70:30 seasonal and option 2d sector allocations. Note that under Alternative 5, 47,591 Chinook salmon is also the performance standard. While NMFS will annually calculate each sector's annual performance threshold, that threshold will be similar to that sector's annual allocation of 47,591 Chinook salmon.

Under Alternatives 4 and 5, none of the sectors would have exceeded their seasonal and sector-specific cap allocation in 2008 or 2009, or the annual cap over in either 2008 or 2009. The low cap is used as a basis for considering whether any of the sectors would have been constrained under the alternatives in the more recent years. None of the caps that would have been imposed under the most restrictive cap level would have been reached in either season by any of the sectors.

Table 7-17 Sector and seasonal caps, in numbers of Chinook salmon, for the Alternative 5 and Alternative 4 cap of 47,591 Chinook salmon and Alternative 2 cap of 29,300 Chinook salmon compared to actual bycatch by sector and season in 2008 and 2009.

	A-season				B-season				Total		
Sector	Sector/ Season allocation of 29,300 cap	Sector/ Season allocation of 47,591 cap	2008 actual bycatch	2009 actual bycatch	Sector/ Season allocation of 29,300 cap	Sector/ Season allocation of 47,591 cap	2008 acual bycatch	2009 actual bycatch	Annual Sector allocation of 47,591 cap	2008 Annual total bycatch	2009 Annual total bycatch
C/P	5,845	10,960	4,091	2,738	2,505	2,556	377	310	13,516	4,468	3,048
Mothership	1,538	2,665	1,125	547	659	1,042	175	86	3,707	1,300	633
CV	11,793	16,590	9,815	6,030	5,054	9,894	4,271	2,252	26,484	14,086	8,282
CDQ	1,333	3,098	604	358	571	785	36	89	3,883	640	447
Total	20,510	33,314	15,635	9,673	8,790	14,277	4,859	2,737	47,591	20,494	12,410

AEQ levels are not estimated for 2008 and 2009. The AEQ for each year considers both removals in that year as well as the lagged impact of age-specific removals in previous years. While bycatch levels in 2008 and 2009 are much lower than previous years, the AEQ estimate for those years would likely be higher than the actual bycatch due to the lagged impacts of the high removals in previous years, particularly the highest year in 2007. This is shown graphically in EIS Figure 5-43. As noted in these sections, while this impact analysis does not predict impacts past 2007, the authors acknowledge that bycatch during the years 2003-2007 will continue to influence adult equivalent salmon returning to river systems for several years into the future.

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8.0 ENVIRONMENTAL JUSTICE

8.1 What is an environmental justice analysis

This chapter is an analysis required under Executive Order (E.O.) 12899, Environmental Justice (59 FR 7629) [68]. Under this E.O., demographic information is used to determine whether minority populations or low-income populations are present in the area affected by the proposed action. If so, a determination must be made as to whether the proposed action may cause disproportionately high and adverse human health or environmental impacts on those populations. The disproportionality of the adverse impact to identified minority or low-income populations is the key factor under environmental justice analysis. Adverse impacts that affect the wider population as a whole are not considered potential environmental justice impacts.

"Environmental" effects under E.O. 12898 are construed to include social and economic effects, and these are discussed in some detail in this section. Human health effects, as mentioned in E.O. 12898, appear to be less relevant to impacts potentially associated with the various management alternatives being considered in this document.[69]

There is no standardized methodology for identification or analysis of environmental justice issues. In determining what constitutes a minority "population," CEQ guidance states, "the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographical analysis." While no available federal guidance addresses the identification of low-income populations, a similar approach has generally been adopted when preparing National Environmental Policy Act (NEPA) documents (King 2001). The U.S. Environmental Protection Agency (EPA) has stated that addressing environmental justice concerns is entirely consistent with NEPA and that disproportionately high and adverse human health or environmental effects on minority or low-income populations should be analyzed with the same tools currently used in the NEPA process. NOAA environmental review procedures[70] state that, unlike NEPA, the trigger for analysis under E.O. 12898 is not limited to actions that are major or significant, and hence federal agencies are mandated to identify and address, as appropriate, "disproportionately high and

[68] This section is based on the discussion in the Alaska Groundfish Harvest Specifications Final EIS (NMFS, 2007). The analysis was originally prepared by Michael Downs and Marty Watson of the consulting firm EDAW.

[69] E.O. 12898 does include language regarding the need to identify differential patterns of subsistence consumption of fish and wildlife, but it goes on to link this data collection with potential human health risks associated with the consumption of pollutant-bearing fish and wildlife. While subsistence in Alaska is associated more strongly with minority (Alaska Native) populations and low-income populations (those in rural areas with fewer commercial economic opportunities) than other populations, there is no indication that any of the alternatives being considered would result in a degradation of resources in a manner such that their consumption would result in a health risk elevated above existing conditions.

[70] NOAA *Environmental Review Procedures for Implementing the National Environmental Policy Act* (Issued 06/03/99).

adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations."

While a "population" can mean a geographically localized set of people (for example, residents of a village, town, or other spatially bounded community), a "population" could also refer to a widely distributed set of people with a uniting or common set of circumstances, livelihoods, or lifeways that may be affected by the management alternatives. Populations could be very localized (e.g., "population pockets" of workers living in group quarters at a series of processing plants in communities directly participating in the relevant fisheries) or they could be spread over very wide areas in a distribution pattern more closely resembling the total set of communities in a given region (e.g., residents of communities hundreds of miles removed from direct fisheries activities but that may nevertheless be affected by changes in access to subsistence resources that are themselves affected by the management action). Defining populations for analysis of Chinook salmon bycatch in the Bering Sea pollock trawl fishery is challenging as the fishery literally spans an area offshore of thousands of miles of coastline that encompasses dozens of communities in Alaska, including many communities with high Alaska Native (i.e., minority) population percentages, as well as encompassing large numbers of participants from the Pacific Northwest.

8.2 What is the action area?

The action area is waters of the Bering Sea, as described in detail in EIS Section 1.3. Note that the action area does not include the waters of the Aleutian Islands. This circumscribes the scope of the analysis somewhat since it is not necessary to consider the allocation of pollock to the Aleut Enterprise Corporation.

The definition of the action area notes that impacts of the action may occur outside the action area in the freshwater habitat and migration routes of the salmon caught as bycatch. Chinook salmon caught as bycatch in the Bering Sea pollock fishery may originate from Asia, Alaska, Canada, and the western United States. Impacts may extend beyond those river systems, as subsistence harvesters distribute Chinook salmon through traditional gift and exchange networks. Thus persons in major cities not on the impacted river system, such as Anchorage, may be affected. Moreover, impacts may occur on shore in communities that process and arrange for the further distribution of pollock deliveries from catcher vessels.

The Yukon River extends beyond Alaska's border with Canada into the Yukon Territory. There are subsistence (aboriginal or First Nations), commercial, personal use, and sport fisheries for Chinook salmon in the Canadian Yukon. The pollock fleet in the Bering Sea may be taking Chinook as bycatch that would otherwise return to the Yukon Territory and spawn, or be taken in one of these fisheries. All of these Yukon fisheries may provide disproportionate benefits to low income or minority populations. For example, the First Nation fishery is only open to the Yukon's Natives to provide for subsistence, ceremonial, and other cultural purposes. Yukon River harvests from the subsistence, commercial, personal use, and sport fisheries combined, averaged 10,051 Chinook over the period 1997-2006. (U.S. and Canada Yukon River Joint Technical Committee 2008)

The main Chinook salmon stocks in Asia spawn in rivers on Russia's Kamchatka Peninsula. The two most important drainages are those of the Kamchatka and Bolshaya Rivers (Varnavskaya and Shpigalskaya). Commercial fishing is an important industry in Kamchatka, and salmon harvests are an important component of this. Salmon harvests are also an important part of regional subsistence harvests. In the early 2000s, 50% of the population was reported to live under the poverty level (Colt et al.) Several of Russia's indigenous populations live in Kamchatka, including the Koryak, Itelman, Even, and Chukchi (Tysiachniouk and Reisman). Minority populations have a history of subsistence use of fishery resources, although social changes in the region may have reduced the salience of traditional cultural practices for some communities (Colt et al.) NMFS does not have detailed information on the specific role of Chinook salmon in the lives of low income and minority populations, however, under the circumstances it is probable that it does play a role.

Environmental Justice analysis is carried out with respect to residents of the U.S. Therefore, the Canadian and Russia fisheries will not be discussed further in this chapter. However, the importance of this fishery to Yukon minorities and low income persons is undoubtedly very similar to the importance of similar fisheries on the Yukon in Alaska and many of the issues discussed below will be applicable to Yukon residents. The Chinook stocks of Kamchatka may also provide benefits to Russian minority and low income populations as well.

8.2.1 Western and Interior Alaska Communities

Environmental justice issues are particularly important for Alaskan communities around the perimeter of the Bering Sea, island communities in the Bering Sea, interior Alaska communities situated on or dependent on the great river systems, such as the Kuskokwim and Yukon, and communities in the southern Chukchi Sea. The harvests are important for coastal regions with Aleut, Alutiiq, Yup'ik and Inupiat populations, but also for Athabaskan Indian populations in interior Alaska.

As described EIS Chapter 5, genetic analysis suggests that significant proportions of the Chinook salmon harvested by the pollock fishery in the Bering Sea originate in the rivers and streams of western Alaska. Chinook salmon harvests are important components of subsistence and commercial fishery harvests in western Alaska, and play an important role in the subsistence/market economies of these regions. Many public comments received during the scoping process for this EIS discussed how salmon serves an important cultural and economic role in the communities of Alakanuk, Eek, Nanakiak, Nunapitchuk, Emmonak, Kwethluk, Bethel, St. Mary's, Ruby, Nulato, Koyukuk, Kotlik, Galena, Kaltag, Fairbanks, Kongiganak, Quinhagak, Nenana, Minto, Marshall, and Hooper Bay, and throughout western and Interior Alaska (NMFS 2008)[71].

The pollock fishery also plays an important role in this region. Sixty-five western Alaska communities have an interest in the productivity of the pollock resource and the costs of harvesting pollock through their participation in the Community Development Quota program. Other communities, such as Dutch Harbor/Unalaska, play an important role in the fishery through the processing of pollock landed by pollock catcher-vessels.

8.2.2 South Central, Southeast Alaska, Pacific Northwest

Southcentral and Southeast Alaska have minority Alaska Native populations that use Chinook salmon for subsistence purposes. However, the impact of these actions on their Chinook use is likely to be much less of an issue in the Southcentral and southeast Alaska region communities than in western Alaska because relatively few fish in the bycatch appear to come from these areas, and Chinook are less important as a subsistence resource in these areas:

- As indicated in Chapter 5, the limited genetic evidence does not indicate that large proportions of the Chinook bycatch originate in these regions. Cook Inlet origin fish appear to account for less than a half percent of the "A" season Chinook bycatch, and Southeast Alaska fish appear to account for 0.1 percent to 1.1 percent. Cook Inlet origin fish may account for 5.3 percent to 7.5

[71] Chapter 3 provides detailed descriptions of regional subsistence, commercial, and recreational salmon fisheries throughout western Alaska.

percent of "B" season fish from the southeast Bering Sea, and 2.2 percent to 3.0 percent of the fish from the northwest Bering Sea. Southeast origin fish may account for 3.3 percent to 4.3 percent of the "A" season fish from the southeast Bering Sea, and 0.5 percent to 3.5 percent of the "B" season fish from the northwest Bering Sea.

- Subsistence overall appears to be less important in these regions than in does in western Alaska. Subsistence harvest summaries from the Alaska Department of Commerce, Community, and Economic Development (ADCCED) indicate that per capita consumption tends to be smaller in Southcentral and Southeast Alaska boroughs and census districts than in those in western Alaska.
- Moreover, available data from 2002 to 2005 show that subsistence catches of Chinook salmon in Southeast Alaska and Southcentral Alaska fisheries (measured in pounds) are only 1.3 percent and 4.6 percent of the Chinook salmon subsistence catch in western Alaska fisheries. (Hartman, pers. comm.).[72]

As noted in EIS Chapter 5, genetic evidence suggests that some Chinook salmon present in the Bering Sea and taken as bycatch originate in Pacific Northwest river systems. These Chinook may have originated in one or more of over 200 stocks British Columbia to Washington. The evidence does not connect the Chinook to specific river systems. Native American tribes in northwest Washington and along the Columbia River have treaty rights to the harvest of returning Chinook salmon stocks and do so for commercial, ceremonial, and subsistence reasons. Thus there is a potential environmental justice issue raised with respect to these fisheries.

The greater Seattle area is the center for much of the economic activity related to the North Pacific pollock fishery. However, the geographic footprint of those activities is difficult to define, and it cannot be attributed to specific communities or neighborhoods in the same manner as Alaska communities may be linked to the fishery, as discussed in the Groundfish Programmatic Supplemental Environmental Impact Statement (PSEIS, NMFS 2004a). Given the nature of engagement with the fishery, the Washington Inland Waters region does not have the same type of resident workforce focused in individual communities in a manner comparable to that seen in Alaska communities. Also, unlike the Alaska groundfish communities, the white portion of the population comprises a large majority of the overall population (i.e., racial or ethnic groups classified as minorities are mathematical minorities within the local overall population, unlike the relevant Alaska communities).

Data collected for the PSEIS (NMFS 2004a) suggest that large proportions of the workers at groundfish processing plants in Unalaska/Dutch Harbor, Sand Point, King Cove, and Akutan and workers on catcher-processor ships and motherships, are members of minority groups. These data are collected from group quarters in these communities suggesting that these workers are transients in these communities. The data do not provide information on place of residence. However, these minorities may raise environmental justice issues as well.

Pacific Northwest Tribal fisheries

Indian tribes in the Pacific Northwest have treaty rights to a share of the Chinook salmon in the offshore troll fishery, Puget Sound, and along the Columbia River system. Not all tribes avail themselves of their rights under these 19th Century treaties, but many do. Members of the tribes that harvest Chinook salmon for subsistence, commercial, and ceremonial purposes, may be impacted by the actions under consideration. Tribes invest in fisheries management by hiring fisheries experts, carrying out fisheries research, managing tribal fishermen, representing tribal interests with state and federal managers, and investing in hatcheries and habitat enhancement. Tribes have created two tribal fishery commissions, the Columbia River Inter-Tribal Fish Commission and the Northwest Indian Fisheries Commission, to

[72] Jeff Hartman, National Marine Fisheries Service, Alaska Region. Sustainable Fisheries Division. P.O. Box 21668 Juneau, AK. 99801. Personal communication, August 29, 2008.

provide a tool for coordinated planning and joint management efforts. Not all tribes with salmon management responsibilities are members of the commissions.

Pacific Northwest Tribal Chinook Harvests

Tribal harvests offshore of the Pacific Northwest, in Puget Sound, in the Columbia River and its tributaries, and in other inland waters, from 1998 to 2007, ranged between about 120,000 Chinook in 1998, and 340,000 Chinook in 2004 (PFMC 2008). Tribal harvests are used for many of the same purposes as Native Alaskan harvests in Alaska: for subsistence, for cultural (ceremonial) purposes, and to earn cash incomes.

More details about tribal involvement in Chinook salmon harvests may be found in the “Affected Environment” sections of the Final Programmatic Environmental Impact Statement for Pacific Salmon Fisheries Management off the Coasts of Southeast Alaska, Washington, Oregon, and California and in the Columbia River Basin (NMFS 2003b) and the Puget Sound Chinook Harvest Resource Management Plan Final Environmental Impact Statement (NMFS 2004b).

8.3 Are minority or low income populations present?

A significant part of the population in the impacted area is made up of Alaskan Natives. Table 8-1 shows the Alaska Native population within each of the U.S. census districts in the action area and compares these with the proportions of the U.S. and Alaskan populations that are made up of American Indian and Alaska Natives. Less than one percent of the U.S. population, and about 16 percent of Alaska’s population is made up of Native Americans; however,0 none of the census districts in the action area is less than 44 percent Alaskan Native.

Table 8-1 Minority and low income populations by western Alaska census district, 2000 Census

Area	Population	American Indian or Native Alaskan	Two or more races	Min native percentage of population	Max native percentage of population
United States	281,421,906	2,447,989	n.a.	~ 1	n.a.
Alaska	626,932	98,043	34,146	16	21
Lake and Peninsula	1,832	1,340	127	74	80
Bristol Bay	1,258	550	30	44	46
Dillingham	4,922	3,452	329	70	77
Bethel	16,006	13,114	617	82	86
Wade Hampton	7,028	6,503	177	93	95
Yukon-Koyukuk	6,551	4,644	256	71	75
Nome	9,196	6,915	387	75	79
Northwest Arctic	7,208	5,944	267	82	86
Aleutians west	5,465	1,145	189	21	24
Aleutians east	2,697	1,005	79	37	40

Source: U.S. Bureau of the Census. Minimum percentage assumes only persons characterized as “American Indian or Alaskan Native” are Alaska Natives. Maximum assumes that all of the persons of two or more races are at least half Alaska Native. “Two or more races” category has not been used for the United States as the number is unlikely to be comparable in interpretation to the Alaskan estimates.

There are a large number of indigenous peoples, with a diversity of life-styles and cultures, living within the action area. Cultural differences with implications for resource use may exist even between groups identified within one of the broad cultural-linguistic groupings commonly used.[73] The following brief list of minority ethnic groups within the region depends primarily on Langdon and Krauss (Langdon 2002; Krauss 1982). From North to South:

- Seward Peninsula and the eastern shore of Norton Sound as far south as Unalakleet are occupied by the Inupiat Eskimo. Langdon distinguishes between the Norton Sound and Bering Straits Inupiat. The later includes the community of Wales at the end of the Seward Peninsula, and the King Island community. No one lives on King Island, but the people who used to, and their descendents, maintain themselves as a distinct community on the mainland. Langdon notes that the Bering Straits Inupiat traditionally tended to harvest larger sea mammals, while the Norton Sound Inupiat tended to harvest small sea mammals, land mammals, fish, and migratory waterfowl.

- The Athabaskan Indians are inland rather than maritime peoples. They inhabit the central core of Alaska. Athabaskan groups living along the Yukon and Kuskokwim River systems may be especially affected by this action. These include the:

  - Deghitan on the lower Yukon and Kuskokwim Rivers
  - Holikachuk on the lower middle Yukon and Innoko Rivers
  - Koyukon in the middle Yukon and Koyukuk Rivers
  - Tanana on the Lower Tanana River
  - Tanacross on the middle Tanana River
  - Gwich'in on the upper Yukon and Porcupine Rivers
  - Han on the upper Yukon River
  - Upper Tanana on the upper Tanana River
  - Upper Kuskokwim on the upper Kuskokwim River

- The Yup'ik Eskimo occupy the great bulge formed by the Yukon and Kuskokwim River deltas and Nelson and Nunivak Islands. Langdon distinguishes between the Yukon, Kuskokwim, Bristol Bay and Delta Yup'ik and the Cup'ik of Nunavak Island. Membership in the different groups implies access to different resources and consequently somewhat different cultural practices. For example, he notes that Yup'ik communities along the resource rich Yukon and Kuskokwim Rivers tended to be larger than the communities of the Delta Yup'ik, who were further removed from these resources.

- The Unangan/Aleut occupy the Aleutian Islands. Langdon distinguishes between Eastern, Central, and western Unangan.

- The Sugpiaq/Alutiiq are the Pacific Eskimos, occupying the Alaska Peninsula, Kodiak, the Gulf waters of the Seward Peninsula, and Prince William Sound. Langdon identifies the Koniag Alutiiq in the west, the Chugach Alutiiq in the east, and the Eyak in the area of the Copper River delta. Communities to the south side of the Alaska Peninsula are generally considered to be minimally impacted by this action. However part of the homeland of the Koniag Alutiiq lies on the north side of the peninsula to the west of Bristol Bay.

[73] Fienup-Riordan found that attitudes towards non-Native hunters could contrast "sharply" between Yup'ik on Nelson and Nunivak Islands. Nelson Islanders sought to treat a relatively new musk ox resource in a more traditional manner, while Nunivak Islanders were more willing to support guided hunting as a way of earning income as well as acquiring meat (Fienup-Riordan, 2002). The point is that there can be significant cultural divergences even among fairly closely related ethnic groupings.

The key point is that there is a complex group of indigenous minority populations that occupy the impacted area. There are many cultural similarities, but cultural differences may affect the way these populations interact with Chinook salmon and other subsistence resources. Cultural differences may exist between broadly defined groups such as the Yup'ik and the Athabaskans, but also between smaller groups within these larger groupings.

Members of Indian tribes in the Pacific Northwest are members of a racially and culturally distinctive minority in that region. Tribes of particular interest are those whose members harvest Chinook salmon, or could harvest Chinook salmon in the ocean fisheries off of the west coast, in Puget Sound, and on the Columbia River, for commercial, ceremonial, or subsistence reasons, pursuant to treaties between their tribes and the United States Government.

Other minority populations work on pollock catcher-processors, catcher-vessels, and shoreside processing plants.[74] These minorities enter the region for harvesting and processing pollock, and perhaps other species, but do not live there. However, these minority populations may also be impacted by the actions under consideration.

The PSEIS (NMFS 2004a) took two approaches to estimate the size of the potential minority population in the shoreside processing sector. Shoreside processors were surveyed to determine the size of minority populations employed, and 1990 and 2000 Census data on group housing was examined to determine the size of minority populations that may be resident in processor housing. The group housing data provided the most detailed and disaggregated information. Information was available separately for Unalaska/Dutch Harbor, Akutan, King Cove, and Sand Point:

- Unalaska: In both years a significant proportion of the residents of group housing were minorities, and the minority proportion grew from 1990 to 2000. Although demographic categories changed somewhat between the 1990 and 2000 census, some relatively large changes are readily apparent. For example, in 1990, the "Asian or Pacific Islander" category accounted for 27 percent of group quarters population, but 42 percent by 2000.
- Akutan: The racial and ethnic categories used in the two censuses differ somewhat making comparisons a little difficult. However, Asian and Pacific Islanders dominate the mix in both years (49 percent in 1990, and 43 percent in 2000). The Alaska Native/Native American population grew from 1 percent to 7 percent. The white population dropped considerably between the two censuses, from 42 percent in 1990 to 24 percent in 2000).
- King Cove: Minorities dominated the group housing in King Cove as well. Again, Asian and Pacific Islanders were the most common minority, rising from 58 percent of the population in 1990 to 64 percent in 2000. A mixture of other minorities were also important. The white population fell from 25 percent in 1990 to 12 percent in 2000.
- Sand Point: Asians and Pacific Islanders grew in importance here as well, rising from 42 percent of the population in 1990 to 61 percent in 2000. In 2000, whites accounted for most of the remaining population.

Confidentiality prevented a detailed description of the data on shoreside workforces collected from industry in 2000. Returns were received from four of the six large shoreside plants, and one of the two floating processors. Out of a combined workforce for these units of 2,364 persons, 22.5 percent were classified as white or non-minority, and 77.5 percent as minority. Not all plants provided details about the specific minorities in their plants. Of those that did, 5 percent or less were Black or African-American and 5 percent or less were Alaska Native/Native American. Asian/Pacific Islanders were the largest

[74] The discussion of minority composition of the pollock industry workforce is based on the discussion in Section 3.9 of the Supplemental Programmatic Groundfish EIS (NMFS, 2004).

minority group in two-thirds of the plants in any region reporting detailed data, and the group classified as Hispanic was the largest minority group in the remaining one-third.

The labor force on the catcher-processors and motherships was not covered by the 1990 and 2000 Censuses. The analysis in the EIS was based solely on the industry survey. Different firms provided different levels of detail in the breakout of the internal composition of the minority component of their workforce, but the detailed information provided encompassed 1,906 out of the 2,126 persons reported, or 90 percent of the total reported workforce. In some instances firms simply reported minority and non-minority proportions of the workforce, in others they provided more detailed information. The portion of the workforce within the detailed reporting set was 36.9 percent white or non-minority and 63.1 percent minority. Adding the more highly aggregated data does not significantly change the overall minority/non-minority ratio. Within the total set of responding entities, individual entity workforces ranged from a 36 percent minority workforce to an 85 percent minority workforce. Among entities reporting detailed data, Hispanic was the largest minority component in every entity's minority workforce segment, with one exception (in which case the largest minority segment was Asian/Pacific Islander, and Hispanic was second). Apart from the entity where Asian/Pacific Islander workers were the largest minority worker segment, Asian/Pacific Islanders were the second largest minority group represented for all but one of reporting entities (in which case the second largest group was Alaska Native/Native American).

Catcher vessel ownership and crews are assumed to reflect the overall demographic make up of the male working age population in their home communities. Although systematic demographic data were not collected for the groundfish catcher vessel crews in the Washington inland waters region, interviews with local sector association personnel suggest that minority population representation within this sector does not exceed the proportion of minority representation in the general population; therefore, environmental justice is not an issue with respect to potential impacts to this sector.

Many of the people in the action area have traditionally obtained significant amounts of food and materials by harvesting local resources. Paid jobs have been relatively scarce and often seasonal, and livings were earned in both the subsistence as well as the wage economy. These communities have been characterized by relatively low levels of labor force participation, high levels of unemployment, low per capita incomes, and high measured poverty rates. In part this reflects the inability of work and income statistics to measure activity outside of the formal marketplace. Significant numbers of transactions also appear to take place through undocumented barter and customary trade.

Because we are not in a position to systematically measure the contribution of subsistence or personal use harvest activity, and this informal production and trading activity, to income and consumption, the low income evaluation in this analysis is based on information from the formal, “documented” economy only.

Table 8-2 provides some income indicators, including the percentage of adults that are in the labor force, the percentage of adults that are unemployed, the percentage of persons in poverty, and per capita income. Labor force, unemployment, and income variables are difficult to interpret in these areas with their mixed subsistence/cash economies. A person’s formal labor force participation may be relatively small compared to what it might be in more heavily monetized economy; nevertheless, the person may be working very hard to earn a livelihood. Similarly, poverty and income statistics should really be adjusted to reflect the monetary value of subsistence production to provide a relatively comparable measure of income. On the other hand, a comparison of the income or poverty gap between the people in one of these areas and the rest of the state provides an indicator of the gap to be filled by subsistence activity.

Table 8-2 1999-2000 Employment, income, and poverty information for census districts and boroughs in the action area from the 2000 Census

Status	Total adults	In labor force	Out of labor force	Employed	Unemployed	Unemployment rate	% not working	% pop in poverty	Per capita income
Alaska	458,054	326,596	131,458	281,532	27,953	9%	29%	9%	22,700
Aleutians East Borough	2,337	1,854	483	1,086	768	41%	21%	22%	18,400
Aleutians West Census Area	4,637	3,788	849	3,252	473	12%	18%	12%	24,000
Bethel Census Area	10,269	6,446	3,823	5,481	936	15%	37%	21%	12,600
Bristol Bay Borough	908	649	259	581	68	10%	29%	9%	22,200
Dillingham Census Area	3,216	2,007	1,209	1,765	230	11%	38%	21%	16,000
Lake and Peninsula Borough	1,224	678	546	581	97	14%	45%	19%	15,400
Nome Census Area	6,176	3,745	2,431	3,107	608	16%	39%	17%	15,500
Northwest Arctic Borough	4,535	2,877	1,658	2,427	447	16%	37%	17%	15,300
Wade Hampton Census Area	4,094	2,399	1,695	1,825	574	24%	41%	26%	8,700
Yukon-Koyukuk Census Area	4,531	2,847	1,684	2,276	566	20%	37%	24%	13,700

Notes: Alaska Department of Labor and Workforce Development. Accessed at http://almis.labor.state.ak.us/?PAGEID=67&SUBID=114 on April 1, 2008.

Pollock deliveries to shoreside processors[75]

Previous studies have indicated that the Alaska communities with the strongest engagement in the North Pacific groundfish fishery are Unalaska, Akutan, Sand Point, and King Cove.[76] These four communities and their specific ties to the groundfish fishery were detailed in the PSEIS (NMFS 2004a). The pollock TAC allocated to catcher vessels delivering to inshore AFA processors is divided among fishing cooperatives that have strong community orientations. Some 55 percent of the 2008 catcher vessel quota is allocated to three cooperatives associated with Dutch Harbor/Unalaska processors (the Unalaska Cooperative, the UniSea Fleet Cooperative, and the Westward Fleet Cooperative), and another 31 percent is allocated to a cooperative associated with an Akutan processor (the Akutan Catcher Vessel Association). This suggests that Dutch Harbor, followed by Akutan, will receive the largest proportions of the landed pollock. In this section, existing community level information is summarized.[77]

[75] This section is based on the discussion in the Alaska Groundfish Harvest Specifications Final Environmental Impact Statement (NMFS, 2007). The analysis was originally prepared by Michael Downs and Marty Watson of the consulting firm EDAW.

[76] As noted in Alaska Groundfish Fisheries PSEIS (NMFS 2004a) there are also ties between the fishery to Adak, Chignik, False Pass, and St. Paul. However, these ties are far less pervasive and do not have the historical depth of the ties seen in Unalaska, Akutan, Sand Point, and King Cove. Due to these differences in existing conditions, the communities of Adak, Chignik, False Pass, and St. Paul are not detailed in this section, but each may experience impacts resulting from management actions under the various alternatives, if not to the degree seen in Unalaska, Akutan, Sand Point, and King Cove.

[77] As noted above, this region also encompasses the Pribilof Island communities (St. George and St. Paul). While not having the same degree of direct engagement with the groundfish fisheries as the other communities specifically noted in this section, the Pribilof communities may experience impacts associated with groundfish management actions in a number of ways, as discussed in subsequent sections on impacts to CDQ communities and marine mammal-based subsistence. Existing conditions relevant to environmental justice analysis for these communities are discussed in more detail in those sections below.

These communities vary widely in their population structure. For example, Unalaska is the largest community but has the lowest Alaska Native population percentage, and King Cove and Sand Point have a much higher Alaska Native population component than either of the other two communities. While Akutan has a relatively low Alaska Native population percentage, the Alaska Native population is highly concentrated in one area and generally insulated from commercial groundfish-related activity and its associated non-Native population. Thus, the Alaska Native portion of the community at least in some ways bears the most resemblance to “village life” from an earlier era among the four communities.

As shown in Table 8-3 below, Unalaska has a far higher white or non-minority population percentage than the other three communities. Asian residents represent the largest population segment in Akutan, and the second largest in Unalaska (behind whites) and in King Cove (behind Alaska Natives), and the third largest in Sand Point (behind Alaska Natives and whites). These communities have quite different histories with respect to the growth of the different population segments present in the community in 2000.

Table 8-3 Racial and ethnic composition of population, selected Alaska Peninsula/Aleutian Islands Region communities, 2000

Race/Ethnicity	**Unalaska**		**Akutan**		**King Cove**		**Sand Point**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**
White	1,893	44.2	168	23.6	119	15.0	264	27.7
Black or African American	157	3.7	15	2.2	13	1.6	14	1.5
Native American/Alaska Native	330	7.7	112	15.7	370	46.7	403	42.3
Nat. Hawaiian/Other Pacific Islander	24	0.6	2	0.3	1	0.1	3	0.3
Asian	1,312	30.6	275	38.6	212	26.8	221	23.2
Some Other Race	399	9.3	130	18.2	47	5.9	21	2.2
Two Or More Races	168	3.9	11	1.5	30	3.8	26	2.7
Total	4,283	100	713	100	792	100	952	100
Hispanic*	551	12.9	148	20.8	59	7.4	129	13.6

* “Hispanic” is an ethnic category and may include individuals of any race (and therefore is not included in the total as this would result in double counting).
Source: U.S. Bureau of Census.

Table 8-4 Employment, income, and poverty information, selected Alaska Peninsula/Aleutian Islands Region communities, 2000

Community	**Total Persons Employed**	**Unemployed**	**Percent Unemployment**	**Percent Adults Not Working**	**Not Seeking Employment**	**Percent Poverty**	**Median Family Income**
Akutan	97	505	78.9	84.84	38	45.5	$43,125
King Cove	450	31	4.7	31.50	176	11.9	$47,188
Sand Point	427	190	22.8	48.67	215	16.0	$58,000
Unalaska	2,675	414	11.1	27.93	625	12.5	$80,829

Source: U.S. Bureau of the Census 2000.

One important constant across all of these communities is that each is a minority community in the sense that minorities make up a majority of the population in each community. Unalaska may be described as a plural or complex community in terms of the ethnic composition of its population. Although Unalaska was traditionally an Aleut community, the ethnic composition has changed with people moving into the community on both a short-term and long-term basis.

Akutan is a unique community in terms of its relationship to the Bering Sea groundfish fishery. It is the site of one of the largest shore plants in the region, but it is also the site of a village that is geographically and socially distinct from the shore plant. This duality of structure has had marked consequences for the relationship of Akutan to the fishery[78] and in turn highlights the fundamentally different nature of Akutan and Unalaska. Akutan, while deriving economic benefits from the presence of a large shore plant near the community proper, has not articulated large-scale commercial fishing activity with the daily life of the community as has Unalaska, nor has it developed the type of support economy that is a central part of the socioeconomic structure of Unalaska.

While U.S. Census estimates show Akutan had a population of 589 in 1990 and 713 in 2000, the Traditional Council considers the local resident population of the community to be around 80 persons, with the balance being considered non-resident employees of the seafood plant. This definition obviously differs from census, state, and electoral definitions of residency but is reflective of the social reality of Akutan. The residents of the village of Akutan, proper, are almost all Aleut.

Sand Point and King Cove share a more or less common development history, but one quite different from either Unalaska or Akutan.[79] Historically, both of these communities saw a large influx of non-resident fish tenders, seafood processing workers, fishermen, and crew members each summer. For the last several decades, both communities were primarily involved in the commercial salmon fisheries of the area, but with the decline of the salmon fishery, plants in both communities have diversified into other species. In more recent years, the processing plants in both communities have become heavily involved in the groundfish fishery.[80]

Table 8-4 displays data on employment, income, and poverty[81] information for the relevant communities for 2000. The income range is large for the communities shown, with the median family income in Akutan being roughly half of that in Unalaska.

Additionally, Table 8-4 illustrates a potentially problematic aspect of the 2000 data. As shown in the PSEIS, in 1990 there was virtually no unemployment in these communities, no doubt due in large to the

[78] One example of this may be found in Akutan's status as a CDQ community. Initially (in 1992), Akutan was (along with Unalaska) deemed not eligible for participation in the CDQ program because the community was home to "previously developed harvesting or processing capability sufficient to support substantial groundfish participation in the BSAI …," though they met all other qualifying criteria. The Akutan Traditional Council initiated action to show that the community of Akutan, per se, was separate and distinct from the seafood processing plant some distance away from the residential community site, that interactions between the community and the plant were of a limited nature, and that the plant was not incorporated in the fabric of the community such that little opportunity existed for Akutan residents to participate meaningfully in the Bering Sea pollock fishery. That is, it was argued that the plant was essentially an industrial enclave or worksite separate and distinct from the traditional community of Akutan and that few, if any, Akutan residents worked at the plant). With the support of the APICDA and others, Akutan was successful in a subsequent attempt to become a CDQ community and obtained CDQ status in 1996.

[79] Sand Point was founded in 1898 by a San Francisco fishing company as a trading post and cod fishing station. Aleuts from surrounding villages and Scandinavian fishermen were the first residents of the community. King Cove was founded in 1911 when Pacific American Fisheries built a salmon cannery. Early settlers were mostly Scandinavian, European, and Aleut fishermen and their families.

[80] Their structural relationships to the fishery have diverged since the passage of the AFA. Processing facilities in both communities qualified as AFA entities; however, King Cove qualified for a locally based catcher vessel co-op while Sand Point did not.

[81] Poverty figures in this section are based on U.S. Census information which, in turn, is based on the Federal government's official poverty definition. Families and persons are classified as below poverty if their total family income or unrelated individual income was less than the poverty threshold specified for the applicable family size, age of householder, and number of related children under age 18 present. The poverty thresholds are the same for all parts of the country and are not adjusted for regional, state, or local variations in the cost of living. The poverty thresholds are updated every year to reflect changes in the Consumer Price Index.

presence of fishery-related employment opportunities (NMFS 2004a). A working knowledge of the fishing industry would seem to indicate the 2000 data are anomalous. For example, in 2000 the U.S. Census lists a total of 505 unemployed persons in Akutan. Given that the traditional village of Akutan consists of less than 100 persons (including all age groups, not just adults in the labor pool who could qualify as employed or unemployed), the overwhelming majority of persons enumerated as unemployed must have been idled seafood processing workers. While this unemployment may have been real in the sense that processing workers were present and not actively working when the census was taken, it is most likely an artifact of the timing of the census. Processing workers are not typically present in the community when the plant is idle for any extended period of time. Under normal conditions, there are no unemployed seafood processing workers present in the community (by design). The same type of data problem may be occurring in Sand Point and Unalaska, but this is not as clear as is the case for Akutan.

The contrast between these and the other communities is reflective of both lack of economic development in these communities and the nature of the workforce population in communities with shore plants, where large numbers of processing workers are present, tend not to have non-working adult family members present with them, and tend to be in the community exclusively for employment purposes.

Beyond the overall population, income, and employment estimates for the individual communities, it is important for the purposes of environmental justice analysis to examine information on the residential groundfish fishery workforces. It is likely that employment and income losses or gains associated with at least some of the proposed alternatives would be felt among the local seafood processing workers, and these workers do not comprise a representative cross section of the community demography.

One method to examine the relative demographic composition of the local processing workforces is to use group quarters housing data from the U.S. Census (keeping with the established practice of using U.S. Census data for environmental justice analysis). The group ethnicity-by-housing type data drawn from the 1990 census and the 2000 census (as well as subsequent sections augmenting this information with industry-provided estimates for 2000) was discussed in detail in the PSEIS and is summarized here.

Group housing in Unalaska is largely associated with the processing workforce. A majority of the population lived in group housing as of 1990 and the total minority population proportion was substantially higher in group quarters than in non-group quarters. The 2000 estimates showed a similar overall split between populations in group quarters versus non-group quarters, but the minority population distribution between and within housing types changed substantially in the 1990 to 2000 period. Although demographic categories changed somewhat between the 1990 and 2000 census, some relatively large changes are readily apparent. For example, in 1990, the “Asian or Pacific Islander” category accounted for 27 percent of group quarters population, and 42 percent by 2000.

In general, in 2000 Unalaska had a substantially greater minority population in absolute and relative terms than it did in 1990, and this is readily apparent within the group quarters population that is largely associated with seafood processing workers. In other words, environmental justice is potentially a large concern if there is the potential for processing worker displacement, and one that has grown through time.

Group housing in Akutan is almost exclusively associated with the processing workforce. As of 2000, a total 89 percent of the population lived in group housing, which represents the extreme of the four communities considered in this region. In 2000, the racial and ethnic composition of the group and non-group housing segments were markedly different, with the non-group housing population being predominately Alaska Native (87 percent), and the group housing population having little Alaska Native/Native American representation (7 percent). Like Unalaska, overall minority population representation was higher in absolute and relative terms in the community as a whole and in both group and non-group quarters in 2000 than in 1990.

As with the other communities, group housing in King Cove is largely associated with the processing workforce (38 percent of the population in 2000). The distribution of ethnicity between housing types is striking. In 2000, Alaska Natives/Native Americans comprised 75 percent of the non-group quarters population in the community; there was only one Alaska Native/Native American individual living in group quarters in the community. The “Asian” group comprised over 64 percent of the group quarters population in 2000, having risen substantially from 1990.

The white component of the population of King Cove was smaller in absolute and relative terms in 2000 than in 1990 for the community as a whole and in group quarters. Among non-group quarters residents, the number of white residents was larger in 2000 than in 1990 but still represented a smaller proportion of the non-group quarters population in 2000 than in 1990. In other words, environmental justice is clearly an issue of potential concern for the community as a whole and for the seafood processing-associated group quarters population in particular, and census counts suggest that minority representation has substantially increased over the period 1990 to 2000.

In Sand Point as of 2000, 36 percent of the population lived in group housing, which was only slightly less than the King Cove estimate for that same year. In 2000, no Alaska Natives/Native Americans lived in group quarters in the community, but they comprised 66 percent of the population living outside of group quarters. As shown, the ethnic and racial diversity among group quarters residents was, in general, substantially less in 2000 than in 1990. Asians comprised over 60 percent of all persons living in group quarters in 2000 with persons of Hispanic origin accounting for about two-thirds of the remaining 40 percent of group quarters residents.

Information on 2000 workforce demographics was obtained for four of the six major groundfish shore plants in the Alaska Peninsula/Aleutian Islands region, as well as one of the two floating processors that are classified as inshore plants. At least some of the entities voluntarily providing these data consider them confidential or proprietary business information, but they agreed to provide the information if it was aggregated with data supplied by others such that details about individual operations were not disclosed. As a result of these concerns, communities cannot be discussed individually.

It can be stated that the total combined reported processing (and administrative) workforce of 2,364 persons was classified as 22.5 percent white or non-minority, and 77.5 percent minority. Reporting shore plants ranged from having a three-quarters minority workforce to an over 90 percent minority workforce. It is worth noting that different firms provided different levels of detail in the breakout of the internal composition of the minority component of their workforce. For some plants, the total minority estimate was not disaggregated, and too few plants within this region provided detailed data to allow region-specific discussion.

In general, however, all of the shore plants in this region that provided detailed data have workforces that are 5 percent or less Black or African American and 5 percent or less Alaska Native/Native American (a pattern also seen in the detailed data from Kodiak plants). More variability was seen among other minority population components. The group classified as Asian/Pacific Islander was the largest minority group in two-thirds of the plants in any region reporting detailed data, and the group classified as Hispanic was the largest minority group in the remaining one-third. Two entities provided time series data. One provided data spanning a 10-year period, while the other provided information covering a 4-year span. For the former, the minority workforce component increased over time; for the latter, no unidirectional trend existed.

8.4 How do minority or low income communities interact with impacted resources?

The interaction of minority and low income communities with potentially impacted resources is treated in several previous sections of the Final EIS and Final RIR. The locations of the sections this analysis depends on will be summarized here to avoid repetition. Potential effects of the proposed action on Chinook salmon are provided in EIS Chapter 5, as well as in RIR Chapter 3. Chapter 3 provides considerable treatment on the management of Chinook salmon, the importance of subsistence use of Chinook and Chum salmon, potentially affected commercial as well as sport and personal use Chinook salmon fisheries. In addition, this chapter identifies regions and communities that depend on Chinook salmon and provided evidence of the importance of commercial salmon fisheries to the economies of Western Alaska.

Potential effects on the pollock fishery are assessed first by provision of descriptive information (Chapter 2) on the fishery, which includes a discussion of the CDQ program (section 2.5) as well as the Prohibited Species Donation program (section 2.4). Identification of communities that are dependent on the groundfish fishery, specifically pollock, is provided in section 6.10. These treatments will not be repeated here; however, the environmental justice assessment that appears below is highly dependent on all of these portions of the analysis and will draw directly from them.

In addition, there are discussion of interactions with marine mammals and seabirds, and other groundfish species, forage species, and other prohibited species provided here. This information is not provided in other parts of the EIS or this RIR.

Marine mammals[82]

The subsistence take of marine mammals is restricted to the Alaska Native portion of the population under the terms of the Marine Mammal Protection Act of 1972 (as reauthorized in 1994 and amended through 1997; the specific exemption for Alaska Natives is found in Section 101 [16 USC 1371]). The Alaska Native exemption within the MMPA allows for Alaska Natives who dwell on the coast of the North Pacific Ocean or Arctic Ocean to take marine mammals for the purposes of subsistence (or for the purposes of creating and selling authentic native handicrafts and articles of clothing). EIS Chapter 8 analyses the impacts of the alternatives on marine mammals.

Humans harvest a wide range of marine mammals in the action area, including seals, whales, Steller sea lions, and walrus. The mammals provide food and materials for a wide range of equipment and utensils. For example, walrus hides stretched over a wooden frame provided the materials for construction on the traditional umiak. The Marine Mammal Protection Act and the Endangered Species Acts permit the sale of handicrafts made from marine mammal parts. Thus handicrafts made from marine mammal parts may be sold to generate cash incomes (NMFS,n.d.).

As discussed in EIS Chapter 8, pollock fishing activities and changes in those activities could impact marine mammal populations though competition for marine mammal prey, by disturbing the animals, or by accidentally killing or injuring animals (“takes”) during the course of normal operations.

The focus in this discussion is on Steller sea lions, harbor seals, and northern fur seals. Harvests in comparison with the potential biological removals (the maximum number of animals, not including

[82] This section reproduces, with minor changes, the marine mammal discussion from the Environmental Justice section of the Groundfish Harvest Specifications EIS. That section was originally prepared by Dr. Mike Downs and Marty Watson of the consulting firm EDAW (NMFS, 2007).

natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population) for marine mammals have been used to identify marine mammals with potentially serious adverse impacts of the groundfish fishery for detailed analysis here. In situations where human induced mortality of species is close the animal's potential biological removal level, stock declines may lead to downward adjustments in removal levels, which would result in the removal level being exceeded under the current levels of mortality. Adjustments to mortality would then be considered, with reduction in subsistence harvests one possibility. Human induced mortality is close to the removal level for two species: Steller sea lions and harbor seals. Groundfish fishery competition for marine mammal prey may be an important factor that could lead to reductions in removal levels. Prey competition is considered for Steller sea lions and northern fur seals.

Steller sea lions are taken by a number of methods throughout the year. Unlike other subsistence activities that are more broadly participatory, hunting for sea lions is a relatively specialized activity, and a relatively small core of highly productive hunters from a limited number of households account for most of the harvest. There has been some change in harvesting techniques in recent years, and there is also variation by region. Seasonality of sea lion harvest is quite variable and appears to be dependent on sea lion abundance and distribution.

Looking across regions, in 2003 approximately 51 percent of the total subsistence take of Steller sea lions occurred in the Aleutian Islands region, about 17 percent in the Kodiak Island region, about 15 percent in the Pribilof Island region, and about 12 percent in the North Pacific Rim region. The Southeast Alaska and South Alaska Peninsula regions accounted for about 3 and 2 percent, respectively, of the total subsistence take in 2003. In 2003 a total of 17 of the 62 surveyed communities reported harvesting sea lions, with 9 communities reporting takes of five or more sea lions. The seven top ranking communities were Atka (82 sea lions), Old Harbor (32 sea lions), St. Paul (18 sea lions), Unalaska (16 sea lions), St. George (14 sea lions), Tatitlek (14 sea lions), and Akutan (9 sea lions). These seven communities accounted for 185 sea lions, or 87 percent of the total Alaska subsistence take (Wolfe et al. 2004).

The number of individuals reporting hunting sea lions has declined substantially since the early 1990s. The estimated numbers of households that reported at least one member hunting sea lions declined from 199 in 1992 to 97 in 2003. In general, declines in the numbers of sea lion hunters occurred at a time when sea lions became increasingly harder to find in local hunting areas and consequently more difficult and expensive to hunt. Rate of success, however, has not tracked in parallel with numbers of hunters or reported increases in time and effort necessary to hunt successfully. The proportion of unsuccessful hunting households for sea lions has ranged from 40 percent in 1994 to 21 percent in 2001. (Wolfe et al. 2004).

While the available information suggests some support for a direct relationship between the overall Steller sea lion population and the level of subsistence harvest, such support is not definitive and other factors cannot be excluded. Given the relatively small numbers involved, the concentrated efforts of a single hunter or just a few hunters can make relatively large percentage changes in community harvest totals. The weighting of factors is also not possible from the evidence available. It does appear that present Steller sea lion harvest methods are likely to be more successful, and certainly more efficient, when resource populations (and density) are higher. A number of factors may be at work, however, such that a recovery in Steller sea lion abundance may not necessarily result in a marked increase in subsistence take, but too little is known regarding the determinants of subsistence demand for Steller sea lions to reach any definitive conclusions.

On a community level, it is important to note that of all the communities identified in the text of the PSEIS (NMFS 2004a) as having a documented Steller sea lion harvest, only Akutan and Unalaska are identified as "regionally important groundfish communities" with substantial direct participation in the fishery. In other words, where use of Steller sea lions is identified as important to the community subsistence base, the commercial groundfish fishery is generally not, and vice versa.

The PSEIS notes that fifty years ago, the harbor seal was so abundant in Alaska (and perceived to be in conflict with commercial salmon fisheries) that the state issued a bounty for the animal. State-sponsored bounties and predator control programs, as well as commercial harvest of harbor seals, occurred on a regular basis throughout the animal's range until the passage of the MMPA. Both adult seals and pups were harvested for pelts. An estimated 3,000 seals, mostly pups, were harvested annually for their pelts along the Alaska Peninsula between 1963 and 1972, accounting for 50 percent of the pup production. (NMFS 2004a)

The PSEIS goes on to note that harvest of harbor seals for subsistence purposes is likely the highest cause of anthropogenic mortality for this species since the cessation of commercial harvests in the early 1970s. Between 1992 and 1998, the statewide harvest of harbor seals from all stocks ranged between 2,546 and 2,854 animals, the majority of which were taken in southeast Alaska. Aside from their value as a food source, harbor seals play an important role in the culture of many Native Alaskan communities. (NMFS 2004a)

The PSEIS provides the following regional information about the relationship between human induced mortality and the maximum number of animals that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (the potential biological removals or PBR). The Bering Sea stock of harbor seals is approximately 13,000 animals, and the calculated PBR is 379 animals. The annual subsistence harvest from this stock from 1994 to 1996 was approximately 161 animals, 42 percent of PBR for this species. In 1998, 178 harbor seals from this stock were taken in the subsistence harvest. For the GOA stock, the calculated PBR is 868 animals. The average annual subsistence harvest from the GOA between 1992 and 1996 was 791 animals, representing 91 percent of the PBR for this stock. The latest available harvest data from 1998 (792) is comparable to the average subsistence harvest of harbor seals from previous years. For the southeast stock, the calculated PBR is 2,114 animals. The average annual subsistence harvest from southeast between 1992 and 1996 was 1,749 animals, representing 83 percent of the PBR for this stock (NMFS 2004a).

The context of subsistence harvest of northern fur seals is much different from that of Steller sea lions, and subsistence effort is highly concentrated in the communities of St. Paul and St. George in the Pribilof Islands. The commercial harvesting of northern fur seals on the Pribilof Islands began shortly after the first known discovery of the islands in 1786. The commercial harvest was continued by the United States when the Pribilof Islands came under U.S. jurisdiction with the purchase of Alaska from Russia in 1867 and lasted until 1984. The method of subsistence harvest of northern fur seals on the Pribilof Islands is a direct outgrowth of the commercial harvest that took place on the islands and, due to this historical and legislative context, the organization of the subsistence harvest of northern fur seals is very different from the organization of the harvest of Steller sea lions elsewhere. The subsistence harvest of northern fur seals in the Pribilof Islands is conducted as an organized, land-based, group activity.

NMFS entered into co-management agreements with the Tribal Governments of St. Paul and St. George under Section 119 of the MMPA in 2000 and 2001, respectively. These agreements are specific to the conservation and management of northern fur seals and Steller sea lions in the Pribilof Islands, with particular attention to the subsistence take and use of these animals. To minimize negative effects on the population, the fur seal subsistence harvest has been limited to a 47-day harvest season (June 23-August 8) during which only sub-adult male seals may be taken. In addition, the Fur Seal Act authorizes subsistence harvest of fur seals by Native Americans dwelling on North Pacific Ocean coasts (but not for seal skins, which must be disposed of), but that harvest can only be from canoes paddled by less than five people each and without the use of firearms.

On St. Paul Island, annual subsistence take of northern fur seals ranged between 754 and 522 animals over the period 2000-2003. On St. George, the annual harvest ranged between 203 and 121 animals over this same period. St. Paul and St. George are predominately Alaska Native communities. In 2000, the total population of St. Paul was 532, 86 percent of whom were Alaska Native/Native American. St. George had a population of 152 in 2000, of whom 92 percent were Alaska Native/Native American. These communities are relatively isolated, even by rural Alaska standards, from other population centers and private sector economic opportunities are relatively limited in both communities as well.

While northern fur seal harvest is an essential component of subsistence in the Pribilof Islands, only three non-Pribilof communities, the Aleutian communities of Akutan, Nikolski, and Unalaska, show any level of harvest for northern fur seals for any year in which ADF&G harvest surveys were conducted. For Akutan, during the single year that shows up in the data, fur seal harvests accounted for about 2 percent of the total subsistence harvest in the community. This is based on pounds per person of total subsistence harvests for the community. For Nikolski and Unalaska, fur seal harvests accounted for about two-tenths of 1 percent and less than one-tenth of 1 percent of total community subsistence harvest, respectively.

As noted in the fur seal subsistence harvest EIS (NMFS 2005), the cumulative effect of the harvest of fur seal prey species (pollock) may result in a conditionally significant adverse impact on fur seals. Such an impact could potentially result in impacts on subsistence hunting opportunities, if the impacts result in a drop in fur seal population leading to a drop in subsistence harvest levels. However, the potential competition between fur seals and the pollock fishery is not well understood (EIS Chapter 8).

Seabirds

Alaskans have been harvesting about 225,000 birds a year for subsistence purposes. Most of these are geese and ducks, but about 23,000 a year have been seabirds. Significant portions of the seabird harvest have taken place in the action area. St. Lawrence Island accounts for about 13,000 seabirds, while most of the rest are taken in the Yukon-Kuskokwim Deltas and the Bering Strait areas. Alaskans have also been harvesting about 113,000 bird eggs a year for subsistence purposes. The vast majority of these, about 95,000 a year, have been seabird eggs, and most of these have been taken in the action area. Particularly important components of the harvest come from the Northwest Arctic, the Bering Strait area, the Bristol Bay area, and St. Lawrence Island. Harvests are also taken, however, in the Yukon-Kuskokwim, Alaska Peninsula, and Aleutian Island areas (AMBCC).[83]

Pollock fishing activities and changes in those activities could impact seabird populations though competition for seabird prey, by accidentally killing or injuring birds ("takes") during the course of normal operations, or by impacting benthic habitat used by the birds. EIS Chapter 8 analyzes the impacts of the alternatives on seabirds.

Groundfish

Groundfish species are those species that support either a single species or mixed species target fishery, are commercially important, and for which a sufficient data base exists that allows each to be managed on its own biological merits. Accordingly, a specific TAC is established annually for each target species. Catch of each species must be recorded and reported. This category includes pollock, Pacific cod, sablefish, yellowfin sole, Greenland turbot, arrowtooth flounder, rock sole, flathead sole, Alaska plaice, "other flatfish," Pacific ocean perch, northern rockfish, shortraker rockfish, rougheye rockfish, "other rockfish," Atka mackerel, and squid (Council, BSAI FMP, page 10). EIS Chapter 7 provides an analysis on the impacts of the alternatives on non-pollock groundfish.

[83] Average annual harvests appear to be rough estimates prepared by the Alaska Migratory Bird Co-Management Council on the basis of a number of different survey instruments, and appear to apply to the period 1995-2002.

Subsistence use of groundfish resources in Alaska is described in the PSEIS (NMFS 2004a). The PSEIS provides relatively little detail about groundfish subsistence in western Alaska, however. Data are provided for Unalaska and Akutan. This data (based on two surveys from the early 1990s) indicates that groundfish comprised 7 percent to 9 percent by weight of subsistence consumption; the major groundfish species consumed were cod and rockfish. Elsewhere in the state subsistence groundfish use levels also appear to be low compared to use levels of subsistence resources overall, and in relation to other fish resources in particular. Commercial fisheries may target stocks, such as rockfish that are also targeted by subsistence fishermen, but there is no indication that this dual use of stocks has resulted in detrimental impacts to groundfish subsistence utilization under existing conditions. (NMFS 2007b) Thus the PSEIS indicates that pollock are not an important subsistence resource.

Forage fish

Forage fish species are those species which are a critical food source for many marine mammal, seabird and fish species. Forage fish may be important to low income and minority populations in the region, if, like eulachon and capelin, they are harvested for subsistence or commercial purposes. They are also important because other species depend on them for forage, and these other species, such as salmon, seals or sea birds, may be harvested for subsistence or commercial use.

Forage fish species in the Bering Sea and Aleutian Islands region include Osmeridae family (eulachon, capelin, and other smelts), Myctophidae family (lanternfishes), Bathylagidae family (deep-sea smelts), Ammodytidae family (Pacific sand lance), Trichodontidae family (Pacific sand fish), Pholidae family (gunnels) Stichaeidae family (pricklebacks, warbonnets, eelblennys, cockscombs, and shannys), Gonostomatidae family (bristlemouths, lightfishes, and anglemouths), and Order Euphausiacea (krill) (Council, BSAI FMP, page 11). EIS Chapter 7 provides an analysis on the impacts of the alternatives on forage fish.

Most forage fish harvests in the Bering Sea and Aleutian Islands consist of smelts (although significant volumes of sandfish were taken in 2001). From 2002 to 2005, BSAI forage fish harvests ranged between 10 and 35 metric tons. Pollock trawling accounted for almost all of the smelt harvest; however, the available information indicates that the trawlers are harvesting a small proportion of biomass (NMFS 2007b).

Prohibited species

Prohibited species are those species and species groups the catch of which must be avoided while fishing for groundfish, and which must be returned to sea with a minimum of injury except when their retention is authorized by other applicable law. Prohibited species in the Bering Sea include Pacific halibut, Pacific herring, Pacific salmon, Steelhead, King crab, and Tanner crab (Council, BSAI FMP, page 10-11).

Pacific salmon (Chinook and chum) have been dealt with in earlier sections. Several of the other species are the objects of fisheries carried out by commercial or subsistence fishermen from western Alaska (halibut, herring, steelhead) or of CDQ groups (crab species). Impacts on these species thus could have impacts on low income or minority communities in western Alaska.

EIS Chapter 7 provides detailed background on the management of the bycatch of these species by the pollock fishery and discusses the potential impacts of the alternatives on these bycatches.

8.5 How will the alternatives affect minority or low income communities?

The potential actions may affect minority and low income populations within the region in several ways. These include: (1) changes in Chinook salmon returns to escapement, subsistence harvest, or commercial harvest, in western and Interior Alaska and changes in salmon deliveries to food banks; (2) changes in pollock revenues earned through participation in the CDQ Program, and changes in western Alaska pollock landings by catcher vessels (3) changes in the impacts of other resources that are exploited commercially or for subsistence by residents of western Alaska, including chum salmon, marine mammals, seabirds, other groundfish, forage species, and prohibited species.

Based on the review of potentially impacted minority and low income populations, the following populations have been identified for detailed analysis:

- Chinook salmon users
- CDQ group beneficiaries
- Pollock fishing and processing workers
- Other marine resource users

The analysis looks at these four user groups as they occur in six regions:

- Kotzebue Sound
- Norton Sound
- Yukon River and Yukon delta
- Kuskokwim River and Kuskokwim delta
- Bristol Bay, Alaska Peninsula, Pribilof Islands, Aleutian Islands
- Persons living outside western and Interior Alaska

Resident populations in western and Interior Alaska have been broken into five regional populations to take account of potential regional variations in impacts (for example, Chinook salmon subsistence is much less important in the Kotzebue Sound region than along the Yukon River). There may be considerable overlap between CDQ group beneficiaries and regional residents in most of these regions. However, the impact of actions would be so different for the two groups that they have been evaluated independently. Yukon River impacts may also impact residents of Canada, however, these impacts have not been addressed independently in this analysis since the focus is on impacts on residents of the United States.

The analysis is presented below in Table 8-5 through Table 8-10 below. These summarize the impacts on low income or minority populations associated with one of these three classes of impacts. Each table has the same structure with a row for each of the major elements of each alternative and a cell in the right hand column that discusses the potential impacts on these communities. This discussion is based on the evaluation of impacts presented previously in this RIR and the species specific chapters in the EIS.

Table 8-5 Kotzebue Sound: impacts on low income or minority populations

Alternative	Options/ suboptions, components	Chinook users	CDQ group beneficiaries	Minorities in pollock harvesting and processing	Users of other marine resources
Alternative 1: Status quo	Status quo	Subsistence salmon harvests are important to residents of communities around Kotzebue Sound, however, most of the salmon harvest is chum salmon. There is little Chinook salmon taken here. These alternatives probably have few, if any, Chinook-related impacts in this region.	No communities north of the Bering Strait are members of CDQ groups. They would not be impacted by any of these alternatives through this mechanism.	NMFS does not have information on the numbers of persons from the Kotzebue region seasonally employed on catcher-processors, motherships, or shoreside processing plants in Dutch Harbor, Akutan, King Cove, or Sand Point. However, NMFS believes the numbers are small, and that this is not a source of disproportionate impacts in this area.	Chum salmon are an important subsistence resource for people in the Kotzebue region. However this action is expected to have a minor impact on chum salmon escapement, and much of that impact will be outside of western Alaska. This is unlikely to be a source of disproportionate impacts on minority or low income populations here. Analysis of Alt 2 impacts on chum salmon show that Chinook management measures are likely to slightly reduce chum salmon bycatch, but stock specific impacts are uncertain. Marine mammals, including seals, walrus, and whales are harvested for subsistence purposes in this region. The impacts of the alternatives on marine mammals exploited regionally are not entirely clear. To the extent that tighter caps reduce salmon bycatch and pollock directed catch, they may reduce competition between the pollock industry and certain marine mammals such as Steller sea lions and northern fur seals for prey. Existing takes by the pollock industry are small so reduction in takes is unlikely to have an impact. Disturbance impacts may decrease or increase, depending on the ways the alternatives affect pollock fleet deployment. Seabirds and seabird eggs are harvested in the region for subsistence purposes. Lower caps under Alternative 2 may reduce potential pollock industry seabird impacts; triggered closures may lead to fleet redeployments with uncertain impacts on seabirds.
Alternative 2: Hard cap	Hard Cap level				
	Seasonal distribution of hard caps				
	Sector Allocation				
	Sector Transfer and rollover				
	Cooperative Provisions				
Alternative 3: Triggered closures	Trigger cap formulation				
	Management				
	Sector allocation				
	Sector transfer				
Alternative 4 and Alternative 5	Hard cap with ICA: 68,392 (Alt 4 AS1, or 60,000 (Alt5 AS1)				
	Hard cap without ICA 47,591: Also Hard Cap if Performance Standard not met				
	Seasonal distribution of hard caps				
	Sector transfer and rollover				

Alternative	Options/ suboptions, components	Chinook users	CDQ group beneficiaries	Minorities in pollock harvesting and processing	Users of other marine resources
					Other groundfish species, forage fish, and PSC fish species, support subsistence consumption in the region. Alternative 2 options with tighter caps may reduce groundfish bycatch in the pollock fishery; seasonal allocation options can shift the pollock fleet between the A and B seasons. These seasons have different bycatch profiles and this may lead to changes in the composition of bycatch. Pollock fishery closures may lead to redeployment of pollock vessels to alternative fisheries; however, catches in those fisheries are limited by TACs and by bycatch limits. Impacts on other groundfish are less predictable under Alternative 3. Nevertheless, aggregate species harvests would continue to be constrained by TAC and bycatch requirements. The alternatives are not expected to increase the harvests of other PSC species to an extent that would affect the abundance of these species. Forage fish impacts may be reduced under Alternative 2, but Alternative 3 impacts are likely to be similar to those under the status quo.

Table 8-6 Norton Sound: impacts on low income or minority populations

Alternative	Key elements of the alternative	Chinook users	CDQ group beneficiaries	Minorities in pollock harvesting and processing	Users of other marine resources
Alternative 1: Status quo	Status quo	Chinook salmon are of relatively small importance in the subsistence and fisheries in Norton Sound and of more importance in commercial fisheries. The average annual Chinook harvest from 1997 to 2006 was 8,332 fish. The numbers of AEQ returns to Norton Sound have not been estimated for this region.	NSEDC represents the CDQ interests of 15 communities and 8,488 persons in this region. This is an estimated 98 percent of the persons in this area. For the most part these persons benefit indirectly from the CDQ group royalty payments and income from fishing vessels through economic development projects in their communities (although some benefit by direct involvement in CDQ activities). In 2008, the NSEDC received 22,456 mt of pollock CDQ	NMFS does not have information on the numbers of persons from the Norton Sound region seasonally employed on catcher-processors, motherships, or shoreside processing plants in Dutch Harbor, Akutan, King Cove, or Sand Point. 2000 Census data and later survey information suggests that Alaska Natives were active in shoreside workforces and on catcher-processors. Except in the shoreside processors at King Cove and Sand Point, Alaska Natives do not seem to have been the largest minority group employed in these operations.	Chum salmon are of modest importance in subsistence fisheries in this region. Analysis of impacts on chum salmon show that Chinook management measures are likely to slightly reduce chum salmon bycatch, but stock specific impacts are uncertain. Marine mammals are harvested for subsistence purposes in this region. The impacts of the alternatives on marine mammals exploited regionally are not entirely clear. To the extent that tighter caps reduce salmon bycatch and pollock directed catch, they may reduce competition between the pollock industry and certain marine mammals such as Steller sea lions and northern fur seals for prey. Existing takes by the pollock industry are small so reduction in takes is unlikely to have an impact. Disturbance impacts may decrease or increase, depending on the ways the alternatives affect pollock fleet deployment. Seabirds and seabird eggs are harvested for subsistence in this region. Lower caps under Alternative 2 may reduce potential pollock industry seabird impacts; triggered closures may lead to fleet redeployments with uncertain impacts on seabirds. Groundfish, forage fish, and PSC fish support subsistence activities. Alternative2 options with tighter caps may reduce groundfish bycatch in the pollock fishery; seasonal allocation options can shift the pollock fleet between the A and B seasons. These seasons have different bycatch
Alternative 2: Hard cap	Hard Cap level	Hard caps would mean that unknown additional numbers of Chinook salmon may return to the fisheries in this area. Any benefit may be proportionately greater for local commercial fishermen than for local subsistence fishermen. Any benefit may be larger with tighter caps.	This can have adverse impacts for the CDQ communities, but not for other communities in the region. Revenue declines are larger the smaller the cap and vary considerably from year to year.	Alternatives that reduce the volumes of pollock harvested by CPs and processed by motherships or in on-shore processing plants, may reduce the demand for processing labor and adversely impact minorities in the workforce.	
	Seasonal distribution of hard caps	With tighter caps and higher bycatch years (2006, 2007) there is a tendency for the number of AEQ Chinook released to natal rivers to increase as the A season allocation is reduced. Under other conditions, the impact is not as clear.	The more the harvest is reduced in the A season, and shifted to the B season, the greater the adverse impact on the six CDQ community royalties and revenues tends to be.	Seasonal distribution of caps may affect the seasonal demand for labor and the seasonal job opportunities for minorities acting in this workforce.	
	Sector Allocation	Opt 1 appears to do better for the year with the highest bycatch or the options with the tightest cap. Opt 2a appears to do better with the higher caps in the lower bycatch years. In other years the record is mixed.	CDQ communities do better if the sector allocations are in proportion to the pollock allocations under the AFA, and worse if the allocation is based on historical average of bycatch use by sector.	Sectoral distribution of pollock may affect the sectoral demand for minority labor.	
	Sector Transfer and rollover	Provisions that allow the transfer or seasonal rollover of salmon caps between sectors allow for more complete utilization of salmon bycatch caps by pollock fishermen. This may increase salmon bycatch in some circumstances.	The ability to transfer CDQ among sectors may reduce the likelihood CDQ groups will be forced to stop fishing because they reach their allocation and provide an opportunity to benefit from clean fishing. Benefits CDQ communities, and does not hurt other communities.	Sector transfers and rollover may make it possible for Pollock operations to harvest more fish, potentially benefiting employees.	

<table>
<tr><th>Alternative</th><th>Key elements of the alternative</th><th>Chinook users</th><th>CDQ group beneficiaries</th><th>Minorities in pollock harvesting and processing</th><th>Users of other marine resources</th></tr>
<tr><td></td><td>Cooperative Provisions</td><td>Allocation to inshore cooperatives is not expected to have an impact on this category of resource users.</td><td>No effects on CDQs were identified.</td><td>No issues identified</td><td rowspan="5">profiles and this may lead to changes in the composition of bycatch. Pollock fishery closures may lead to redeployment of pollock vessels to alternative fisheries; however, catches in those fisheries are limited by TACs and by bycatch limits. Impacts on other groundfish are less predictable under Alternative 3. Nevertheless, aggregate species harvests would continue to be constrained by TAC and bycatch requirements. The alternatives are not expected to increase the harvests of other PSC species to an extent that would affect the abundance of these species. Forage fish impacts may be reduced under Alternative 2, but Alternative 3 impacts are likely to be similar to those under the status quo.</td></tr>
<tr><td rowspan="4">Alternative 3: Triggered closures</td><td>Trigger cap formulation</td><td>The impact of this alternative in this area is likely to be relatively modest compared to more southerly areas due to the limited amount of Chinook harvested as discussed in the text of this chapter. Regional AEQ impact changes have not been estimated. The analysis does examine impacts on the change in actual Chinook bycatch. These numbers are not comparable to AEQs. At higher bycatch levels, tighter caps reduce bycatch and presumably reduce AEQ. At lower bycatch levels, weaker caps can produce little effect, or lead to bycatch increases, although the 48,700 and 29,300 cap levels are still associated with bycatch decreases. The bycatch numbers are not reported here as they are not comparable to AEQ numbers used elsewhere in this analysis.</td><td>The RIR does not break out estimates of the revenue at risk separately for CDQ groups under Alternative 3. However, inferring the impact from the impacts on the other sectors, revenues placed at risk would fluctuate by the year and depend on the bycatch. Revenues placed at risk increase with the restrictiveness of the trigger or with the level of annual bycatch. In low bycatch years and large caps, no revenues may be placed at risk. However, in higher bycatch years and with tighter caps (48,700 and 29,300) significant revenues may be placed at risk. Particularly in the A season. In 2007, the least restrictive cap, 87,500 places 22% to 49% of A season revenues at risk depending on the seasonal allocation. The industry may well be able to make up some or all of revenues at risk.</td><td>Alternatives that reduce the volumes of pollock harvested by CPs and processed by motherships or in on-shore processing plants, may reduce the demand for processing labor and adversely impact minorities in the workforce.</td></tr>
<tr><td>Seasonal allocation</td><td>Regional AEQs not estimated for this alternative. The seasonal allocation options can affect the numbers of Chinook that escape the bycatch however there seems to be little pattern of impact among the different allocations. In some cases specific year-cap-allocation patterns can generate increases in net bycatch.</td><td>In higher salmon bycatch years, and when caps are tighter, seasonal allocations that reduce A season harvests more place more revenues at risk. For lower bycatch years and more relaxed caps the opposite effect can occur (although revenues at risk are much smaller).</td><td>Seasonal distribution of caps may affect the seasonal demand for labor and the seasonal job opportunities for minorities acting in this workforce.</td></tr>
<tr><td>Management</td><td rowspan="2">There are no estimates of regional AEQ impacts associated with these components of the alternative.</td><td>Management of trigger mechanisms does not appear to have significant implications for environmental justice.</td><td>Environmental justice issues have not been identified for these elements of the alternative.</td></tr>
<tr><td>Sector allocation</td><td>CDQ communities do better if the sector allocations are in proportion to the pollock allocations under the AFA, and worse if the allocations based on historical average of bycatch use by sector.</td><td>Sectoral distribution of pollock may affect the sectoral demand for minority labor.</td></tr>
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Alternative	Key elements of the alternative	Chinook users	CDQ group beneficiaries	Minorities in pollock harvesting and processing	Users of other marine resources
	Sector transfer and rollover		The ability to transfer CDQ among sectors may reduce the likelihood CDQ groups will be forced to stop fishing because they reach their allocation and provide an opportunity to benefit from clean fishing. Benefits CDQ communities, and does not hurt other communities.	If transfers and rollovers make it possible to harvest a larger proportion of the Pollock, these measures could benefit minorities in harvesting and processing.	
Alternative 4 and Alternative 5	Hard cap with ICA: 68,392 (Alt 4 AS1, or 60,000 (Alt5 AS1)	AEQ estimates are not available for this region.	CDQ losses of about $5 million in the B season in the highest bycatch year; no A season losses, or losses in other years. This is equivalent to about 6% of the total 2007 CDQ pollock gross revenue.	Hypothetical annual potentially forgone pollock gross revenue, for the non-CDQ fleet ranges from $0 to $364 million depending on the year. (Assumes transferability and 100% AB rollover). This may have adverse impacts on minority populations in pollock industry workforce. Especially among workers in shoreside plants.	
	Hard cap without ICA 47,591: Also Hard Cap if Performance Standard not met	AEQ estimates are not available for this region.	CDQ losses of about $13 million in the A season in the highest bycatch year. No A season losses in other years. CDQ losses of about $5 million in 2007. These impacts are 18% and 7% of total CDQ pollock revenue in those years and seasons.	Hypothetical annual potentially forgone pollock gross revenue, for the non-CDQ fleet ranges from $0 to $452 million depending on the year. (Assumes transferability and 80% AB rollover). This may have adverse impacts on minority populations in the pollock industry workforce. Especially among workers in shoreside plants.	
	Sector transfer and rollover	Implications same as for Alternative 2			

Table 8-7 Yukon River and delta: impacts on low income or minority populations

<table>
<tr><th>Alternative</th><th>Key elements of the alternative</th><th>Chinook users</th><th>CDQ group beneficiaries</th><th>Minorities in pollock harvesting and processing</th><th>Users of other marine resources</th></tr>
<tr><td>Alternative 1: Status quo</td><td>Status quo</td><td>Chinook salmon are important to the subsistence and commercial fishermen on the Yukon River. Reductions in harvest because of bycatch by the pollock fishery have a relatively large impact in this region. Estimated AEQ reductions in the period from 2003 to 2007 ranged between 8,484 and 18,306 fish, depending on the year. Yukon River Chinook harvests averaged 95,754 fish from 1997-2006.</td><td>YDFDA represents the CDQ interests of six communities and 3,123 persons in this region. This is an estimated 23% of the persons who live in the two census districts (and three additional communities) through which the Yukon flows. For the most part these persons benefit indirectly from the CDQ group royalty payments and income from fishing vessels through economic development projects in their communities (although some benefit by direct involvement in CDQ activities). In 2008, the YDFDA received 14,266 mt of pollock CDQ.</td><td>NMFS does not have information on the numbers of persons from the Yukon River region seasonally employed on catcher-processors, motherships, or shoreside processing plants in Dutch Harbor, Akutan, King Cove, or Sand Point. 2000 Census data and later survey information suggests that Alaska Natives were active in shoreside workforces and on catcher-processors. Except in the shoreside processors at King Cove and Sand Point, Alaska Natives do not seem to have been the largest minority group employed in these operations.</td><td rowspan="5">Chum salmon are of importance in subsistence fisheries in this region. Analysis of impacts on chum salmon show that Chinook management measures are likely to slightly reduce chum salmon bycatch, but stock specific impacts are uncertain.

Marine mammals are harvested for subsistence purposes in this region. The impacts of the alternatives on marine mammals exploited regionally are not entirely clear. To the extent that tighter caps reduce salmon bycatch and pollock directed catch, they may reduce competition between the pollock industry and certain marine mammals such as Steller sea lions and northern fur seals for prey. Existing takes by the pollock industry are small so reduction in takes is unlikely to have an impact. Disturbance impacts may decrease or increase, depending on the ways the alternatives affect pollock fleet deployment.

Seabirds and seabird eggs are harvested for subsistence in this region. Lower caps under Alternative 2 may reduce potential pollock industry seabird impacts; triggered closures may lead to fleet redeployments with uncertain impacts on seabirds.

Groundfish, forage fish, and PSC fish support subsistence activities. Alternative2 options with tighter caps may reduce groundfish bycatch in the pollock fishery; seasonal allocation options can shift the pollock fleet between the A and B seasons. These seasons have different bycatch profiles and this may lead to changes in the composition of bycatch. Pollock fishery closures may lead to</td></tr>
<tr><td rowspan="4">Alternative 2: Hard cap</td><td>Hard Cap level</td><td>Benefits vary depending on size of cap, other elements of the alternative such as seasonal and sectoral allocations, and potential bycatch in a year. The range of potential outcomes had a low of a 29 AEQ increase in bycatch to a high of a 15,332 AEQ reduction in bycatch. These results suggest that the action could provide a significant increase in regional harvests.</td><td>This can have adverse impacts for the CDQ communities, but not for other communities in the region. Revenue declines are larger the smaller the cap and vary considerably from year to year.</td><td>Alternatives that reduce the volumes of pollock harvested by CPs and processed by motherships or in on-shore processing plants, may reduce the demand for processing labor and adversely impact minorities in the workforce.</td></tr>
<tr><td>Seasonal distribution of hard caps</td><td>With tighter caps and higher bycatch years (2006, 2007) there is a tendency for the number of AEQ Chinook released to natal rivers to increase as the A season allocation is reduced. Under other conditions, the impact is not as clear.</td><td>The more the harvest is reduced in the A season, and shifted to the B season, the greater the adverse impact on the six CDQ community royalties and revenues tend to be.</td><td>Seasonal distribution of caps may affect the seasonal demand for labor and the seasonal job opportunities for minorities acting in this workforce.</td></tr>
<tr><td>Sector Allocation</td><td>Opt 1 appears to do better for the year with the highest bycatch or the options with the tightest cap. Opt 2a appears to do better with the higher caps in the lower bycatch years. In other years the record is mixed.</td><td>CDQ communities do better if the sector allocations are in proportion to the pollock allocations under the AFA, and worse if the allocations based on historical average of bycatch use by sector.</td><td>Sectoral distribution of pollock may affect the sectoral demand for minority labor.</td></tr>
<tr><td>Sector Transfer or rollover</td><td>Provisions that allow the transfer or seasonal rollover of salmon caps between sectors allow for more complete utilization of salmon bycatch caps by pollock fishermen. This may increase salmon bycatch in some circumstances.</td><td>The ability to transfer CDQ among sectors may reduce the likelihood CDQ groups will be forced to stop fishing because they reach their allocation and provide an opportunity to benefit from clean fishing.</td><td>Sector transfers and rollover may make it possible for Pollock operations to harvest more fish, potentially benefiting employees.</td></tr>
</table>

Alternative	Key elements of the alternative	Chinook users	CDQ group beneficiaries	Minorities in pollock harvesting and processing	Users of other marine resources
	Cooperative Provisions	Allocation to inshore cooperatives is not expected to have an impact on this category of resource users.	No effects on CDQs were identified.	No issues identified	redeployment of pollock vessels to alternative fisheries; however, catches in those fisheries are limited by TACs and by bycatch limits. Impacts on other groundfish are less predictable under Alternative 3. Nevertheless, aggregate species harvests would continue to be constrained by TAC and bycatch requirements. The alternatives are not expected to increase the harvests of other PSC species to an extent that would affect the abundance of these species. Forage fish impacts may be reduced under Alternative 2, but Alternative 3 impacts are likely to be similar to those under the status quo.
Alternative 3: Triggered closures	Trigger cap formulation	Regional AEQ impact changes have not been estimated. The analysis does examine impacts on the change in actual Chinook bycatch. These numbers are not comparable to AEQs. At higher bycatch levels, tighter caps reduce bycatch and presumably reduce AEQ. At lower bycatch levels, weaker caps can produce little effect, or lead to bycatch increases, although the 48,700 and 29,300 cap levels are still associated with bycatch decreases. The bycatch numbers are not reported here as they are not comparable to AEQ numbers used elsewhere in this analysis.	The RIR does not break out estimates of the revenue at risk separately for CDQ groups under Alternative 3. However, inferring the impact from the impacts on the other sectors, revenues placed at risk would fluctuate by the year and depend on the bycatch. Revenues placed at risk increase with the restrictiveness of the trigger or with the level of annual bycatch. In low bycatch years and large caps, no revenues may be placed at risk. However, in higher bycatch years and with tighter caps (48,700 and 29,300) significant revenues may be placed at risk. Particularly in the A season. In 2007, the least restrictive cap, 87,500 places 22% to 49% of A season revenues at risk depending on the seasonal allocation. The industry may well be able to make up some or all of revenues at risk.	Alternatives that reduce the volumes of pollock harvested by CPs and processed by motherships or in on-shore processing plants, may reduce the demand for processing labor and adversely impact minorities in the workforce.	
	Seasonal allocation	Regional AEQs not estimated for this alternative. The seasonal allocation options can affect the numbers of Chinook that escape the bycatch, however there seems to be little pattern of impact among the different allocations. In some cases specific year-cap-allocation patterns can generate increases in net bycatch.	In higher salmon bycatch years, and when caps are tighter, seasonal allocations that reduce A season harvests more place more revenues at risk. For lower bycatch years and more relaxed caps the opposite effect can occur (although revenues at risk are much smaller).	Seasonal distribution of caps may affect the seasonal demand for labor and the seasonal job opportunities for minorities acting in this workforce.	
	Management	There are no estimates of regional AEQ impacts associated with these components of the alternative.	Management of trigger mechanisms does not appear to have significant implications for environmental justice.	Environmental justice issues have not been identified for these elements of the alternative.	
	Sector allocation		CDQ communities do better if the sector allocations are in proportion to the pollock allocations under the AFA, and worse if the allocations based on historical average of bycatch use by sector.	Sectoral distribution of pollock may affect the sectoral demand for minority labor.	

Alternative	Key elements of the alternative	Chinook users	CDQ group beneficiaries	Minorities in pollock harvesting and processing	Users of other marine resources
	Sector transfer		The ability to transfer CDQ among sectors may reduce the likelihood CDQ groups will be forced to stop fishing because they reach their allocation and provide an opportunity to benefit from clean fishing. Benefits CDQ communities, and does not hurt other communities.	If transfers and rollovers make it possible to harvest a larger proportion of the Pollock, these measures could benefit minorities in harvesting and processing.	
Alternative 4 and Alternative 5	Hard cap with ICA: 68,392 (Alt 4 AS1, or 60,000 (Alt5 AS1)	The change in Yukon bycatch may range from an increase of 329 AEQ Chinook to a decrease of 5,228 AEQ Chinook, depending on the year.	CDQ losses of about $5 million in the B season in the highest bycatch year; no A season losses, or losses in other years. This is equivalent to about 6% of the total 2007 CDQ pollock gross revenue.	Hypothetical annual potentially forgone pollock gross revenue, for the non-CDQ fleet ranges from $0 to $364 million depending on the year. (Assumes transferability and 100% AB rollover). This may have adverse impacts on minority populations in pollock industry workforce. Especially among workers in shoreside plants.	
	Hard cap without ICA 47,591: Also Hard Cap if Performance Standard not met	Under this scenario, the change in Yukon AEQ Chinook bycatch may range from an increase of 61 fish to a decrease of 8,840 fish, depending on the year.	CDQ losses of about $13 million in the A season in the highest bycatch year. No A season losses in other years. CDQ losses of about $5 million in 2007. These impacts are 18% and 7% of total CDQ pollock revenue in those years and seasons.	Hypothetical annual potentially forgone pollock gross revenue, for the non-CDQ fleet ranges from $0 to $452 million depending on the year. (Assumes transferability and 80% AB rollover). This may have adverse impacts on minority populations in the pollock industry workforce. Especially among workers in shoreside plants.	
	Sector transfers and rollovers	Implications the same as for Alternative 2			

Table 8-8 Kuskokwim River and delta: impacts on low income or minority populations

Alternative	Options/ suboptions, components	Chinook users	CDQ group beneficiaries	Minorities in pollock harvesting and processing	Users of other marine resources
Alternative 1: Status quo	Status quo	Chinook salmon are important to the subsistence and commercial fishermen on the Kuskokwim River. Reductions in harvest because of bycatch by the pollock fishery have a relatively large impact in this region. Estimated AEQ reductions in the period from 2003 to 2007 ranged between 5,514 and 11,899 fish, depending on the year. Kuskokwim River Chinook harvests averaged 77,557 fish from 1997-2006.	The CVRF represents the CDQ interests of 20 communities and 7,855 persons in this region. This is an estimated 47% of the persons who live in the Bethel census area (and three additional communities). For the most part these persons benefit indirectly from the CDQ group royalty payments and income from fishing vessels through economic development projects in their communities (although some benefit by direct involvement in CDQ activities). In 2008, the CVRF received 24,456 mt of pollock CDQ.	NMFS does not have information on the numbers of persons from the Kuskokwim River region seasonally employed on catcher-processors, motherships, or shoreside processing plants in Dutch Harbor, Akutan, King Cove, or Sand Point. 2000 Census data and later survey information suggests that Alaska Natives were active in shoreside workforces and on catcher-processors. Except in the shoreside processors at King Cove and Sand Point, Alaska Natives do not seem to have been the largest minority group employed in these operations.	Chum salmon are of importance in subsistence fisheries in this region. Analysis of impacts on chum salmon show that Chinook management measures are likely to slightly reduce chum salmon bycatch, but stock specific impacts are uncertain. Marine mammals are harvested for subsistence purposes in this region. The impacts of the alternatives on marine mammals exploited regionally are not entirely clear. To the extent that tighter caps reduce salmon bycatch and pollock directed catch, they may reduce competition between the pollock industry and certain marine mammals such as Steller sea lions and northern fur seals for prey. Existing takes by the pollock industry are small so reduction in takes is unlikely to have an impact. Disturbance impacts may decrease or increase, depending on the ways the alternatives affect pollock fleet deployment. Seabirds and seabird eggs are harvested for subsistence in this region. Lower caps under Alternative 2 may reduce potential pollock industry seabird impacts; triggered closures may lead to fleet redeployments with uncertain impacts on seabirds. Groundfish, forage fish, and PSC fish support subsistence activities. Alternative2 options with tighter caps may reduce groundfish bycatch in the
Alternative 2: Hard cap	Hard Cap level	Benefits vary depending on size of cap, other elements of the alternative such as seasonal and sectoral allocations, and potential bycatch in a year. The range of potential outcomes had a low of a 19 AEQ increase in bycatch to a high of a 9,966 AEQ reduction in bycatch. These results suggest that the action could provide a significant increase in regional harvests.	This can have adverse impacts for the CDQ communities, but not for other communities in the region. Revenue declines are larger the smaller the cap and vary considerably from year to year.	Alternatives that reduce the volumes of pollock harvested by CPs and processed by motherships or in on-shore processing plants, may reduce the demand for processing labor and adversely impact minorities in the workforce.	
	Seasonal distribution of hard caps	With tighter caps and higher bycatch years (2006, 2007) there is a tendency for the number of AEQ Chinook released to natal rivers to increase as the A season allocation is reduced. Under other conditions, the impact is not as clear.	The more the harvest is reduced in the A season, and shifted to the B season, the greater the adverse impact on the six CDQ community royalties and revenues tend to be.	Seasonal distribution of caps may affect the seasonal demand for labor and the seasonal job opportunities for minorities acting in this workforce.	
	Sector Allocation	Opt 1 appears to do better for the year with the highest bycatch or the options with the tightest cap. Opt 2a appears to do better with the higher caps in the lower bycatch years. In other years the record is mixed.	CDQ communities do better if the sector allocations are in proportion to the pollock allocations under the AFA, and worse if the allocations based on historical average of bycatch use by sector.	Sectoral distribution of pollock may affect the sectoral demand for minority labor.	

Alternative	Options/ suboptions, components	Chinook users	CDQ group beneficiaries	Minorities in pollock harvesting and processing	Users of other marine resources
	Sector Transfer or rollover	Provisions that allow the transfer or seasonal rollover of salmon caps between sectors allow for more complete utilization of salmon bycatch caps by pollock fishermen. This may increase salmon bycatch in some circumstances.	The ability to transfer CDQ among sectors may reduce the likelihood CDQ groups will be forced to stop fishing because they reach their allocation and provide an opportunity to benefit from clean fishing.	Sector transfers and rollover may make it possible for Pollock operations to harvest more fish, potentially benefiting employees.	pollock fishery; seasonal allocation options can shift the pollock fleet between the A and B seasons. These seasons have different bycatch profiles and this may lead to changes in the composition of bycatch. Pollock fishery closures may lead to redeployment of pollock vessels to alternative fisheries; however, catches in those fisheries are limited by TACs and by bycatch limits. Impacts on other groundfish are less predictable under Alternative 3. Nevertheless, aggregate species harvests would continue to be constrained by TAC and bycatch requirements. The alternatives are not expected to increase the harvests of other PSC species to an extent that would affect the abundance of these species. Forage fish impacts may be reduced under Alternative 2, but Alternative 3 impacts are likely to be similar to those under the status quo.
	Cooperative Provisions	Allocation to inshore cooperatives is not expected to have an impact on this category of resource users.	No effects on CDQs were identified.	No issues identified	
Alternative 3: Triggered closures	Trigger cap formulation	Regional AEQ impact changes have not been estimated. The analysis does examine impacts on the change in actual Chinook bycatch. These numbers are not comparable to AEQs. At higher bycatch levels, tighter caps reduce bycatch and presumably reduce AEQ. At lower bycatch levels, weaker caps can produce little effect, or lead to bycatch increases, although the 48,700 and 29,300 cap levels is still associated with bycatch decreases. The bycatch numbers are not reported here as they are not comparable to AEQ numbers used elsewhere in this analysis.	The RIR does not break out estimates of the revenue at risk separately for CDQ groups under Alternative 3. However, inferring the impact from the impacts on the other sectors, revenues placed at risk would fluctuate by the year and depend on the bycatch. Revenues placed at risk increase with the restrictiveness of the trigger or with the level of annual bycatch. In low bycatch years and large caps, no revenues may be placed at risk. However, in higher bycatch years and with tighter caps (48,700 and 29,300) significant revenues may be placed at risk. Particularly in the A season. In 2007, the least restrictive cap, 87,500 places 22% to 49% of A season revenues at risk depending on the seasonal allocation. The industry may well be able to make up some or all of revenues at risk.	Alternatives that reduce the volumes of pollock harvested by CPs and processed by motherships or in on-shore processing plants, may reduce the demand for processing labor and adversely impact minorities in the workforce.	
	Seasonal allocation	Regional AEQs not estimated for this alternative. The seasonal allocation options can affect the numbers of Chinook that escape the bycatch, however there seems to be little pattern of impact among the different allocations. In some cases specific year-cap-allocation patterns can generate increases in net bycatch.	In higher salmon bycatch years, and when caps are tighter, seasonal allocations that reduce A season harvests more place more revenues at risk. For lower bycatch years and more relaxed caps the opposite effect can occur (although revenues at risk are much smaller).	Seasonal distribution of caps may affect the seasonal demand for labor and the seasonal job opportunities for minorities acting in this workforce.	
	Management	There are no estimates of regional AEQ impacts associated with these components of the alternative.	Management of trigger mechanisms does not appear to have significant implications for environmental justice.	Environmental justice issues have not been identified for these elements of the alternative.	

Alternative	Options/ suboptions, components	Chinook users	CDQ group beneficiaries	Minorities in pollock harvesting and processing	Users of other marine resources
	Sector allocation		CDQ communities do better if the sector allocations are in proportion to the pollock allocations under the AFA, and worse if the allocations based on historical average of bycatch use by sector.	Sectoral distribution of pollock may affect the sectoral demand for minority labor.	
	Sector transfer		The ability to transfer CDQ among sectors may reduce the likelihood CDQ groups will be forced to stop fishing because they reach their allocation and provide an opportunity to benefit from clean fishing. Benefits CDQ communities, and does not hurt other communities.	If transfers and rollovers make it possible to harvest a larger proportion of the Pollock, these measures could benefit minorities in harvesting and processing.	
Alternative 4 and Alternative 5	Hard cap with ICA: 68,392 (Alt 4 AS1, or 60,000 (Alt5 AS1)	The change in Kuskokwim bycatch may range from an increase of 214 AEQ Chinook to a decrease of 3,398 AEQ Chinook, depending on the year.	CDQ losses of about $5 million in the B season in the highest bycatch year; no A season losses, or losses in other years. This is equivalent to about 6% of the total 2007 CDQ pollock gross revenue.	Hypothetical annual potentially forgone pollock gross revenue, for the non-CDQ fleet ranges from $0 to $364 million depending on the year. (Assumes transferability and 100% AB rollover). This may have adverse impacts on minority populations in pollock industry workforce. Especially among workers in shoreside plants.	
	Hard cap without ICA 47,591: Also Hard Cap if Performance Standard not met	Under this scenario, the change in Kuskokwim AEQ Chinook bycatch may range from an increase of 40 fish to a decrease of 5,746 fish, depending on the year.	CDQ losses of about $13 million in the A season in the highest bycatch year. No A season losses in other years. CDQ losses of about $5 million in 2007. These impacts are 18% and 7% of total CDQ pollock revenue in those years and seasons.	Hypothetical annual potentially forgone pollock gross revenue, for the non-CDQ fleet ranges from $0 to $452 million depending on the year. (Assumes transferability and 80% AB rollover). This may have adverse impacts on minority populations in the pollock industry workforce. Especially among workers in shoreside plants.	
	Sector transfers and rollovers	Implications the same as for Alternative 2			

Table 8-9 Bristol Bay, Alaska Peninsula, Pribilof Islands and Aleutian Islands: impacts on low income or minority populations

Alternative	Options/ suboptions, components	Chinook users	CDQ group beneficiaries	Minorities in pollock harvesting and processing	Users of other marine resources
Alternative 1: Status quo	Status quo	Chinook salmon are important to the subsistence and commercial fishermen on this area. Reductions in harvest because of bycatch by the pollock fishery may have a relatively large impact in this region. Estimated AEQ reductions in the period for the Bristol Bay area alone from 2003 to 2007 ranged between 7,211 and 15,560 fish, depending on the year. Chinook harvests from Bristol Bay alone averaged about 88,000 fish from 1997-2006.	CBSFA, APICDA, and the BBEDC represent the CDQ interests of 23 communities and 7,605 persons in this region. This is an estimated 57% of the persons who live in this area. For the most part these persons benefit indirectly from the CDQ group royalty payments and income from fishing vessels through economic development projects in their communities (although some benefit by direct involvement in CDQ activities). In 2008, these associations and corporation received 40,760 mt of pollock CDQ.	NMFS does not have information on numbers of minorities and low income persons from these regions participating in shoreside processing, catcher-processor, or mothership workforces. 2000 Census data suggests that Alaska Natives were active in shoreside workforces and on catcher-processors. However, the shoreside processing takes place in this region in towns on the Alaska Peninsula and in the Aleutian Islands. Plants employ Alaska Natives. If costs of travel to and from the plants are an issue, Natives from this region may be employed in shoreside plants to a greater extent than Natives from other regions.	Chum salmon are of modest importance in subsistence fisheries in this region. Analysis of impacts on chum salmon show that Chinook management measures are likely to slightly reduce chum salmon bycatch, but stock specific impacts are uncertain. Marine mammals are harvested for subsistence purposes in this region. The impacts of the alternatives on marine mammals exploited regionally are not entirely clear. To the extent that tighter caps reduce salmon bycatch and pollock directed catch, they may reduce competition between the pollock industry and certain marine mammals such as Steller sea lions and northern fur seals for prey. Existing takes by the pollock industry are small so reduction in takes is unlikely to have an impact. Disturbance impacts may decrease or increase, depending on the ways the alternatives affect pollock fleet deployment. Seabirds and seabird eggs are harvested for subsistence in this region. Lower caps under Alternative 2 may reduce potential pollock industry seabird impacts; triggered closures may lead to fleet redeployments with uncertain impacts on seabirds. Groundfish, forage fish, and PSC fish support subsistence activities. Alternative2 options with tighter caps may reduce groundfish bycatch in the pollock fishery; seasonal allocation options can shift the pollock fleet between the A and B seasons. These seasons have different bycatch profiles and this may lead to changes
Alternative 2: Hard cap	Hard Cap level	Benefits vary depending on size of cap, other elements of the alternative such as seasonal and sectoral allocations, and potential bycatch in a year. The range of potential outcomes for Bristol Bay alone had a low of a 24 AEQ increase in bycatch to a high of a 13,032 AEQ reduction in bycatch. These results suggest that the action could provide a significant increase in regional harvests.	This can have adverse impacts for the CDQ communities, but not for other communities in the region. Revenue declines are larger the smaller the cap and vary considerably from year to year.	Alternatives that reduce the volumes of pollock harvested by CPs and processed by motherships or in on-shore processing plants, may reduce the demand for processing labor and adversely impact minorities in the workforce.	
	Seasonal distribution of hard caps	With tighter caps and higher bycatch years (2006, 2007) there is a tendency for the number of AEQ Chinook released to natal rivers to increase as the A season allocation is reduced. Under other conditions, the impact is not as clear.	The more the harvest is reduced in the A season, and shifted to the B season, the greater the adverse impact on the six CDQ community royalties and revenues tend to be.	Seasonal distribution of caps may affect the seasonal demand for labor and the seasonal job opportunities for minorities acting in this workforce.	
	Sector Allocation	Opt 1 appears to do better for the year with the highest bycatch or the options with the tightest cap. Opt 2a appears to do better with the higher caps in the lower bycatch years. In other years the record is mixed.	CDQ communities do better if the sector allocations are in proportion to the pollock allocations under the AFA, and worse if the allocation is based on historical average of bycatch use by sector.	Sectoral distribution of pollock may affect the sectoral demand for minority labor.	
	Sector Transfer or rollover	Provisions that allow the transfer or seasonal rollover of salmon caps between sectors allow for more complete utilization of salmon	The ability to transfer CDQ among sectors may reduce the likelihood CDQ groups will be forced to stop fishing because they reach their	Sector transfers and rollover may make it possible for Pollock operations to harvest more fish, potentially benefiting employees.	

Alternative	Options/ suboptions, components	Chinook users	CDQ group beneficiaries	Minorities in pollock harvesting and processing	Users of other marine resources
		bycatch caps by pollock fishermen. This may increase salmon bycatch in some circumstances.	allocation and provide an opportunity to benefit from clean fishing.		in the composition of bycatch. Pollock fishery closures may lead to redeployment of pollock vessels to alternative fisheries; however, catches in those fisheries are limited by TACs and by bycatch limits. Impacts on other groundfish are less predictable under Alternative 3. Nevertheless, aggregate species harvests would continue to be constrained by TAC and bycatch requirements. The alternatives are not expected to increase the harvests of other PSC species to an extent that would affect the abundance of these species. Forage fish impacts may be reduced under Alternative 2, but Alternative 3 impacts are likely to be similar to those under the status quo.
	Cooperative Provisions	Allocation to inshore cooperatives is not expected to have an impact on this category of resource users.	No effects on CDQs were identified.	No issues identified	
Alternative 3: Triggered closures	Trigger cap formulation	Regional AEQ impact changes have not been estimated. The analysis does examine impacts on the change in actual Chinook bycatch. These numbers are not comparable to AEQs. At higher bycatch levels, tighter caps reduce bycatch and presumably reduce AEQ. At lower bycatch levels, weaker caps can produce little effect, or lead to bycatch increases, although the 48,700 and 29,300 cap levels are still associated with bycatch decreases. The bycatch numbers are not reported here as they are not comparable to AEQ numbers used elsewhere in this analysis.	The RIR does not break out estimates of the revenue at risk separately for CDQ groups under Alternative 3. However, inferring the impact from the impacts on the other sectors, revenues placed at risk would fluctuate by the year and depend on the bycatch. Revenues placed at risk increase with the restrictiveness of the trigger or with the level of annual bycatch. In low bycatch years and large caps, no revenues may be placed at risk. However, in higher bycatch years and with tighter caps (48,700 and 29,300) significant revenues may be placed at risk. Particularly in the A season. In 2007, the least restrictive cap, 87,500 places 22% to 49% of A season revenues at risk depending on the seasonal allocation. The industry may well be able to make up some or all of revenues at risk.	Alternatives that reduce the volumes of pollock harvested by CPs and processed by motherships or in on-shore processing plants, may reduce the demand for processing labor and adversely impact minorities in the workforce.	
	Seasonal allocation	Regional AEQs not estimated for this alternative. The seasonal allocation options can affect the numbers of Chinook that escape the bycatch, however there seems to be little pattern of impact among the different allocations. In some cases specific year-cap-allocation patterns can generate increases in net bycatch.	In higher salmon bycatch years, and when caps are tighter, seasonal allocations that reduce A season harvests more place more revenues at risk. For lower bycatch years and more relaxed caps the opposite effect can occur (although revenues at risk are much smaller).	Seasonal distribution of caps may affect the seasonal demand for labor and the seasonal job opportunities for minorities acting in this workforce.	
	Management	There are no estimates of regional AEQ impacts associated with these components of the alternative.	Management of trigger mechanisms does not appear to have significant implications for environmental justice.	Environmental justice issues have not been identified for these elements of the alternative.	
	Sector allocation		CDQ communities do better if the sector allocations are in proportion to the pollock allocations under the AFA, and worse if the allocations based on historical average of	Sectoral distribution of pollock may affect the sectoral demand for minority labor.	

Alternative	Options/ suboptions, components	Chinook users	CDQ group beneficiaries	Minorities in pollock harvesting and processing	Users of other marine resources
			bycatch use by sector.		
	Sector transfer		The ability to transfer CDQ among sectors may reduce the likelihood CDQ groups will be forced to stop fishing because they reach their allocation and provide an opportunity to benefit from clean fishing. Benefits CDQ communities, and does not hurt other communities.	If transfers and rollovers make it possible to harvest a larger proportion of the Pollock, these measures could benefit minorities in harvesting and processing.	
Alternative 4 and Alternative 5	Hard cap with ICA: 68,392 (Alt 4 AS1, or 60,000 (Alt5 AS1)	The change in Bristol Bay bycatch may range from an increase of 280 AEQ Chinook to a decrease of 4,444 AEQ Chinook, depending on the year.	CDQ losses of about $5 million in the B season in the highest bycatch year; no A season losses, or losses in other years. This is equivalent to about 6% of the total 2007 CDQ pollock gross revenue.	Hypothetical annual potentially forgone pollock gross revenue, for the non-CDQ fleet ranges from $0 to $364 million depending on the year. (Assumes transferability and 100% AB rollover). This may have adverse impacts on minority populations in pollock industry workforce. Especially among workers in shoreside plants.	
	Hard cap without ICA 47,591: Also Hard Cap if Performance Standard not met	Under this scenario, the change in the Bristol Bay AEQ Chinook bycatch may range from an increase of 52 fish to a decrease of 7,514 fish, depending on the year.	CDQ losses of about $13 million in the A season in the highest bycatch year. No A season losses in other years. CDQ losses of about $5 million in 2007. These impacts are 18% and 7% of total CDQ pollock revenue in those years and seasons.	Hypothetical annual potentially forgone pollock gross revenue, for the non-CDQ fleet ranges from $0 to $452 million depending on the year. (Assumes transferability and 80% AB rollover). This may have adverse impacts on minority populations in the pollock industry workforce. Especially among workers in shoreside plants.	
	Sector transfers and rollovers	Implications the same as for Alternative 2			

Table 8-10 Persons who live outside of western and Interior Alaska: impacts on low income or minority populations

Alternative	Options/ suboptions, components	Chinook users	CDQ group beneficiaries	Minorities in pollock harvesting and processing	Users of other marine resources
Alternative 1: Status quo	Status quo	Chinook salmon are important to tribal fishermen in the Pacific Northwest. Reductions in West Coast AEQ harvest because of bycatch by the pollock ranged from 5,828 and 18,185, depending on the year. It is not, however, possible to assign these estimated AEQ reductions to specific river systems or states. Some low income persons have received Chinook salmon through salmon donation programs run by pollock fishing operations. As noted in the text of the chapter, this is not expected to be a significant source of impact on minorities or low income persons.	No communities in these regions are beneficiaries of CDQ groups. Therefore there are no disproportionate impacts on minority or low income populations associated with these actions.	Data from 2000 and 2004 indicates that significant portions of the shoreside processor, catcher-processor, and mothership pollock sector workforces are made up of minority populations. Minorities, including Asians and Native Americans/Alaska Natives, made up over 50% of the workforces in Unalaska, Akutan, King Cove, and Sand Point in 2000. Less detailed information on catcher-processors and motherships also suggests that over 50% of these workforces are minority as well.	Persons in these areas are not believed to be affected by impacts on the resources discussed under this category.
Alternative 2: Hard cap	Hard Cap level	Benefits vary depending on size of cap, other elements of the alternative such as seasonal and sectoral allocations, and potential bycatch in a year. The range of potential outcomes had a low of a 1,126 AEQ increase in bycatch to a high of a 14,766 AEQ reduction in bycatch. These results suggest that the hard cap could produce a significant reduction in bycatch of salmon destined for the west coast.		Alternatives that reduce the volumes of pollock harvested by CPs and processed by motherships or in on-shore processing plants, may reduce the demand for processing labor and adversely impact minorities in the workforce.	
	Seasonal distribution of hard caps	With tighter caps and higher bycatch years (2006, 2007) there is a tendency for the number of AEQ Chinook released to natal rivers to increase as the A season allocation is reduced. Under other conditions, the impact is not as clear.		Seasonal distribution of caps may affect the seasonal demand for labor and the seasonal job opportunities for minorities acting in this workforce.	
	Sector Allocation	Opt 1 appears to do better for the year with the highest bycatch or the options with the tightest cap. Opt 2a appears to do better with the higher caps in the lower bycatch years. In other years the record is mixed.		Sectoral distribution of pollock may affect the sectoral demand for minority labor.	

Alternative	Options/ suboptions, components	Chinook users	CDQ group beneficiaries	Minorities in pollock harvesting and processing	Users of other marine resources
	Sector Transfer or rollover	Provisions that allow the transfer or seasonal rollover of salmon caps between sectors allow for more complete utilization of salmon bycatch caps by pollock fishermen. This may increase salmon bycatch in some circumstances.		Environmental justice issues have not been identified for these elements of the alternative.	
	Cooperative Provisions	Allocation to inshore cooperatives is not expected to have an impact on this category of resource users.			
Alternative 3: Triggered closures	Trigger cap formulation	Regional AEQ impact changes have not been estimated. The analysis does examine impacts on the change in actual Chinook bycatch. These numbers are not comparable to AEQs. At higher bycatch levels, tighter caps reduce bycatch and presumably reduce AEQ. At lower bycatch levels, weaker caps can produce little effect, or lead to bycatch increases, although the 48,700 and 29,300 cap levels are still associated with bycatch decreases. The bycatch numbers are not reported here as they are not comparable to AEQ numbers used elsewhere in this analysis.		Alternatives that reduce the volumes of pollock harvested by CPs and processed by motherships or in on-shore processing plants, may reduce the demand for processing labor and adversely impact minorities in the workforce.	
	Seasonal allocation	Regional AEQs not estimated for this alternative. The seasonal allocation options can affect the numbers of Chinook that escape the bycatch, however there seems to be little pattern of impact among the different allocations. In some cases specific year-cap-allocation patterns can generate increases in net bycatch.		Seasonal distribution of caps may affect the seasonal demand for labor and the seasonal job opportunities for minorities acting in this workforce.	
	Management	There are no estimates of regional AEQ impacts associated with these components of the alternative.		Environmental justice issues have not been identified for these elements of the alternative.	
	Sector allocation			Sectoral distribution of pollock may affect the sectoral demand for minority labor.	
	Sector transfer			If transfers and rollovers make it possible to harvest a larger proportion of the Pollock, these measures could benefit minorities in harvesting and processing.	

Alternative	Options/ suboptions, components	Chinook users	CDQ group beneficiaries	Minorities in pollock harvesting and processing	Users of other marine resources
Alternative 4 and Alternative 5	Hard cap with ICA: 68,000 (Alt 4 AS1, or 60,000 (Alt5 AS1)	The change in Pacific Northwest bycatch may range from no decrease in AEQ Chinook to a decrease of 8,444 AEQ Chinook, depending on the year.		Hypothetical annual potentially forgone pollock gross revenue, for the non-CDQ fleet ranges from $0 to $364 million depending on the year. (Assumes transferability and 100% AB rollover). This may have adverse impacts on minority populations in pollock industry workforce. Especially among workers in shoreside plants.	
	Hard cap without ICA 47,591: Also Hard Cap if Performance Standard not met	Under this scenario, the change in Pacific Northwest Chinook bycatch may range from a decrease of 81 AEQ Chinook to a decrease of 11,135 AEQ Chinook, depending on the year.		Hypothetical annual potentially forgone pollock gross revenue, for the non-CDQ fleet ranges from $0 to $452 million depending on the year. (Assumes transferability and 80% AB rollover). This may have adverse impacts on minority populations in the pollock industry workforce. Especially among workers in shoreside plants.	
	Sector transfers and rollovers	Implications the same as for Alternative 2			

9.0 PREPARERS AND PERSONS CONSULTED

9.1 Lead Preparers

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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.

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