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APPENDIX A

REGULATORY IMPACT REVIEW

Of Measures to Reduce Chinook Salmon Bycatch in the Bering Sea and Aleutian Islands Pollock Trawl Fishery

Initial Review Draft
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Note: This document will be revised to form the Draft Environmental Impact Statement

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EXECUTIVE SUMMARY

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 and Aleutian Islands (BSAI) area 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 (Secretary) and in the Regional Fishery Management Councils. The groundfish fisheries in the EEZ off Alaska are managed under the Fishery Management Plan (FMP) for Groundfish of the BSAI.

Statutory authority for measures designed to reduce bycatch is specifically addressed in Sec. 600.350 of the Magnuson-Stevens Act. That section establishes National Standard 9—Bycatch, which directs the Councils to minimize bycatch and to minimize mortality of bycatch when it cannot be avoided. The purpose of Chinook salmon bycatch management in the Bering Sea pollock fishery is, therefore, to minimize Chinook salmon bycatch to the extent practicable while achieving optimum yield from the pollock fishery.

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, that should be so stated.*[1]

Groundfish that are the target of the BSAI trawl fisheries, and the salmon bycatch these fisheries take, 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/or harvest allocation privileges. Trawl vessels operating in the BSAI groundfish fisheries do not have ownership or access privileges to salmon. Similarly, salmon harvesters operating in the waters of and off Alaska do not have ownership or access privileges to groundfish.

[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.

Bycatch of salmon in the BSAI trawl fisheries reduces the common property pool of the salmon resource. Such reductions may reduce the targeted subsistence, commercial, personal use, and sport catch of salmon, and thereby the revenue of salmon harvesters who have ownership of salmon access privileges (e.g. Alaska Limited Entry permits) and/or established harvesting rights (e.g. subsistence) and harvesting history. This may, over time, reduce the value of salmon access ownership privileges as well as reducing the socioeconomic and cultural benefits for subsistence users. The market; however, has no mechanism by which groundfish harvesters may compensate salmon harvesters for such losses. Further, the market cannot value the cultural significance of the subsistence lifestyle. Thus, salmon bycatch reduction measures are imposed to reduce, to the extent practicable, this market failure. The goal of the action considered in this RIR is to improve salmon bycatch reduction in the BSAI pollock trawl fisheries and, thereby, further mitigate the effects of market failure.

Potentially Affected Fisheries

This RIR provides an overview of the directly affected BSAI pollock trawl fishery. A detailed treatment of the Western Alaska Chinook salmon fisheries, and dependent communities, that are thought to be most affected by Chinook salmon bycatch in the pollock fishery is also provided. The discussion of potentially affected salmon fisheries is intended to determine which Western Alaska Chinook salmon fisheries have been experiencing declining Chinook runs in recent years and whether related harvest fisheries opportunities have been impacted.

The BSAI Pollock fishery

Until 1998, the Bering Sea directed pollock fishery had been an open access fishery, commonly characterized as a “race for fish.” In 1998, however, Congress enacted the American Fisheries Act (AFA) to rationalize the fishery by limiting participation and allocating specific percentages of the BSAI directed pollock fishery TAC among the competing sectors of the fishery. 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. In the 2006 Bering Sea pollock trawl fishery, 90 catcher vessels participated in harvesting pollock, a slight decline since 2002, when 98 vessels participated in the fishery. Catcher processors also declined in the same period, from 31 operating the BSAI in 2002 to 19 by 2006.

Pollock is apportioned in the BSAI between inshore, offshore, and mothership sectors after allocations are subtracted for the CDQ program and incidental catch allowances. The BSAI pollock fishery is further divided into two seasons – the winter “A” roe season and the summer “B” season, which is largely non-roe.

The pollock fishery in waters off Alaska is the largest U.S. fishery by volume, and the economic character of that fishery centers on the products produced from pollock. In the U.S., Alaska pollock catches are processed mainly for roe, surimi, and fillet products. Fillet production has increased particularly rapidly due to increased harvests, increased yields, and the shift by processors from surimi to fillet production made possible under the AFA.

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.

In October 2005, to reduce the pollock fisheries' bycatch of Pacific salmon, the North Pacific Fisheries Management Council (Council) adopted Amendment 84 to the BSAI Fisheries Management Plan. Pacific salmon are caught incidentally in the BSAI pollock trawl fisheries, especially in the pollock fishery. Of the five species of Pacific salmon, Chinook salmon (*Onchorynchus tshawytscha*) and chum salmon (*O. keta*) are most often caught incidentally in the pollock fisheries.

The Council developed Amendment 84 to attempt to resolve the bycatch problem through the AFA pollock cooperatives. The amendment exempts pollock vessels from Chinook and Chum Salmon Savings Area closures if the vessels participate in an intercooperative agreement (ICA) to reduce salmon bycatch. Through the ICA, the cooperatives reduce salmon bycatch by a method called the ''voluntary rolling hotspot system'' (VRHS).

Regulatory management measures implemented prior to Amendment 84 to reduce salmon bycatch had not been effective. The Council developed Amendment 84 to attempt to resolve the bycatch problem through the AFA pollock cooperatives. The amendment exempts pollock vessels from Chinook and Chum Salmon Savings Area closures if the vessels participate in an intercooperative agreement (ICA) to reduce salmon bycatch. Through the ICA, the cooperatives reduce salmon bycatch by a method called the ''voluntary rolling hotspot system'' (VRHS).

Despite these efforts, salmon bycatch numbers have continued to increase substantially. In light of the high amount of Chinook salmon bycatch in recent years, the Council and NMFS are considering measures to effectively reduce bycatch to the extent practicable while achieving optimum yield from the pollock fishery.

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 122,000 Chinook salmon in 2007.

Western Alaska Salmon Fisheries

This RIR 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.

Norton Sound

The Alaska Board of Fisheries (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% of the overall value. Chinook value has fluctuated since the 1980s and rose to $225,136 in 1997 when it was nearly 62% 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 form 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 is expected to have been achieved throughout the area.

The Alaska Board of Fisheries (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 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.

Historic 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 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 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% 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% 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.

Alternatives Considered

The analysis of alternatives considers two action alternatives as well as multiple components and options under each alternative. Alternative 2 is a hard cap on Chinook salmon bycatch while Alternative 3 would invoke a large area closure when a triggering amount of Chinook salmon are caught. 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 or rollovers of unused bycatch allocations, cooperative level allocations and transfers as well as the possibility of a system similar to the present VRHS system. Given the extensive number of combinations of possible scenarios, the analysis has focused on a subset of those combinations in order to attempt to define direct adverse effects in terms of potentially foregone revenue and revenue at risk and potential benefits in terms of the number of salmon potentially not bycaught, or "saved."

The various provisions for transferability, rollovers, and cooperative provisions are treated qualitatively and in a generally comprehensive way. Such options allow flexibility with regard to allowing more pollock to be harvested by moving bycatch allocations around to those who are in need of them most. As such these provisions would likely improve the economic yield of the pollock fishery by mitigating impacts on revenue. However, if greater salmon conservation than a hard cap or triggered closure might provide is a goal, then limiting transferability would tend to save more Chinook salmon and several levels of limits are available in the alternative set.

Management and Enforcement Implications

Due to the complexity of the alternative set and the large number of combinations of alternatives, components and options, management and enforcement issues have been given extensive treatment within the sections on analysis of each alternative in this RIR. Due to the complexity of the issues, it is not possible to adequately summarize that treatment here. Thus, careful consideration of management and enforcement issues described within the text is necessary to understand the implication of the proposed actions.

Direct Effects Alternative 2: Hard Caps

Salmon Saved

This RIR draws heavily on an analysis of hypothetical reductions in Western Alaska specific adult equivalent Chinook salmon bycatch areas that is contained within the EIS. The values are based on median Adult Equivalency (AEQ) values and mean proportions regional assignments within strata (A-season, and NW and SE B seasons) genetics data collected from 2005-2007. The proportional breakouts of Western Alaska Chinook are from Myers et al. 2004. The RIR reproduces output from the AEQ analysis for Western Alaska River System, specifically the Yukon, Bristol Bay, and Kuskokwim areas.

The potential benefit of Chinook salmon bycatch reduction, in terms of Yukon River salmon adult equivalency, increases as the cap decreases and bycatch increases the greatest adult equivalence benefits would have occurred in years when bycatch was highest (i.e. 2007). For the Yukon River, maximum estimated adult equivalent salmon benefits, in numbers of fish, are 13,300 fish under the most constraining hard cap of 29,300 Chinook in the 2007 year. As the hard cap is increased, the benefits in terms of AEQ estimates necessarily decrease as more Chinook are allowed to be bycaught. With a hard cap of 48,700 Chinook the maximum benefit of 10,027 fish is from the 2007 year. The low end AEQ estimate of 738 fish occurs in the 2004 year. As the cap is further increased, the AEQ estimates decrease and with the highest cap of 87,500 Chinook maximum benefit of 5,499 fish is estimated for the 2007 year. The least benefit under this cap is actually negative. A thorough review of the tabular data shows a nearly continuous range of potential benefits, in numbers of adult Chinook, from less than zero to 13,300.

For the Bristol Bay Region, the maximum estimated AEQ salmon benefits, in numbers of fish, are 11,305 fish under the most constraining hard cap of 29,300 Chinook in 2007. With a hard cap of 48,700 Chinook the maximum benefit of 8,523 fish is from the 2007 year. The low end AEQ estimate, under a 48,700 cap, of 653 fish occurs in the 2004 year. As the cap is further increased, the AEQ estimates decrease and with the highest cap of 87,500 Chinook maximum benefit of 4,674 fish is estimated for the 2007 year. The least benefit under this cap is actually negative. A thorough review of the tabular data shows a nearly continuous range of potential benefits, in numbers of adult Chinook, from less than zero to 11,305, depending on cap, split, option, and year.

For the Kuskokwim Region, the maximum estimated adult equivalent salmon benefit in numbers of fish is 8,645 fish under the most constraining hard cap of 29,300 Chinook in the 2007 year. With a hard cap of 48,700 Chinook the maximum benefit of 6,517 fish is from the 2007 year. The low end AEQ estimate, under a 48,700 cap, of 671 fish occurs in the 2004 year. As the cap is further increased, the AEQ estimates decrease and with the highest cap of 87,500 Chinook maximum benefit of 3,574 fish is estimated for the 2007 year. The least benefit under this cap is negative. A thorough review of the tabular data shows a nearly continuous range of potential benefits, in numbers of adult Chinook, from less than zero to 8,645 depending on cap, split, option, and year.

The maximum benefit to the Western Alaska region would be approximately 33,250 fish during the most severe bycatch year of 2007, and for the most restrictive cap and option as discussed previously. In the 2004 year, the lowest bycatch year in the period, that maximum benefit is 11,328. The minimum benefit in the 2007 year would have been 3,167 fish, 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 splits and/or options are. Further, not all scenarios provide salmon savings benefit.

Potentially Foregone Revenue

Under the Chinook salmon bycatch hard cap scenarios included in this alternative, the pollock trawl fishery, and/or specific sectors that participate in it (depending on allocations 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 in order to mitigate potential losses in revenue due to unharvested pollock TAC.

The RIR provides hypothetical estimates of foregone pollock first wholesale revenue by year and season under Chinook bycatch option for fleet wide caps, and for CDQ versus non-CDQ. As expected, the greatest impact would have occurred in the highest bycatch year (2007) and under the most restrictive bycatch cap of 29,300. In the A season, the greatest effect occurs under the 50/50 seasonal split because of the higher roe pollock price in the A season. The B season impact has the reverse situation with effects being greatest under the 70/30 split, which constrains B season revenue more. The maximum A season impact was $529.4 million in 2007 under the 50/50 split and the 29,300 cap. That value is composed of $482.7 million from non-CDQ and $46.7 million from CDQ fisheries. In the B season, the maximum impact is $179.9 million in 2007 with the 293,300 cap and the 70/30 split. In percentage terms the A season maximum impact represents 84% of total revenue and the B season total impact is 30% of total B season revenue.

As is expected, as the hard cap is increases the impacts decrease. However, in the 2007 year when bycatch was highest, even the 87,500 cap would have resulted in total foregone revenue of $322.6 million in the A season, with no CDQ impact. The impact would have been $72.9 million in the B season, with CDQ impact only under the 70/30 split. These values are 51% and 12% of total revenue for the A and B seasons respectively. Thus, in a high bycatch year, even the highest cap has significant potential impacts. Also evident is that as the cap increases, the effect of the split is increased. For example, the $322.6 million A season impact under the 50/50 split would have been $134.8 million under the 70/30 split. The reverse pattern is, of course, observed in the B season.

Impacts estimated for 2004, which is among the lowest bycatch year, are considerably smaller than those estimated for 2007 but are still significant in some cases. In the 2004 A season total impact under the 29,300 cap is estimated to have been $128 million under the 50/50 split, all coming from non-CDQ fishery participation. Under the 70/30 split that amount drops to $64.3 million. With the exception of $200.000 in estimated impact under the 50/50 split and a 48,700 cap, none of the other caps would have caused foregone revenue impacts in 2004. In the B season, 2004 foregone revenue estimates are greatest under the 29,300 cap and 70/30 split, where $82.7 million is the estimated impact.

Overall, the impacts 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 impact values. Even in the second highest bycatch year of 2006, A season impacts under even the largest cap of 87,500 Chinook are estimated have been $183.6 million, which is 29% of total first whole sale revenue in the pollock fishery. However, in lower bycatch years of 2003, 2004, and 2005, there was very little A season impact at the 68,100 cap level, and in percentage terms, this is also true of the B season. The RIR also provides these effects broken out by sector and by year in a series of lookup tables.

Direct Effects of Alternative 3: Triggered Closures

Salmon Savings

The triggered Closures analyzed here are based on hard caps that are formulated in the same manner as those formulated 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 the EIS) for the A and B seasons. The difference here is that the triggered closure does not cap salmon bycatch but rather used 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, the EIS 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, taken from the EIS, 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.

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.

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 split. However, even the 87,500 trigger with the 70/30 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 2005 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.

Revenue at Risk

While the hard caps of Alternative 2 have the potential effect of fishery closure and resulting foregone pollock fishery revenue, the triggered closures don't directly create foregone revenue, but rather, they place revenue at risk of being foregone. 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 data show that in the highest bycatch years and under the most restrictive trigger levels, revenue at risk would be about $485 million in the A season for all vessels combined. That represents 77% 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 $125.2 million in revenue at risk, or a bout 21% 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 $33.2 million (70/30 split) to $97.4 million (50/50s split) at risk. These values are 11% and 31% of total revenue respectively.

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 17% of total B season revenue. At the 29,300 trigger, and 70/30 split, the B season revenue at risk remains above 15% in all years except 2003. Even under the 87,500 trigger with a 70/30 split, more than $50 million, or 8% 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% of total first wholesale value.

Concluding Thoughts

This RIR represents an initial review draft analysis of potential effects of a wide range of Chinook salmon bycatch alternatives on the BSAI pollock trawl fleet and attempts to demonstrate benefits in terms of the numbers of Chinook salmon that would be saved by the alternatives. This analysis has demonstrated that potential impacts range from zero to more than half a billion dollars under the most restrictive scenario and in the highest bycatch year, and that even the least restrictive measures may have large consequences in terms of foregone revenue and/or revenue at risk in high bycatch years. What has also been shown is that in those cases of greatest impact, there is also the potential for the greatest benefit in terms of Chinook salmon saved, with as many as 32,250 fish estimated to return to Western Alaska Rivers as adults. It is hoped that this initial analysis of this very complex alternative set will provide sufficient information for selection of a preliminary preferred alternative that can be analyzed with greater specificity regarding both direct and indirect effects.

1 INTRODUCTION

1.1 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 and Aleutian Islands (BSAI) area pollock trawl fishery. The proposed alternatives include eliminating the Chinook Salmon Savings Area and thereby eliminating an exemption to the savings area for participants in a voluntary rolling hot spot management system (VRHS), imposing a hard cap number of Chinook salmon that may be taken in the BSAI pollock trawl fishery, and/or implementing a triggered closure area that would be managed by the National Marine Fisheries Service (NMFS) with an exemption from NMFS management for vessels participating in an industry operated and funded VRHS. The alternative set also contains components that allow for sector level allocations of hard caps, transfers and/or rollovers, and cooperative management provisions. The complete alternative set is discussed in section A3, below.

1.2 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.

1.3 Statutory Authority

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 (Secretary) and in the Regional Fishery Management Councils. The groundfish fisheries in the EEZ off Alaska are managed under the Fishery Management Plan (FMP) for Groundfish of the BSAI.

Statutory authority for measures designed to reduce bycatch is specifically addressed in Sec. 600.350 of the Magnuson-Stevens Act. That section establishes National Standard 9—Bycatch, which directs the Councils to minimize bycatch and to minimize mortality of bycatch when it cannot be avoided.

1.4 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 from the pollock fishery. 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, 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.

Several management measures are being used to reduce Chinook salmon bycatch in the Bering Sea pollock fishery. Chinook salmon taken incidentally in groundfish fisheries are classified as prohibited species and, as such, must be either discarded or donated through the Pacific Salmon Donation Program. In the mid-1990s, NMFS implemented regulations recommended by the Council to control the bycatch of Chinook salmon taken in the Bering Sea pollock fishery. These regulations established the Chinook Salmon Savings Areas and mandated year-round accounting of Chinook salmon bycatch in the pollock fishery. Once Chinook salmon bycatch levels reached a specified amount in a Chinook Salmon Savings Area, the area would be closed to pollock fishing. These areas were adopted based on historic observed salmon bycatch rates and were designed to avoid high spatial and temporal levels of salmon bycatch.

The Council started considering revisions to salmon bycatch management in 2004 when information from the fishing fleet indicated that it was experiencing increases in salmon bycatch following the regulatory closure of the Chinook Salmon Savings Area. While the non-CDQ fleet could no longer fish inside the Chinook Salmon Savings Area, vessels fishing on behalf of the CDQ groups were still able to fish inside the area because the CDQ groups had not yet reached their Chinook salmon prohibited species catch limit. Much higher salmon bycatch rates were reportedly encountered outside of the closure areas by the non-CDQ fleet than experienced by the CDQ vessels fishing inside. Further, the closure areas increased costs to the pollock fleet and processors.

To address this problem, the Council examined other means to minimize salmon bycatch that were more flexible and adaptive. Since 2006, the pollock fleet has used a salmon bycatch reduction inter-cooperative agreement to establish a voluntary rolling hotspot system (VRHS). The VRHS is intended to increase the ability of pollock fishery participants to minimize salmon bycatch by giving them more flexibility to move fishing operations to avoid areas where they experience high rates of salmon bycatch. The VRHS was first implemented through an exempted fishing permit and subsequently, in 2007, through Amendment 84 to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands (FMP).

In light of the high amount of Chinook salmon bycatch in recent years, the Council and NMFS are considering measures to effectively reduce bycatch to the extent practicable while achieving optimum yield from the pollock fishery. 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 122,000 Chinook salmon in 2007.

The Council and NMFS decided to limit the scope of this action to Chinook salmon, leaving in place the existing non-Chinook salmon bycatch reduction measures, because of the need for immediate action to reduce Chinook salmon bycatch. Chinook salmon is separated from non-Chinook salmon because Chinook salmon is a highly valued species and a species of concern that warrants specific protection measures. Additionally, the Council and NMFS expect the Chinook salmon bycatch reduction measures under consideration to also reduce non-Chinook salmon bycatch. The Council will address non-Chinook salmon bycatch in the Bering Sea pollock trawl fishery with a subsequent action.

1.5 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, that should be so stated.*[2]

Groundfish that are the target of the BSAI trawl fisheries, and the salmon bycatch these fisheries take, 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/or harvest allocation privileges. Trawl vessels operating in the BSAI groundfish fisheries do not have ownership or access privileges to salmon. Similarly, salmon harvesters operating in the waters of and off Alaska do not have ownership or access privileges to groundfish.

Bycatch of salmon in the BSAI trawl fisheries reduces the common property pool of the salmon resource. Such reductions may reduce the targeted subsistence, commercial, personal use, and sport catch of salmon, and thereby the revenue of salmon harvesters who have ownership of salmon access privileges (e.g. Alaska Limited Entry permits) and/or established harvesting rights (e.g. subsistence) and harvesting history. This may, over time, reduce the value of salmon access ownership privileges as well as reducing the socioeconomic and cultural benefits for subsistence users. The market; however, has no mechanism by which groundfish harvesters may compensate salmon harvesters for such losses. Further, the market cannot value the cultural significance of the subsistence lifestyle. Thus, salmon bycatch reduction measures are imposed to reduce, to the extent practicable, this market failure. The goal of the action considered in this RIR is to improve salmon bycatch reduction in the BSAI pollock trawl fisheries and, thereby, further mitigate the effects of market failure.

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

2 DESCRIPTION OF POTENTIALLY AFFECTED FISHERIES

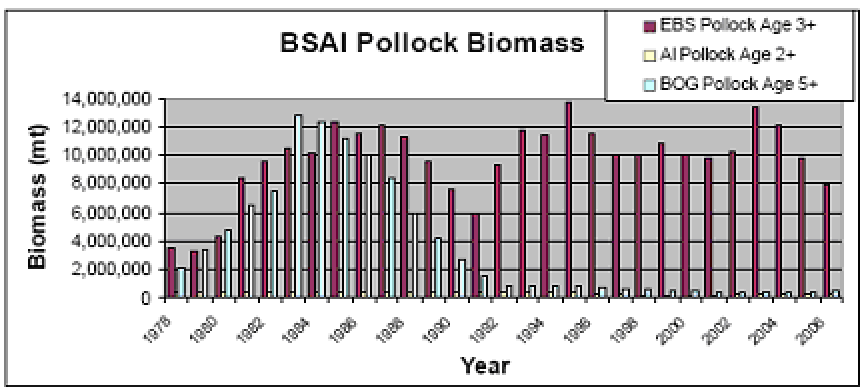
2.1 BSAI Pollock Trawl Fishery

Introduction

Walleye pollock (*Theragra chalcogramma*) is 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, pollock is managed 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, which in recent years has been at historically high biomass levels. The Aleutian Islands region pollock stock was closed to directed fishing between 1999 and 2003; in 2004, however, the TAC was reopened to provide for economic development in Adak. The Aleutian Basin pollock stock has been closed to directed fishing since 1991 due to low biomass levels. Figure 2-1 below shows changes in the biomass of BSAI pollock since 1978.

Figure 2-1 BSAI Pollock Biomass (1978-2006)



(Data taken from http://www.afsc.noaa.gov/refm/stocks/estimates.htm September 5, 2007.)

2.1.1 Management: The American Fisheries Act and Participation in the Fishery

Management History

Prior to passage of the Magnuson Fishery Conservation and Management Act of 1976 (now the Magnuson Stevens Act), foreign fisheries dominated the BSAI pollock fishery. Pollock had been harvested at low levels in the Eastern Bering Sea until the l950s and the advent of the foreign fisheries conducted mainly by Japanese, Russian, and Korean trawlers. Harvests by these foreign fleets increased rapidly during the late 1960s and, in 1972, reached a peak catch of 2.2 million mt of pollock, flatfish, rockfish, cod, and other groundfish.

The Magnuson-Stevens Act

The Magnuson Stevens Act established federal authority over the 200-mile Exclusive Economic Zone (EEZ) and thus effectively provided for the development of domestic fisheries. United States vessels began fishing for pollock in 1980 and, by 1987, were taking 99% 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 Bering Sea and Aleutians Islands area (BSAI) and in the Gulf of Alaska (GOA) comprised 71% (1.57 million tons) of the total groundfish catch of 2.2 million tons. The greater part of pollock harvests occurs in the BSAI, where, in recent years, approximately 95% of the pollock has been harvested.

The American Fisheries Act

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

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 thus 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" would allow. 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 BSAI 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.

Amendment 84

In October 2005, to reduce the pollock fisheries' bycatch of Pacific salmon, the North Pacific Fisheries Management Council (Council) adopted Amendment 84 to the BSAI Fisheries Management Plan. Pacific salmon are caught incidentally in the BSAI pollock trawl fisheries, especially in the pollock fishery. Of the five species of Pacific salmon, Chinook salmon (*Onchorynchus tshawytscha*) and chum salmon (*O. keta*) are most often caught incidentally in the pollock fisheries. Although the other three salmon species (sockeye [*O. nerka*], pink [*O. gorbuscha*)], and coho [*O. kisutch*]) are also caught incidentally, chum salmon make up 98% of all non-Chinook bycatch in the BSAI pollock fisheries.

Regulatory management measures implemented prior to Amendment 84 to reduce salmon bycatch had not been effective. The Council developed Amendment 84 to attempt to resolve the bycatch problem through the AFA pollock cooperatives. The amendment exempts pollock vessels from Chinook and Chum Salmon Savings Area closures if the vessels participate in an intercooperative agreement (ICA) to reduce salmon bycatch. Through the ICA, the cooperatives reduce salmon bycatch by a method called the ‘‘voluntary rolling hotspot system’’ (VRHS).

The VHRS provides real-time salmon bycatch information so that the fleet can avoid areas of high chum and Chinook salmon bycatch rates. Using a system of base bycatch rates, the ICA assigns vessels to certain tiers based on bycatch rates relative to the base rate and implements area closures for vessels in certain tiers. Monitoring and enforcement are carried out through private contractual arrangements.

Parties to the ICA include the American Fisheries Act cooperatives, the six Western Alaska Community Development Quota (CDQ) groups, at least one third party group representing western Alaskans who depend on salmon and have an interest in salmon bycatch reduction, and at least one private firm retained to facilitate bycatch avoidance behavior and information sharing.

Annual Pollock Seasons

The annual BSAI 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.

Description of the BSAI Trawl Pollock Fleet

Number of Vessels

In the 2006 Bering Sea pollock trawl fishery, 90 catcher vessels participated in harvesting pollock, a slight decline since 2002, when 98 vessels participated in the fishery. Catcher processors also declined in the same period, from 31 operating the BSAI in 2002 to 19 by 2006. Note that although the BSAI comprises a far larger proportion of the pollock catch than the Gulf of Alaska (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 BSAI. (See Tables 41-44 of the 2007 Economic SAFE for additional information.)

Further comparison of the demographic characteristics of the participants in the BSAI and GOA fisheries provides additional information about the pollock fleet. In the GOA, where only a small portion of the total Alaska pollock is harvested, approximately 40% of the catch is harvested by vessels owned by residents of Alaska. In contrast, less than 1% of the BSAI catch is harvested by vessels owned by Alaska residents. These percentages have remained stable since 2002 for both the BSAI and GOA.

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%) and non-pelagic trawling (12%). 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 non-pelagic trawling 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 NMFS 2007).

Many of the catcher/processors that target pollock also target hake or Pacific whiting in Washington or Oregon. The At-sea Processors Association (APA) notes that while the principal fishery of west coast US-flag catcher/processors is the "mid-water pollock fishery," vessels that participate in BSAI groundfish fisheries of the Bering Sea/Aleutian Islands management areas also participate in the west coast Pacific whiting fishery. (http://www.atsea.org/)

Table 2-1 below shows the ports of delivery for the BSAI pollock fishery in 2006, the number of vessels delivering to those ports, and the tonnage of pollock deliveries.

Table 2-1 BSAI Pollock Fishery Ports of Delivery in 2006

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**

(Ports with fewer than four processors are grouped into the "Other" category to preserve confidentiality.)

Table 2-2 provides estimated seafood processing employment, percent of non-resident workers, and percent of non-resident earnings in the Alaska Department of Labor (ADOL) define Aleutian and Pribilof Islands Region, which includes the major landing ports used by the shorebased pollock fleet. The total worker count in the seafood processing sector has ranged from a low of 6,592 in 2005 to a high of 7,331 in 2003 and was 7,243 in 2005. It should be noted that these counts include processing workers for all fisheries in the region, not just groundfish. Non-resident workers have made up a large proportion of more than 80% in recent years. Seafood processing wages in the region are estimated to have been approximately $115 million in 2005, with non-resident wages accounting for 74.5% of total wages.

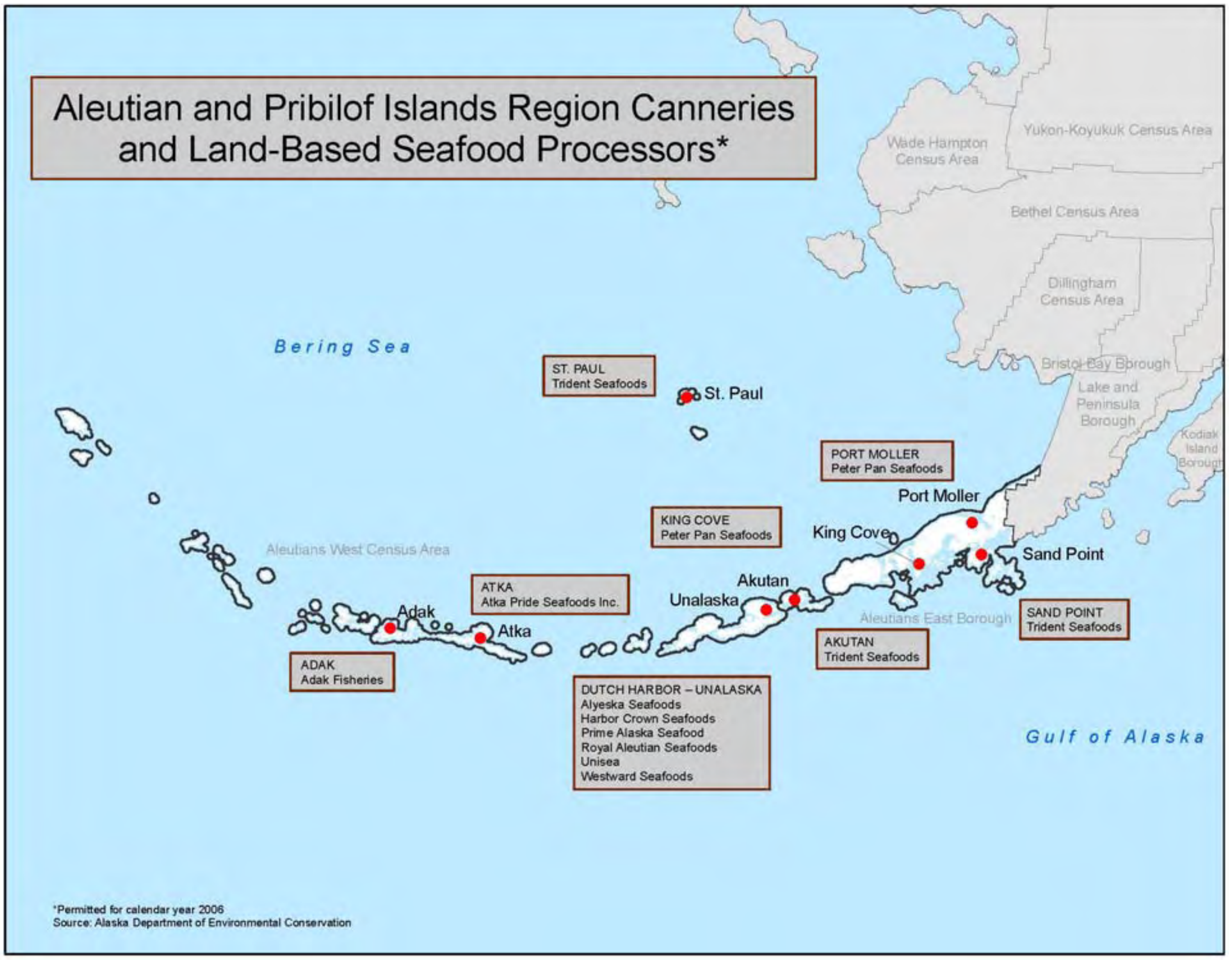
Table 2-2 Aleutian and Pribilof Islands Region1 Seafood Processing Workforce and Earnings, 2000–2005

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 Alaska Department of Labor and Workforce Development, Research and Analysis Section, reprinted with permission (Windish-Cole, 2008)

Figure 2-2 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 ADOL (Windish-Cole, 2008).

Figure 2-2 Aleutian and Pribilof Islands Region Canneries and Land-Based Seafood Processors



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

2007-2008 BSAI Pollock Allocations

Pollock is apportioned in the BSAI between inshore, offshore, and mothership sectors after allocations are subtracted for the CDQ program and incidental catch allowances. The BSAI 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 BSAI is as follows:

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

The following table (Table 2-3) exhibits the allocations and harvests (in metric tons) in the Bering Sea trawl fisheries from 2003 to 2006. The table also shows the corresponding ex-vessel value and price of those harvests.

Table 2-3 Bering Sea Pollock Sector Allocations and Catch; Ex-vessel Value; and Ex-Vessel Price, 2003–2006

Year/TAC	Sector (# of vessels)	Allocation (metric tons)	Catch (metric tons)	Ex-vessel Value-$ Mil	Price-$/lb, round wt.
2003	CV (91)	653,047	652,254	181.3	
	CP (18)	522,437	522,428	119.6	
1,491,760	M	130,564	130,609	na	.107
	CDQ	149,176	149,121	--	
2004	CV (93)	649,580	637,971	198.5	
	CP (19)	519,664	519,570	222.3	
1,492,000	M	129,916	129,222	na	.106
	CDQ	149,200	149,173	--	
2005	CV (90)	653,787	648,117	229.1	
	CP (22)	523,029	517,699	266.3	
1,478,000	M	130,757	130,669	na	.125
	CDQ	149,750	149,715	--	
2006	CV (90)	660,318	645,599	231.1	
	CP (19)	528,254	527,134	246.0	
1,487,756	M	132,063	131,404	na	.129
	CDQ	150,400	150,374	--	

2.1.3 Market Disposition of Alaska Pollock

Production

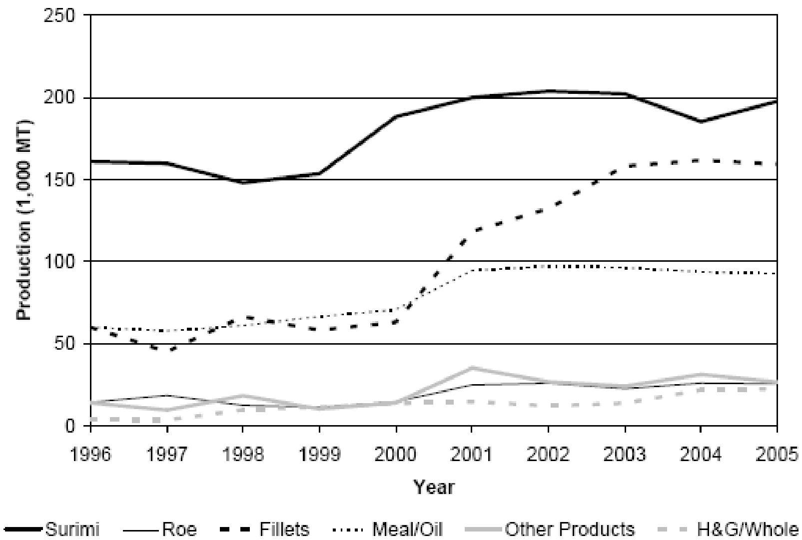
The pollock fishery in waters off Alaska is the largest U.S. fishery by volume, and the economic character of that fishery centers on the products produced from pollock. In the U.S., Alaska pollock catches are processed mainly for roe, surimi, and fillet products. Fillet production has increased particularly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

Prior to the implementation of the AFA, U.S. Alaska pollock catches were processed mainly into surimi. The BSAI fishery was then managed as an "open-access" fishery in which vessels sought to harvest as large a share of the TAC as possible. 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 advantage. With the rationalization of the fishery under the AFA, the industry was able to abandon practices compelled by open access and to begin developing more deliberate production strategies according to market demands.

This shift in production practices led primarily to a particularly rapid increase in fillet production to meet greater demand created by declining harvests in the Russian pollock fishery and a decrease in the supply of fillets from Atlantic cod.

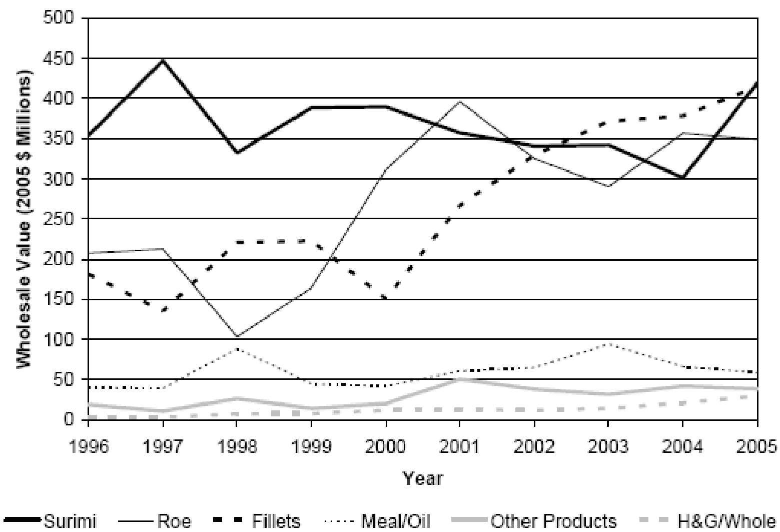
shows the Alaskan production of pollock by product from 1996 to 2005. Figure 2-4 shows the wholesale value of these products over the same period. These figures show the dramatic increase in production and wholesale value of fillets from 2000 to present.

Figure 2-3 Alaska Primary Production of Pollock by Product Type, 1996-2005



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

Figure 2-4 Wholesale Value of Alaska Pollock by Product Type, 1996-2005



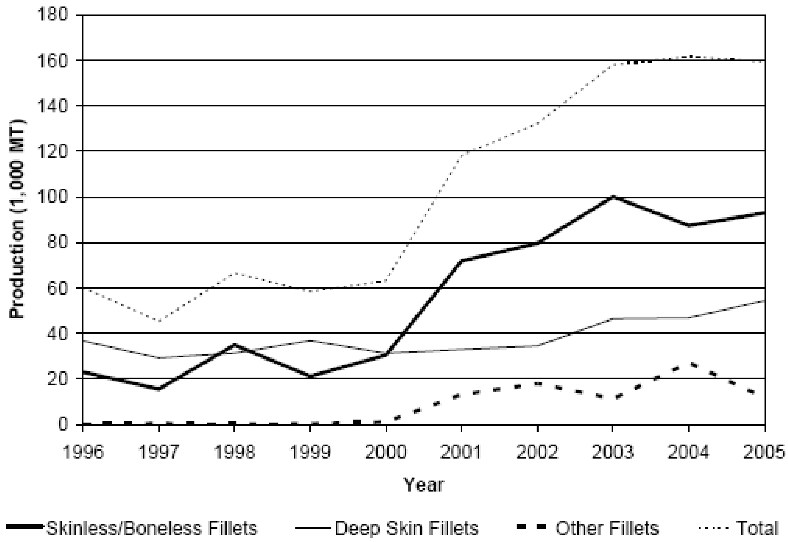
Note: Product types may include several more specific products.
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2005

Fillet Production

Pollock is a fragile fish that deteriorates relatively quickly after harvest, so little is sold fresh. Pollock fillets are typically sold 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, frozen-at-sea fillets fetch the highest prices, followed by single-frozen fillets processed by Alaska shoreside plants.

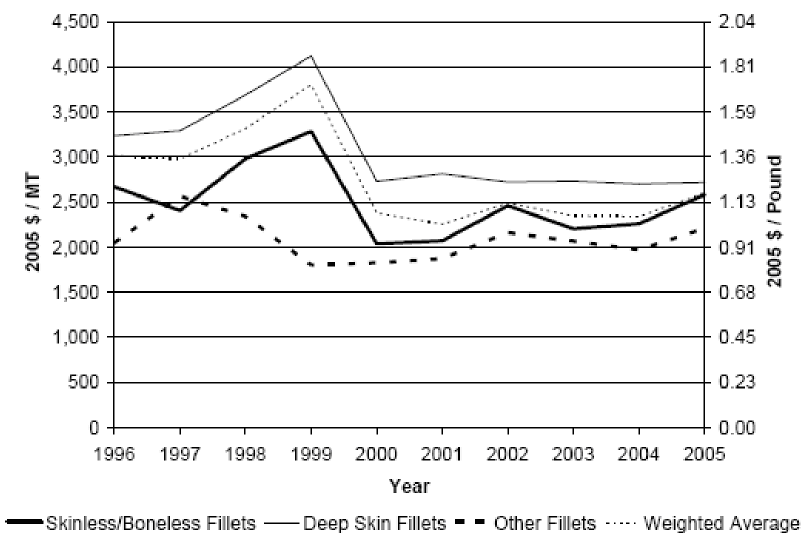
The following figures (Figure 2-5 through Figure 2-7) show the primary production, wholesale price, and wholesale value of pollock fillets by fillet type from 1996-2005.

Figure 2-5 Alaska Production of Pollock Fillets by Fillet Type, 1995-2005.



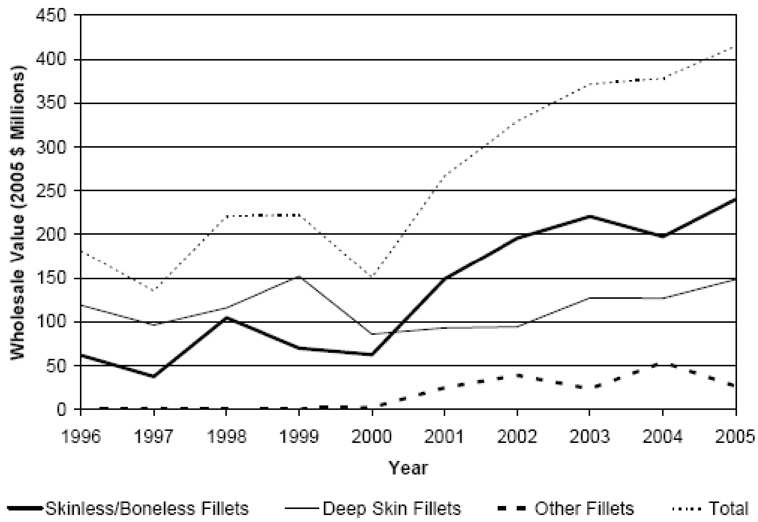
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2005

Figure 2-6 Wholesale Prices for Alaska Production of Pollock Fillets by Fillet Type, 1996-2005



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

Figure 2-7 Wholesale Value of Alaska Production of Pollock Fillets by Fillet Type, 1995-2005.



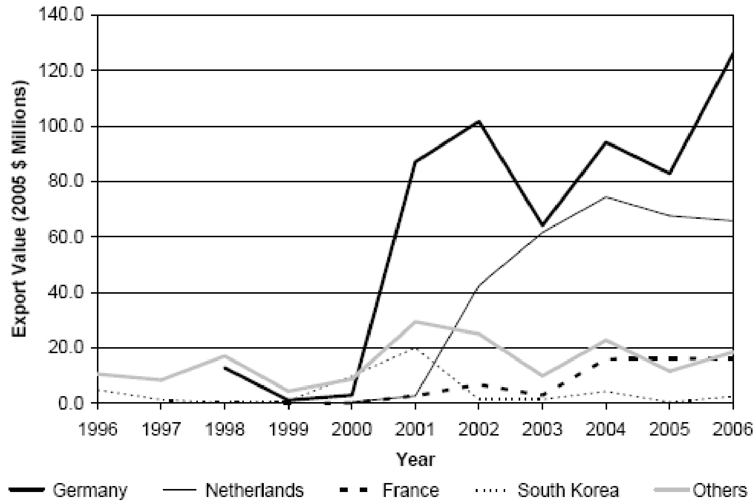
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2005.

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 NMFS 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.

Historically, the primary market for pollock fillets has been the domestic market. Fillets made into deep-skin blocks were destined primarily for U.S. foodservice industry, including fast food restaurants. Competition in this domestic market comes from imported twice-frozen pollock fillets and fillet blocks caught in Russia and reprocessed in china. However, with Russian-caught Alaska pollock in short supply due to declining harvests, twice-frozen fillets from China have become more expensive, and imports have subsequently declined.

Figure 2-8 shows the leading countries importing U.S.-produced Alaska pollock from 1996 to 2006, along with the 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 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.

Figure 2-8 **U**.S. Exports of Alaska Pollock Fillets to Leading Importing Countries, 1996–2006.



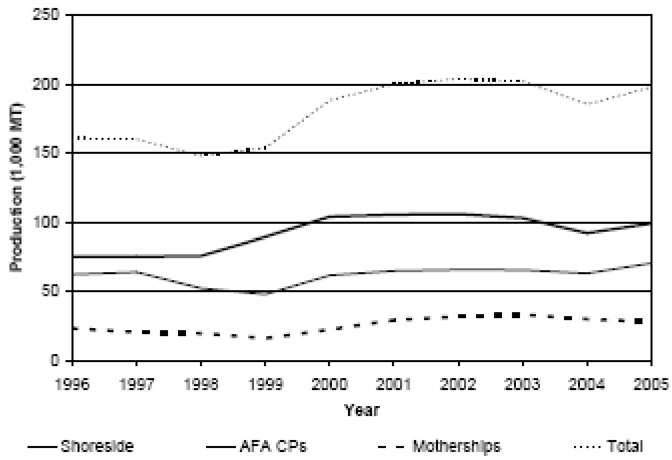
Note: Data include all exports of Alaska pollock from all U.S. Customs Districts
Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/

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% of the total volume of surimi production. Nevertheless, approximately half of the surimi produced continues to come from Alaska pollock.

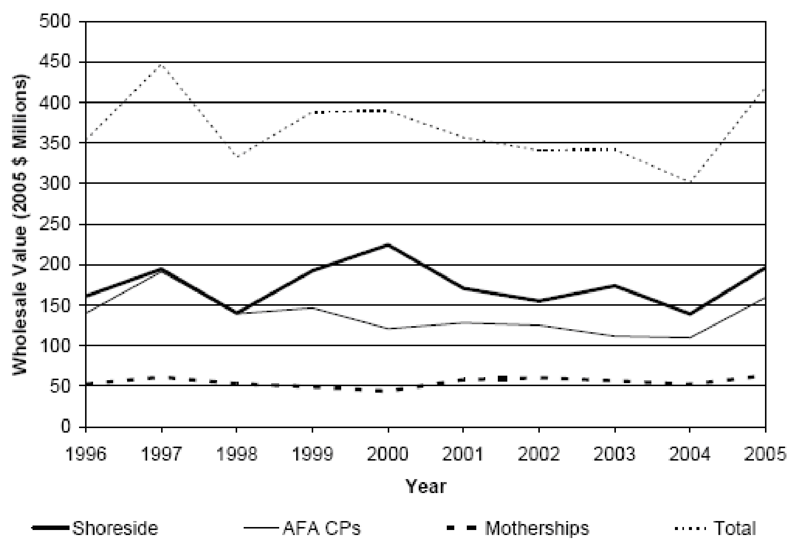
U.S. production of Alaska pollock surimi rose slightly in the late 1990s, despite the growth of the surimi market. As noted, the AFA's ending of open access occasioned an increase in fillet production, and this resulted in a corresponding reduction in the share of the harvests going to surimi production. However, the impact of the reduction was offset partially by 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. Alaska pollock surimi wholesale prices spiked in 1999, possibly because the BSAI pollock TAC decreased, but have been relatively stable since 2001. Figure 2-9 through Figure 2-11show the production, wholesale value, and wholesale price of U.S.-produced Alaska pollock surimi by sector for 1996 to 2006.

Figure 2-9 Alaska Production of Pollock Surimi by Sector, 1995-2006.



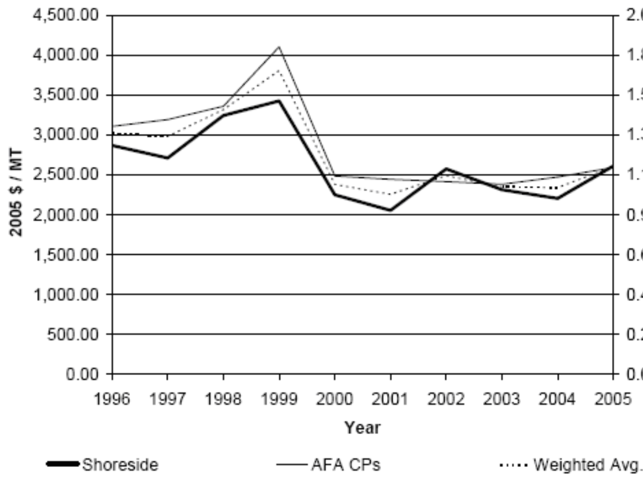
Note: Reported surimi production and value do not specify the grade of products.
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2005

Figure 2-10 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.
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2005

Figure 2-11 Wholesale Prices for Alaska Production of Pollock Surimi by Sector, 1996-2005.



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

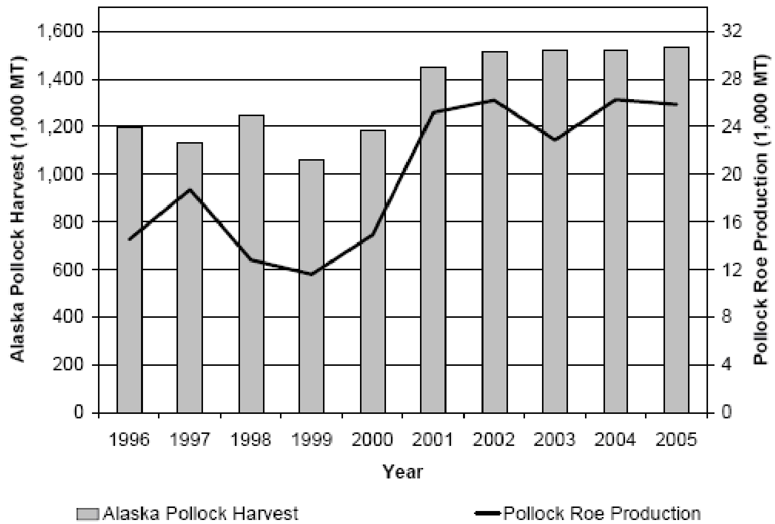
The quality of pollock surimi is graded by the National Surimi Association in Japan, which established a quality-ranking system that has been adopted by many suppliers. The highest quality surimi is designated as SA grade, and the grade second highest in quality designated as FA. The third quality grade 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% 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 NMFS 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

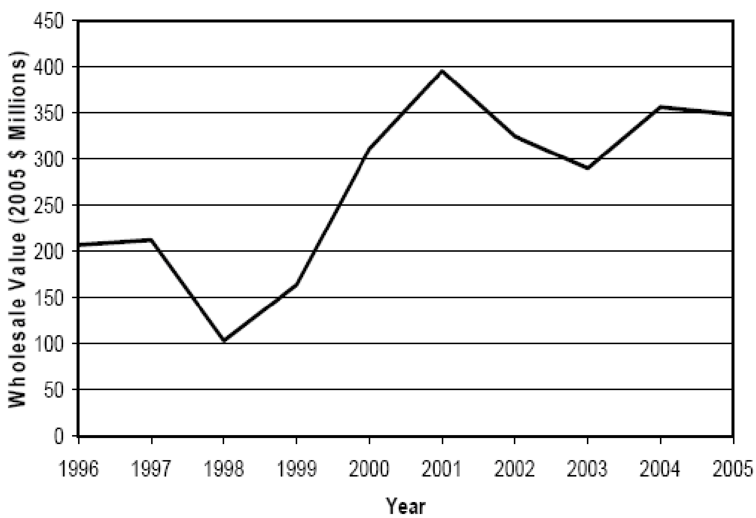
Roe is extracted from the fish after heading, separated from other viscera, and frozen. After being stripped of roe, the remaining fish can be further processed into surimi or fillets. One of the most important products of Alaska pollock, roe actually accounts for a small share of the volume of pollock 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. Figure 2-12 and Figure 2-13 exhibit the harvests, primary production, and wholesale value of roe from Alaska-caught pollock.

Figure 2-12 Alaska Pollock Harvests and Production of Pollock roe, 1996–2005.



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

Figure 2-13 Wholesale Value of Alaska 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

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 roe industry.

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 close proximity to other countries in Western Europe; most 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 as 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 (EU Fish Processors' Association 2006, as cited in NMFS 2007). This is in contrast to the need for mainly mechanical filleting and preparation by U.S. processors, with consequent yield loss. Researchers estimate that American at-sea processors require 69% more fish to produce the same quantity of pollock fillets as compared to Chinese processors (Ng 2007, as cited in NMFS 2007).

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 NMFS 2007).

2.1.4 The Voluntary Rolling Hotspot System

In past years, NMFS and the Council have implemented a number of FMP amendments to reduce overall salmon bycatch in the BSAI trawl fisheries, such as Amendment 21b, which established a Chinook salmon savings area closed to trawl gear when the incidental catch of Chinook salmon in BSAI trawl fisheries reached 48,000 fish; Amendment 58, which reduced the Chinook salmon bycatch limit from 48,000 fish to 29,000 fish and mandated year-round accounting of Chinook bycatch in the directed pollock fishery; and Amendment 35, which established a chum salmon savings area closed to all trawling from August 1 through August 31 of each year and closed for the remainder of the calendar year if 42,000 non-Chinook salmon are caught in the Catcher Vessel Operational Area during the period August 15 through October 14.

Despite these efforts, salmon bycatch numbers have continued to increase substantially. 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 119,866 fish, while bycatch of chum and other salmon species, although down considerably from previous years, remained high at 90,679 fish taken incidentally. 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 2-4 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 2-4 Catch and bycatch of pollock and salmon in the directed 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 shoreside vessels.
Source: Adapted from SeaState, Report to the North Pacific Fishery Management Council for the BSAI Groundfish Fishery Exempted Fishing Permit #07-02.

To address these continuing increases in salmon bycatch, in October 2007 NMFS implemented Amendment 84, which provides for the pollock cooperatives to enter into voluntary, contractual agreements for reducing salmon bycatch by the pollock fleet. These intercooperative agreements (ICAs) would exempt participating non-CDQ and CDQ pollock vessels from closures of the Chinook and chum salmon savings areas in the Bering Sea and allow the 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 tenants 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 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 who 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.

Salmon Bycatch Reduction ICA and Associated Exempted Fishing Permits

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 salmon bycatch reduction ICA, the AFA Catcher Vessel Intercooperative and the Pollock Conservation Cooperative 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 reduction 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.

In 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 we refer readers 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 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:

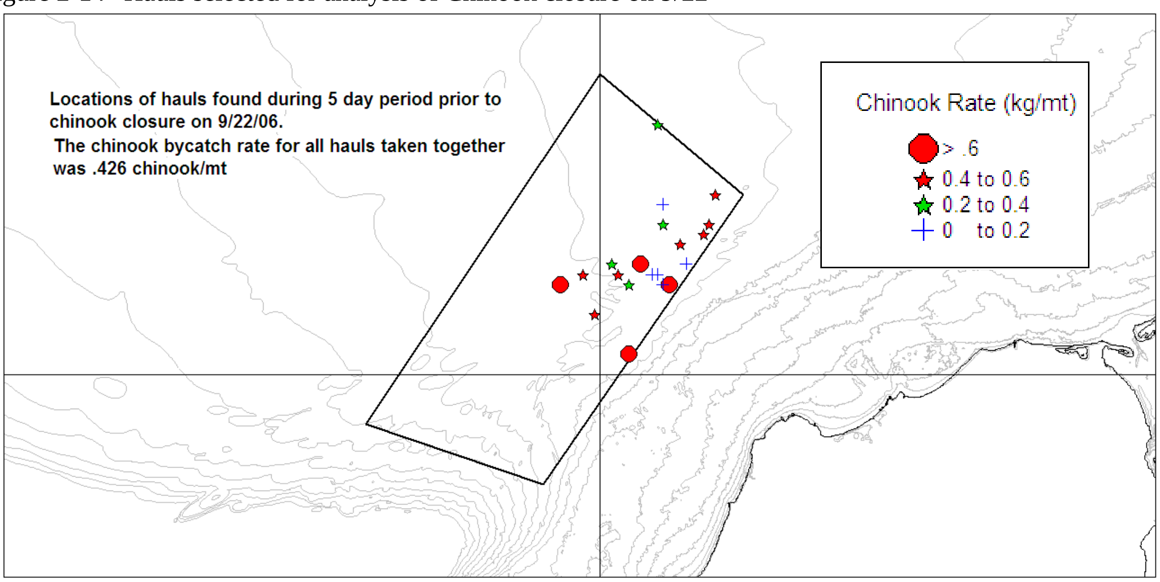
1. SeaState first extracted all observer data for haul locations falling inside a closure area, for a five-day period preceding the closure. Shoreside catcher vessel hauls that had the same “start fishing date” were aggregated, so that hauls with the same bycatch rate are not artificially repeated. For 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.[3] SeaState extracted the same haul or "grouped" haul information, for the same vessels, for the next five days. Their associated 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. 1 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. 1) either moved a small distance to the southwest, or made large moves to the northwest (Figures 2 and 3). Lower Chinook rates were found in all of the new fishing areas.

Figure 2-14 Hauls selected for analysis of Chinook closure on 9/22



[3] 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.

Figure 2-15 View at the same scale as above of five day fishing activity for vessels in the first map (Fig 2) 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).

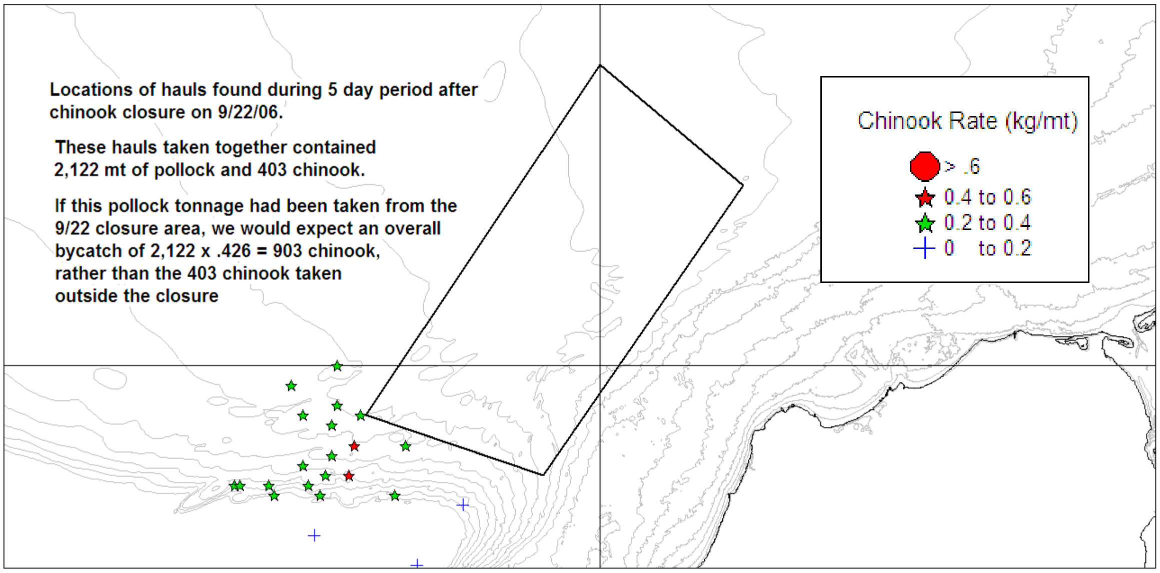
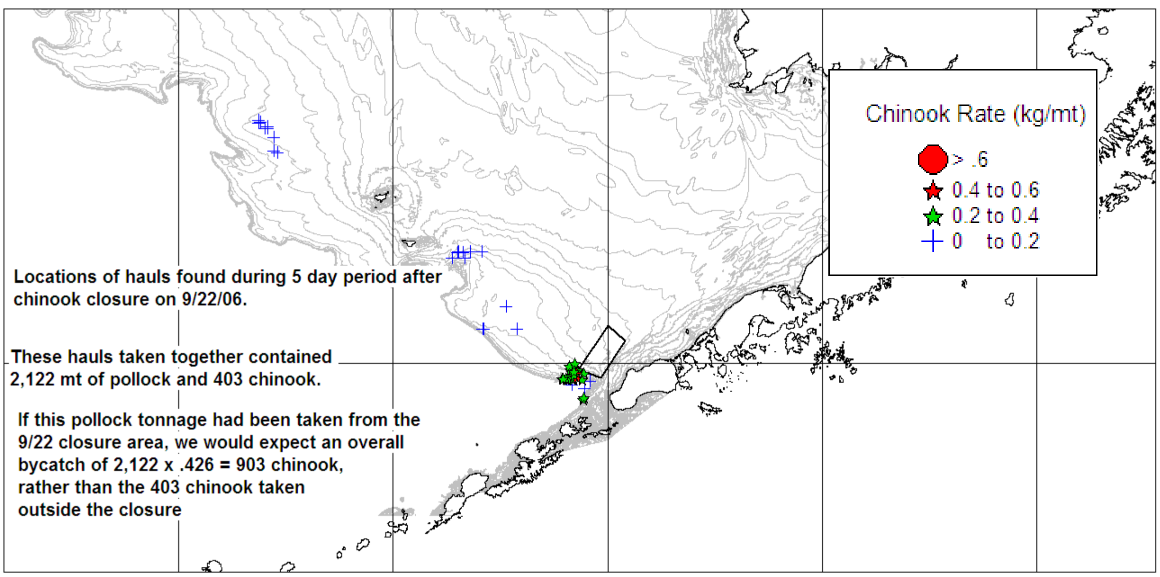


Figure 2-16 Full view of all hauls from boats in map 1-A for the 5 day period after the start of the 9/22 closure



2.1.5 Salmon avoidance results from the 2007 EFP Report

This section reprints result that are documented in the Report to the North Pacific Fishery Management Council (Council) for the BSAI groundfish fishery Exempted Fishing Permit (EFP) #07-02, which authorized the VRHS system in 2007, prior to effectiveness 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 2-5 and
Table 2-6 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 shoreside catcher vessels that had observers aboard before the closure, but then delivered and came back to the grounds without an observer.

Table 2-5 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% 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 2-6 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 shoreside delivery information and 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 2-6 also indicates that the combination of Chinook and chum closures resulted in 182,000 mt of pollock catch that could be tracked. Chinook savings of 14,576 from an expected bycatch of 27,048 (had boats continued to fish in the closed areas) indicate a reduction of 54%. Chum savings of 86,410 from an expected chum take of 101,191 (that would have been taken had vessels continued to fish in the closed areas) indicate a reduction of 85% in expected chum bycatch.

Table 2-5 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 2-6 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 2-7 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 shoreside catcher vessels 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 2-7 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, .

Figure 2-17 and Figure 2-18 show Chinook bycatch rates for various pollock fishing areas and contrast the 2006 and 2007 seasons (both A and B season). In Fig. 5, 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 2-8. Shoreside 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 2-8 Shoreside and offshore Chinook rates based on data compiled by Sea State.

Year	Shoreside A	Offshore A	Shoreside 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 shoreside recording began in 2000.

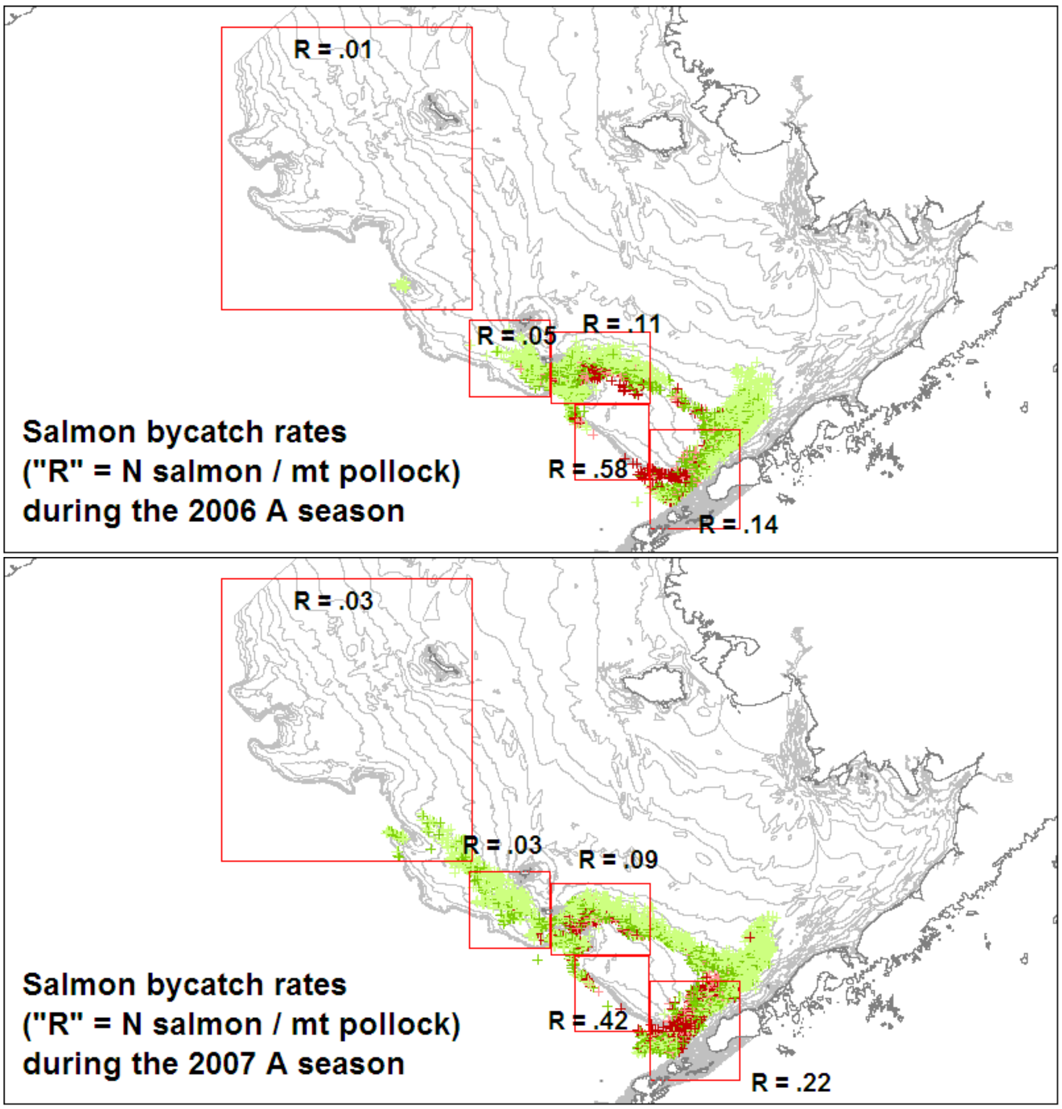
The pollock fishery encountered record levels of Chinook bycatch during the 2007 seasons. CPUEs on Chinook salmon, measured simply as the number of salmon caught per hour of fishing, summed across all vessels, rose dramatically in 2006 and continued to stay at high levels throughout 2007 (Figure 2-19 and Figure 2-20). Slight declines in salmon CPUE were seen in the shoreside CV data, but offshore sectors saw increased salmon CPUEs. Also, any lowering in the shoreside 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 Figure 2-21 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 has thus taken 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.

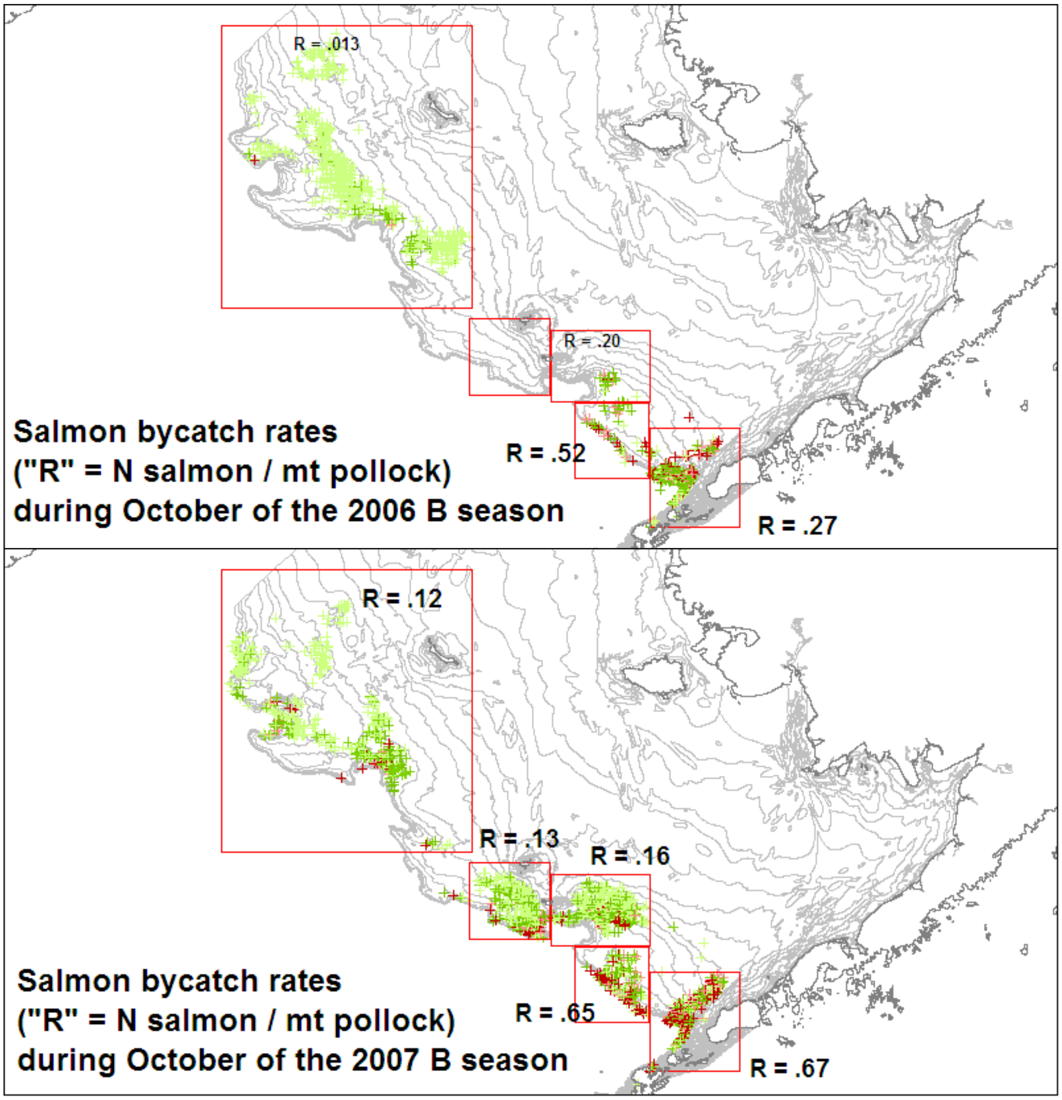
- **A predefined A season closure shown below (Figure 2-22) will be observed for the entire A season.** The area to be closed is defined by a heavy black line in the chart below. It was determined by trying to bound the areas that show the consistently highest A season bycatch rates, but still leave 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 (see
- Figure 2-23, slide from Council presentation below).

Figure 2-17 Comparison of Salmon Bycatch Rates in the 2006 and 2007 Pollock A Seasons



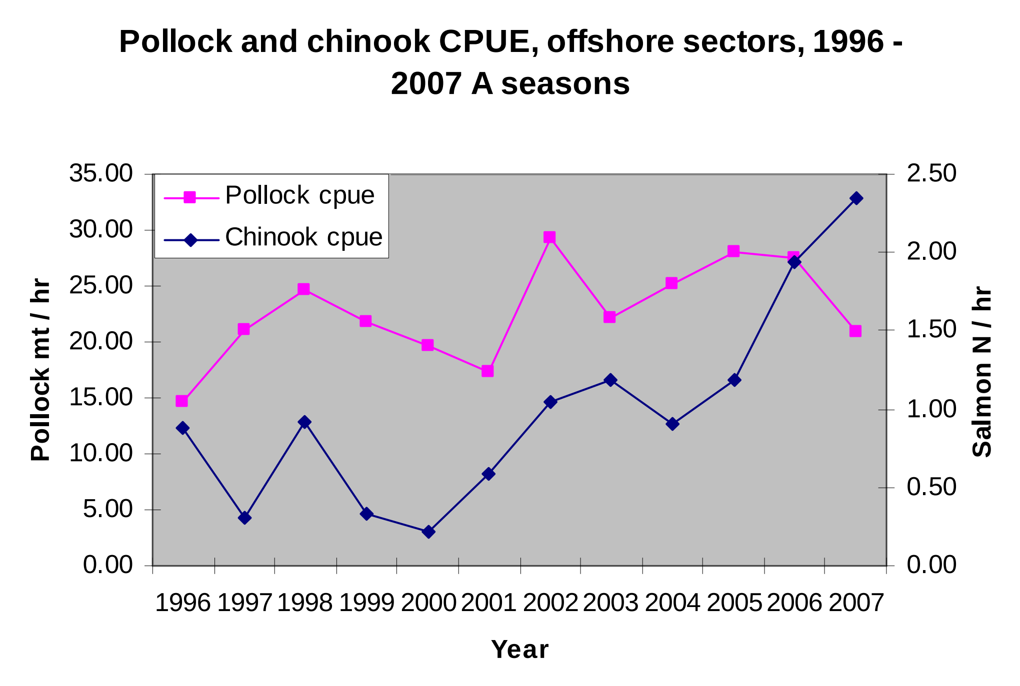
Shading indicates level of Chinook bycatch, ranging from light green (lowest) to red (highest). Shading scale is the same for both years

Figure 2-18 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

Figure 2-19 A Season Pollock and Chinook CPUE, 1996–2007, Offshore and CV Sectors



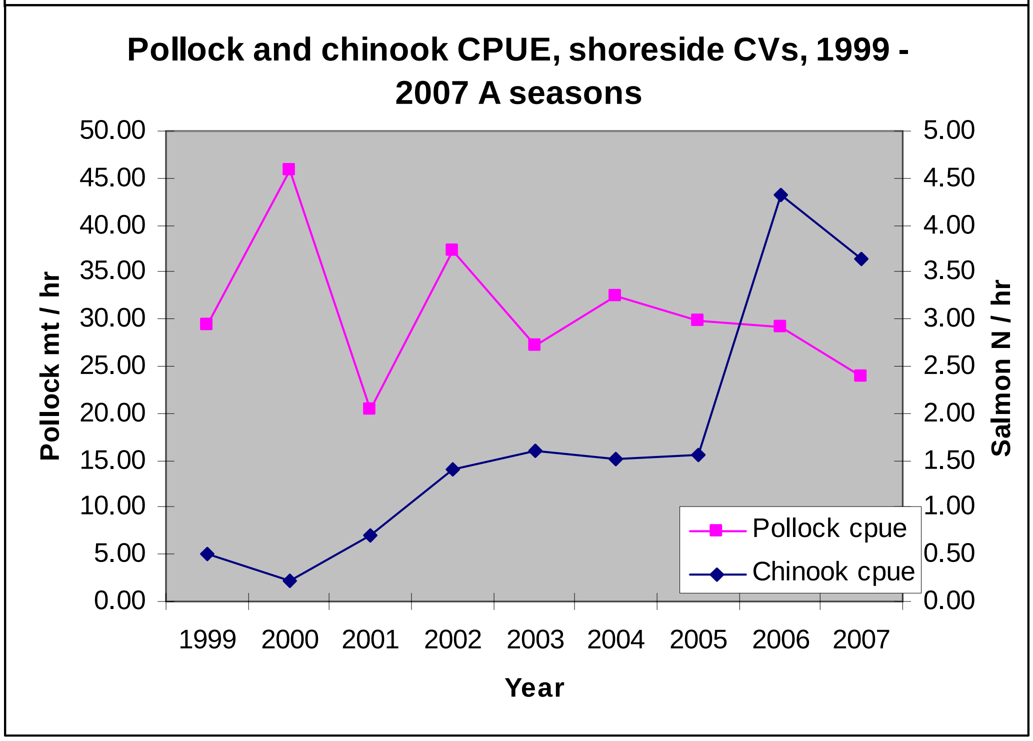


Figure 2-20 B Season Pollock and Chinook CPUE, 1996–2007, Offshore and CV Sectors

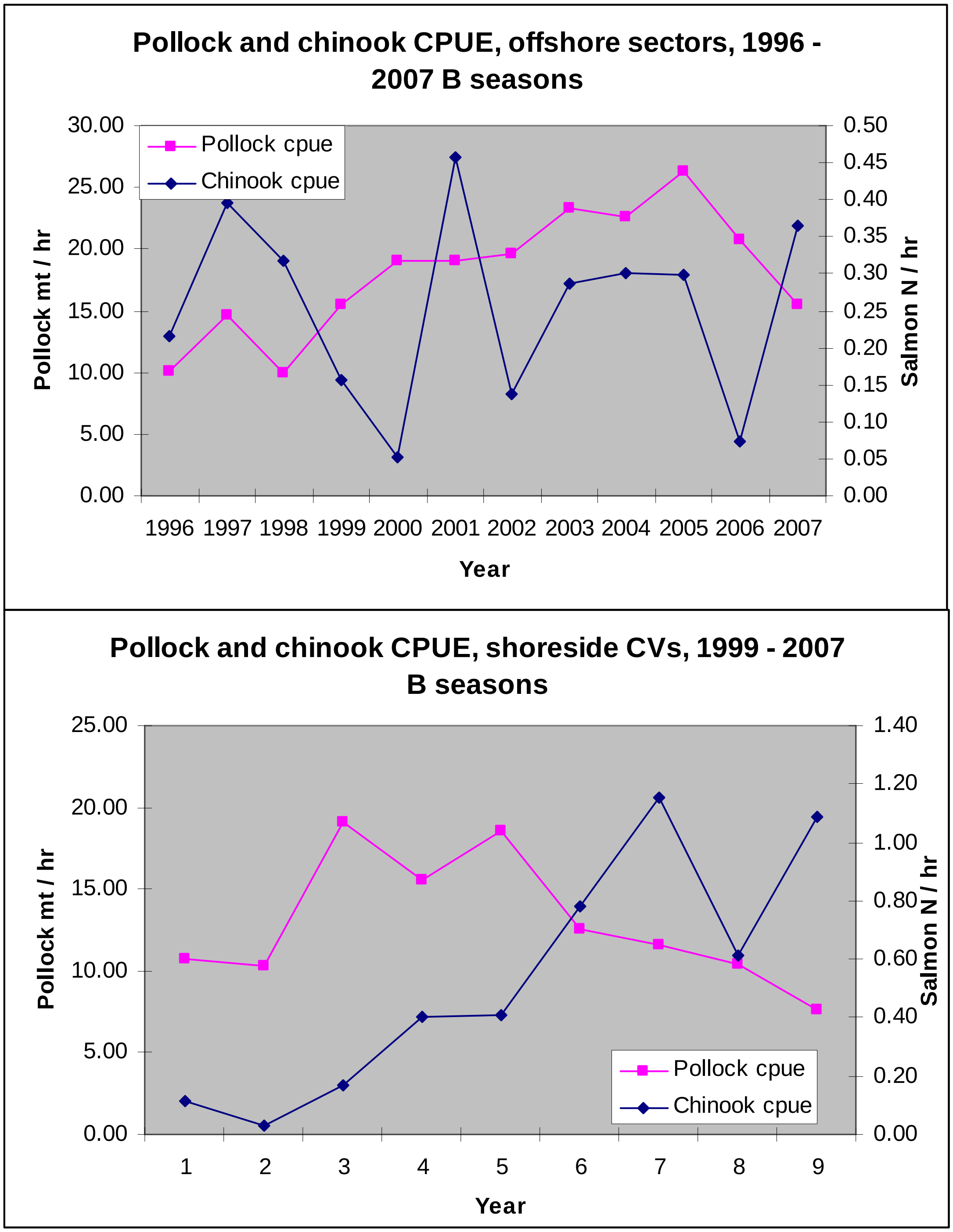


Figure 2-21 Length frequencies of Chinook, 2007A and 2007B seasons.

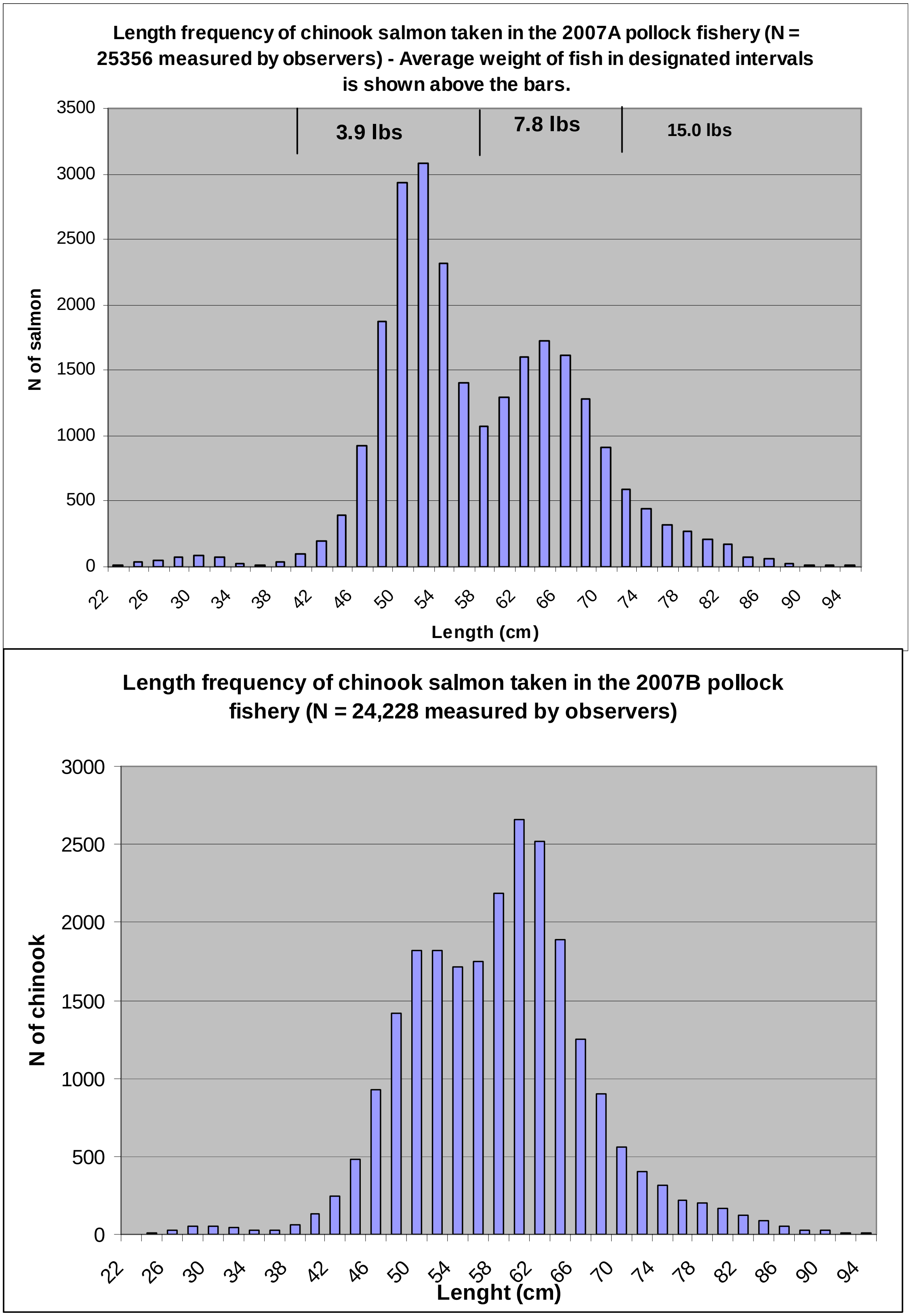


Figure 2-22 2008 Pollock A Season Pre-season Closure

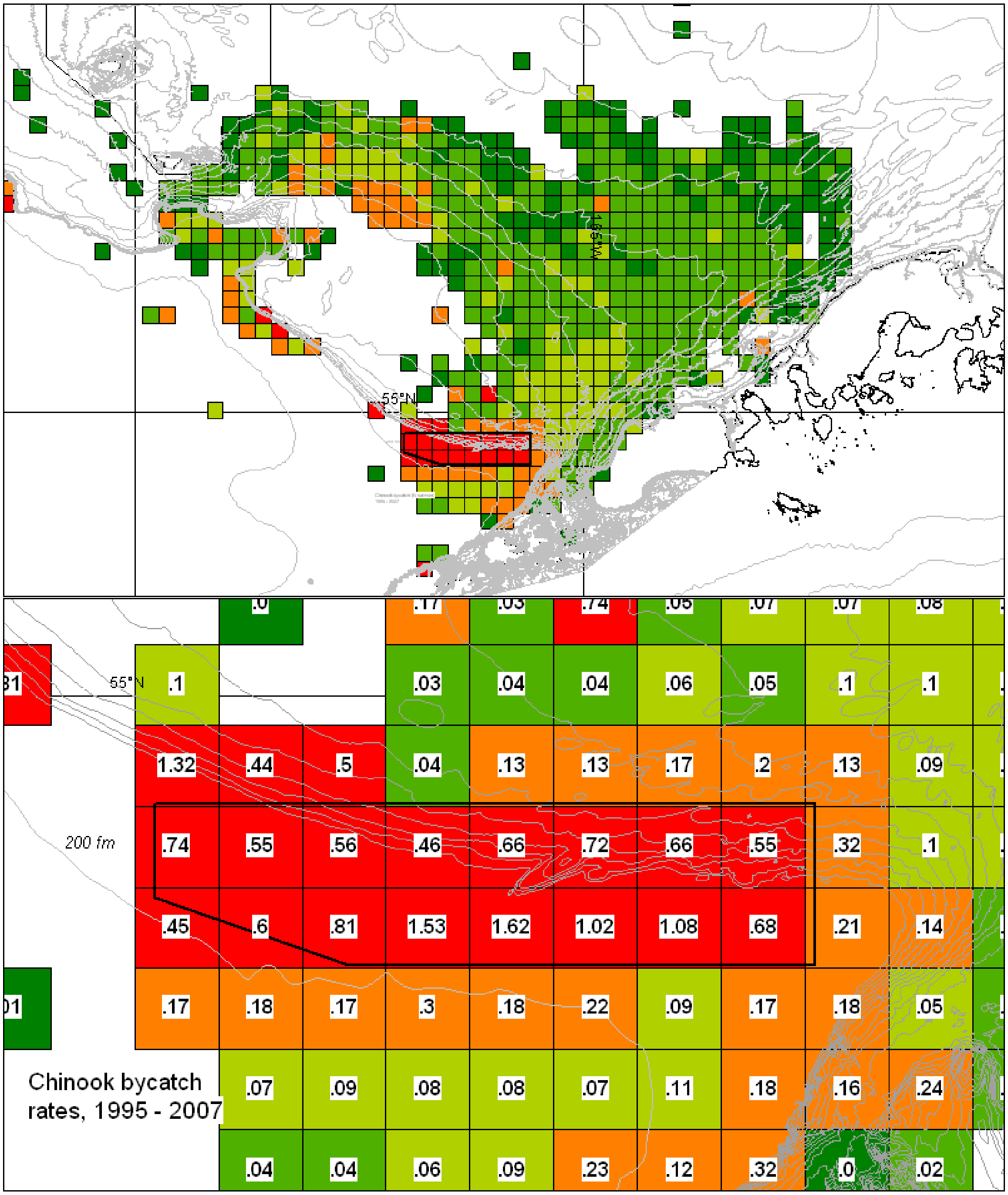


Figure 2-23 Correspondence between high bycatch areas noted by Council analysts and pre-season closure (above).

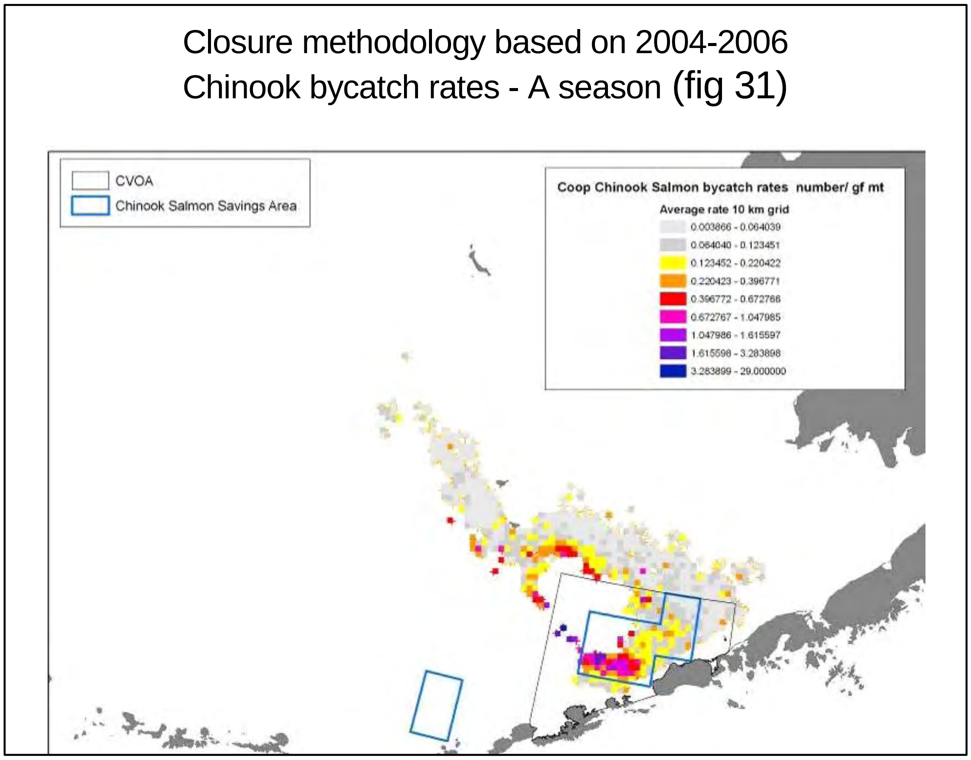


Table 2-9 Chinook and chum salmon closure effectiveness, 2007 A season, by Chinook closure

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			

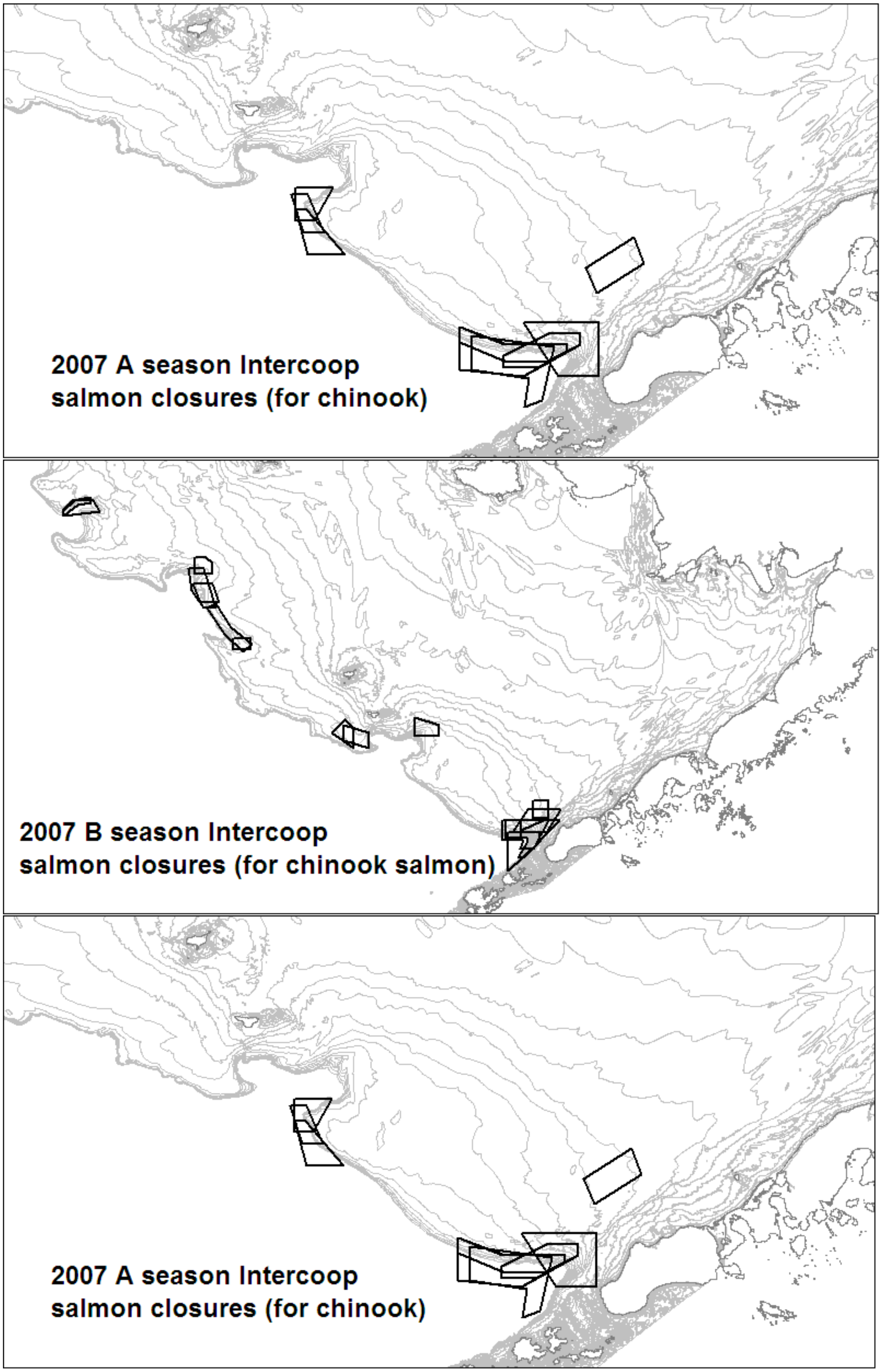
Table 2-10 Chinook and chum salmon closure effectiveness, 2007 B season, by Chinook closure

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 2-11 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**			

Figure 2-24 Charts showing closures



2.1.6 Donation of Bycaught Salmon: Prohibited Species Donation Program

The Prohibited Species Donation program (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 of reasons for requiring the discard of prohibited species is that some of the fish will live if they are returned to the sea with a minimum of injury. However, all salmon die that are incidentally caught 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 taking participating in the PSD program.

The NMFS Regional Administrator, Alaska Region, may select one or more tax-exempt organizations to be authorized distributors 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.

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. NOAA presented SeaShare with a 2006 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).

Table 2-12 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 2007 (SeaShare, personal communication, 2008). NMFS does not have the information to convert accurately 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 2-12 Net Weight of Steaked and Finished PSD Salmon Received by SeaShare, 1996-2007

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	

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

The packaged PSD salmon is distributed through SeaShare to food banks located primarily in the Puget Sound area of the Pacific Northwest. Less than full truckload quantities of fish are distributed to Seattle-area food banks that use their freezer trucks to pick up the frozen salmon directly from the freight carriers. Sometimes full truckloads are made available to any qualified food bank within the America's Second Harvest network that is willing to pick it up with a freezer truck and pay for shipping expenses. Due to transportation costs, donated salmon usually stays in the Western U.S. Individual food banks distribute the salmon to soup kitchens, shelters, food pantries, and hospices (SeaShare, 2008). Over the 12 years that the salmon PSD program has been in place, nearly 2 million pounds of steaked and finished salmon have been donated through the program. Using an estimated four meals per pound of salmon, nearly 650,000 meals have been donated on average per year. The donated salmon provides a highly nutritious source of protein in the diets of people who often have access to only meagre and 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 paperwork, 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 its 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, 2003).

The PSD program reduces waste in fisheries with salmon PSC bycatch. 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 bycatch are directly utilized as high quality human food, improving social welfare and reducing fishery waste.

2.2 Potentially Affected Salmon Fisheries

Analysis of the stock composition of Chinook salmon incidentally caught in the BSAI trawl fisheries 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% Western Alaska, 31% Central Alaska, 8% Southeast Alaska/British Columbia, and 5% Russia.

This section provides extensive background information on the commercial, subsistence and recreational Chinook salmon fisheries in Western Alaska river systems likely most affected by Chinook salmon bycatch. The data cited in the sections treating salmon fisheries by region are from published Alaska Department of Fish and Game (ADF&G) reports as well as from data provided by ADF&G specifically for development of this document. ADF&G is a participating agency in the preparation of this document. Thus, data tables and text from management reports are often adopted herein as originally written by ADF&G area management staff. Some tabular data and text has been reformatted for greater focus of the issues needing treatment in this RIR; however, considerable effort has been made to include all table footnotes and to include a long range historical perspective.

The Importance of Subsistence Harvest

Many rural Western Alaska communities have mixed subsistence-market based economies, where subsistence harvests are a prominent part of the local economy and the social welfare of the people (Wolfe and Walker, 1987). The subsistence salmon harvests in the AYK region, for example, have cultural and practical significance to many of the approximately 4,500 households residing in 38 communities in the region, and have been relied upon for food by indigenous peoples since their original immigration into the region (Buklis, 1999). 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. Subsistence studies have estimated that fish make up as much as 85% (by weight) of subsistence fish and wildlife harvested in the AYK region, with salmon contributing as much as 53% and as much as 650 pounds per capita. (Buklis, 1999).

It is important to understand that subsistence harvesting activity is not without cost. Subsistence salmon harvesters generally 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 recent years, the dependency on commercial catch to offset costs incurred in the subsistence fishery may result in financial difficulties, when commercial harvests are depressed.

The relative commercial value of Chinook versus chum salmon, or other salmon, is also a consideration. A single commercially harvested Chinook salmon weighs, and is worth, considerably more than a chum salmon. It is likely more difficult to offset subsistence costs with chum salmon or other salmon commercial catch if commercial Chinook harvests are depressed. This problem has been occurring over the past decade in several fisheries as the value of chum salmon has fallen dramatically and some areas have not had commercial Chinook harvest opportunities due to conservation concerns and subsistence harvest priority. Buklis described this problem with the example that in 1976, the sale of 6 summer chum salmon roughly equaled the value of 1 Chinook salmon. In 1988, the relationship was 14 to 1 and, by 1996, it was 65 to 1(Buklis, 1999). These relationships highlight the importance of Chinook harvests but also the amounts of chum and other salmon harvests that would be needed to offset declines in commercial Chinook harvest value.

Another factor in gauging the adequacy of subsistence harvests is whether subsistence harvest opportunity is adversely affected by subsistence schedules and/or subsistence catch limits on specific river systems. If the timing of subsistence openings is heavily restricted, it is more likely that pulses of fish moving upriver may be missed and catches that do occur may be smaller in number than would occur if subsistence nets were in the water for longer periods of time. Thus, it may take longer, both in hours fished and fishing periods, for subsistence harvesters to catch enough fish to meet food supply needs when subsistence schedules are restricted. Greater time needed to harvest subsistence fish can mean that less time is available to work in summertime cash employment either in, for example, seafood processing and support industries, for local government, and/or in seasonal firefighting.

Shorter subsistence openings may also affect the quality of the processed fish. If openings happen to coincide with wet weather, traditional methods of fish drying are made more difficult and spoilage may result. If subsistence fishing is not restricted, harvesters can determine whether to fish when weather limits their ability to process the fish. However, when restrictions are in place, subsistence harvesters may feel pressured to fish, and to process fish, when they would rather not do so for fear of spoilage.

Yet another aspect to the realities of the difficulties associated with subsistence fishing is that the timing of the run can have impacts due to insect activity and, similarly, the timing of harvests dictated by a restricted schedule can have such impacts.

Personal Use and Sport Fishery Impacts

In several areas of Alaska, the value of salmon harvested in personal use, sport, and subsistence fisheries has been estimated via the economic travel cost modeling method. Such studies have been carried out on the Copper and Gulkana river dipnet fisheries (Henderson, et al., 1999; Layman et al., 1996) Henderson, et al., found that rural areas with high unemployment and high percentages of subsistence users had higher visitation rates to the Copper River, than more urban areas, although the differences were not statistically significant. They also found that estimated consumer surplus', per Copper River trip, in 1996, ranged from \$50.93 to \$56.88, depending on assumed opportunity cost of time. Another important finding was that these estimates were within the lower bound range of the replacement costs of the catches. However, they are lower than the upper bound estimate of foregone gross ex-vessel (i.e, commercial) average per trip revenue of \$98.09**.** This suggests that personal use and subsistence values, while possibly greater than sport value, are potentially less than commercial value of the catch. Henderson et al., point out that the opportunity cost of personal use and subsistence harvest to commercial fishermen would be the difference between the estimated ex-vessel value and the incremental cost of catching a fish.

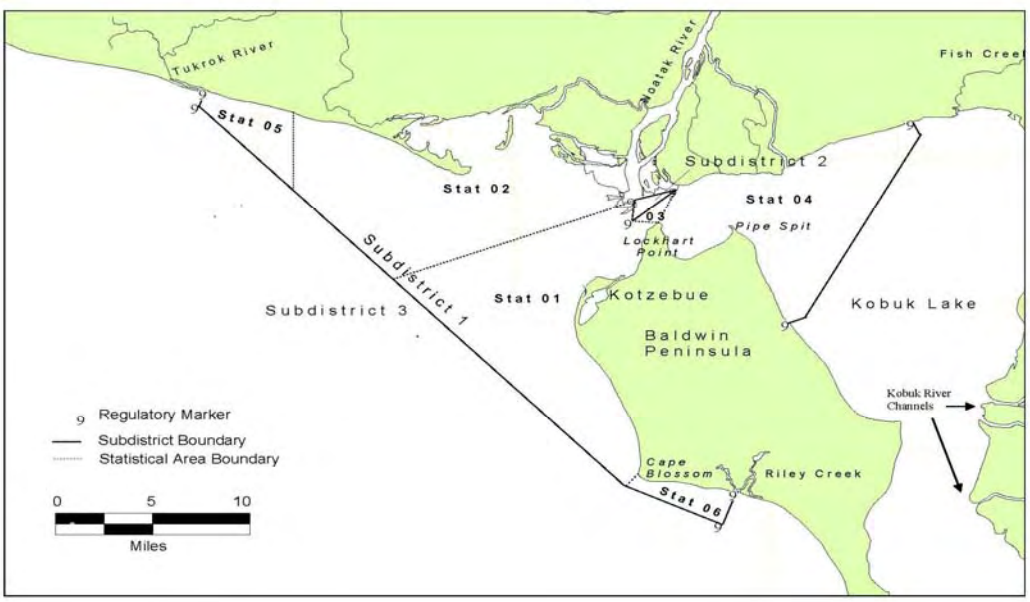
Layman et al. estimated that Gulkana River sport trip consumer surpluses ranged from $26.05 to $32.35, using opportunity cost of time of 30% and 60% of wage rate, respectively, in 1992. Henderson et al. updated these numbers for inflation to 1996 values of $28.55 and $35.46 per trip. Thus, sport trips on the Gulkana appear to generate smaller consumer surplus values than do subsistence trips on the Copper River. However, the quantity of fish that may be retained in the Copper River subsistence fishery is much larger than in the Gulkana sport fishery.

Unfortunately, the range of consumer surplus benefits found in the above mentioned studies couldn't be directly applied (e.g. via benefits transfer) to subsistence activity in Western Alaska. This is largely because it is difficult to define a similar "trip" in Western Alaska, due to differing transport modes (e.g riverboat vs. car) and duration (e.g., a week or an opening vs. a day or a weekend). The results of these studies do, however, suggest the importance to rural residents is higher than non-rural residents, and that subsistence harvest has value potentially as high as replacement cost.

2.2.1 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 (Fig. 1). 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 is developed from ADF&G 2007a, Menard, 2007a, and data supplied by ADF&G).

Figure 2-25 Kotzebue Fishery Management Area



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 fishers 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.

Subsistence Fishery Situation and Outlook

Subsistence fishing has long been an important food gathering activity for people of the Kotzebue Sound drainages. The most recent subsistence survey of salmon harvests in 2004 estimated a total of 20,604 chum salmon were harvested from the Kobuk River and 3,997 chum salmon were harvested from the Noatak River. Over 90% of the subsistence salmon harvests are chum salmon. Subsistence salmon surveys were not done in 2006. Previous surveys in the 2000s indicate that Kotzebue residents harvest approximately the same amount of salmon as all the other villages combined.

As in other areas, the subsistence fishery takes precedence over the commercial fishery. There appear to be no indications, in published management reports and summaries, that subsistence chum salmon harvest opportunities are lacking in the region. The 2007 season summary (ADF&G 2007a) indicates that no subsistence salmon surveys are scheduled. No other information on subsistence harvest is available other than comments that chum salmon fishing on the Kobuk River and Noatak River was very good in August

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 the department 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 1).

In the Kotzebue fishery gear is limited to set nets with an aggregate of no more than 150 fathoms per fisher. Fishers generally operate with one end on or near shore and with all three shackles connected. Fishers also set in deeper channels in 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 fishers reporting average to above average catches, and the Kobuk test fish index being above average. The commercial harvest consisted of 147,085 chum salmon. Also harvested during the commercial fishery and kept for personal use were 2 chum salmon, 15 Chinook salmon, 3 pink salmon, 2 coho salmon, 960 Dolly Varden and 13 sheefish.

Recreational 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 km2) 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 maintain a Kotzebue-based commercial fishery. Many thousands of anadromous Dolly Varden overwinter 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 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 species inhabit Walker, Selby and Nutuvukti lakes.

(http://www.sf.adfg.state.ak.us/Management/Areas.cfm/FA/northwestOverview.overview)

2.2.2 Norton Sound

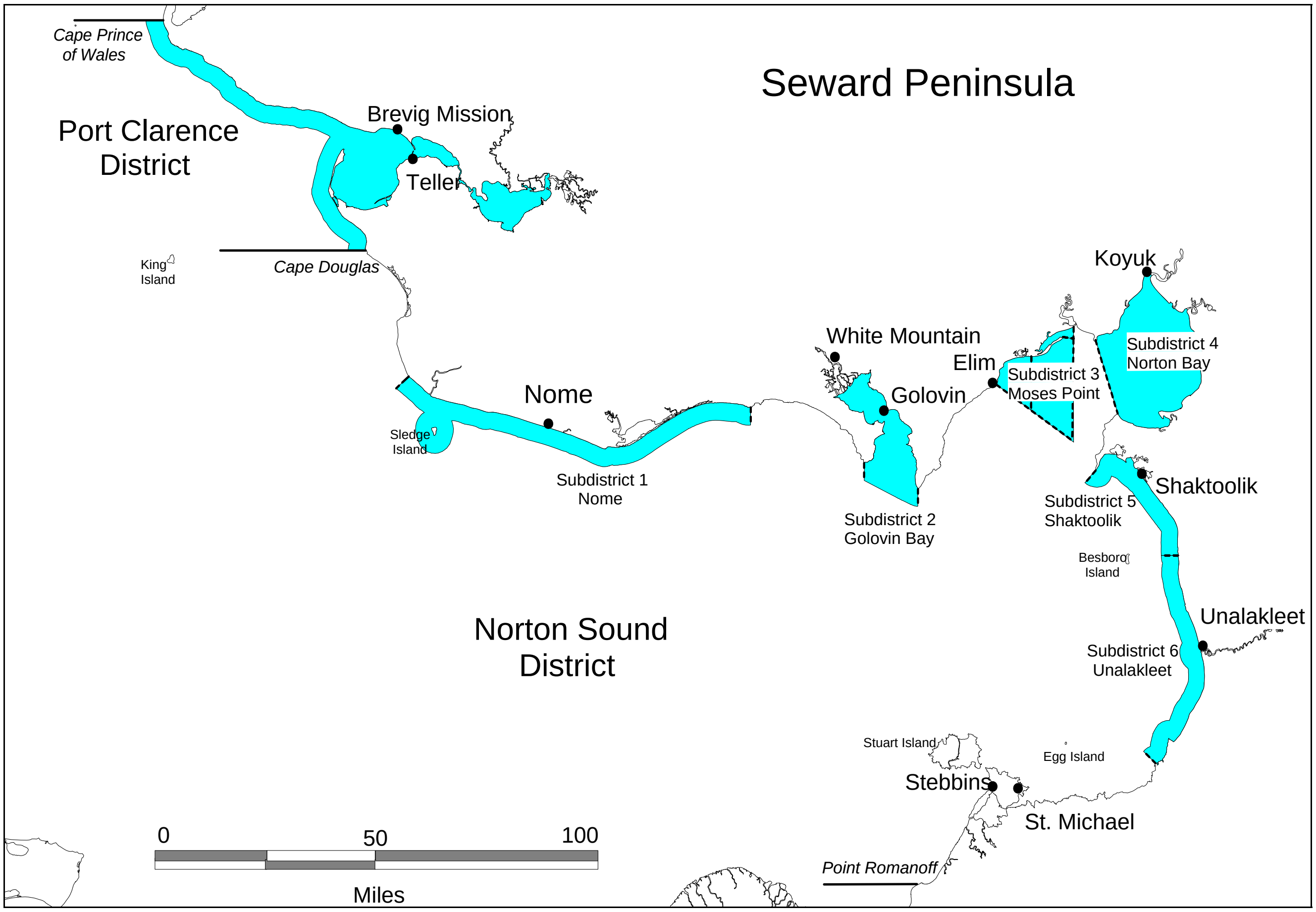
Norton Sound is comprised of two fishing districts, the Norton Sound District and the Port Clarence District). The Norton Sound District extends from Cape Douglas south to Point Romanof and includes over 500 miles of coastline. The area open to commercial salmon fishing is divided into six Subdistricts. 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 is developed from ADF&G 2007d, Menard, 2007b, and ADF&G supplied data)

Table 2-13 Kotzebue District Chum Salmon Catch and Dollar Value 1962-2007.

Year		Total Catch	Number of Permits [a]	Season Catch per Permit Holder	Gross Value of Catch to Permit Holders [b]	
1962		129,948	84	1,547	$4,500	
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	

[a] During 1962-1966 and 1968-1971 figures represent the number of vessels licensed to fish in the Kotzebue District, not the number of fishers.
[b] Some estimates between 1962 and 1981include only chum value which in figures represent over 99% of the total value. Figures after 1981 represent the chum value as well as incidental species such as Dolly Varden, whitefish and other salmon.
[c] Includes 2,000 chum salmon and $3,648 from the Sikusuilaq springs Hatchery terminal fishery.
[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.

Figure 2-26 Norton Sound Fishing District Map



Status of Runs and Conservation Concerns

The Alaska Board of Fisheries (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.

Subsistence Fishery Situation and Outlook

The Norton Sound subsistence fishery is managed under a permit system with annual harvest limits specific to each managed body of water in the region. There are also gear restrictions that limit use of gillnets to reduce take of Chinook and coho. Table 2-14 provides subsistence restriction information by river system in the Norton Sound Area.

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. Beginning June 16, subsistence fishing in the marine waters of Subdistricts 5 and 6 will be restricted to two 48-hour fishing periods a week from 6:00 p.m. Monday until 6:00 p.m. Wednesday and from 6:00 p.m. Thursday until 6:00 p.m. Saturday. Also, beginning June 16, subsistence fishing in the Unalakleet River will be restricted from 8:00 a.m. Monday until 8:00 p.m. Tuesday and from 8:00 a.m. Friday until 8:00 p.m. Saturday.

Overall subsistence salmon harvest in the Norton Sound region peaked in 1996 (Table 2-15), 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.

Table 2-14 Norton Sound Areas Subsistence Restrictions

Nome Subdistrict

Sinuk River 500 salmon/family (no more than 40 chum, 40 coho, and 100 sockeye)
Cripple River 300 pink salmon/family (no chum and 5 coho)
Penny River 300 pink salmon/family (no chum and 5 coho)
Nome River 500 salmon/family (no more than 40 chum, and 40 coho)
Snake River 200 salmon/family (no more than 40 chum, and 40 coho)
Eldorado River 400 salmon/family (no more than 100 chum, and 40 coho)
Flambeau River 400 salmon/family (no more than 100 chum, and 40 coho)
Bonanza River 400 salmon/family (no more than 40 chum, and 40 coho)
Solomon River 300 salmon/family (no more than 20 chum, and 20 coho)
Safety Sound/Bonanza Channel 400 salmon/family (no more than 100 chum, and 40 coho)
Marine Waters 500 salmon/family (no more than 100 chum, and 40 coho)

Norton Sound District from Cape Douglas to Rocky Point (outside the Nome Subdistrict)

Marine Waters No catch limits
Fresh Waters 100 salmon /family (no more than 20 chum and 10 coho)

Golovin and Moses Point Subdistricts

Marine Waters & Fresh Waters - No catch limits

Port Clarence District

Marine Waters No catch limits
Pilgrim River 250 salmon/family (no more than 2 king, 200 red & 5 coho)
Salmon Lake Opened by emergency order only/50 salmon
Kuzitrin River 100 salmon/family (above the confluence of the Pilgrim River) – no more than 2 king.

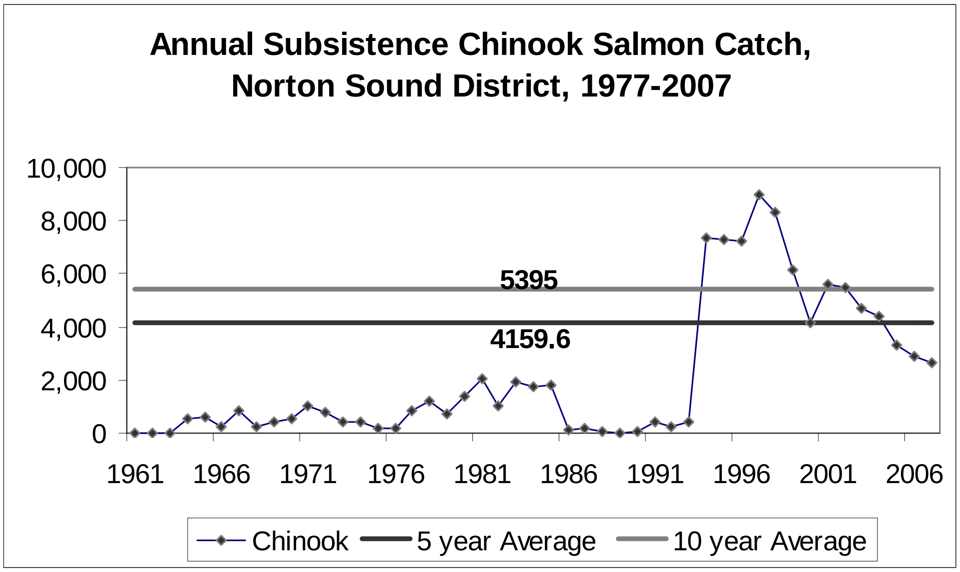
Note: The waters of the Nome Subdistrict are subject to weekly closures from June 15 to September 30. The Port Clarence District is outside the Nome Subdistrict boundary and, therefore, subsistence fishing can occur 7 days a week unless closed by Emergency Order.

Table 2-15 Subsistence salmon catch by species for all subdistricts in Norton Sound District, 1963–2007

Year	Notes	Chinook	Sockeye	Coho	Pink	Chum	Total
1963		5	-	118	16607	17635	34365
1964		565	-	2567	9225	12486	24843
1965		574	-	4812	19131	30772	55289
1966		269	-	2210	14335	21873	38687
1967		817	-	1222	17516	22724	42279
1968		237	-	2391	36912	11661	51201
1969		436	-	2191	18562	15615	36804
1970		561	-	4675	26127	22763	54126
1971		1,026	197	4097	10863	21618	37801
1972		804	93	2319	14158	13873	31247
1973		392	-	520	14770	7185	22867
1974		420	-	1064	16426	3958	21868
1975		186	11	192	15803	8113	24305
1976		203	-	1004	18048	7718	26973
1977		846	-	2,530	14,296	26,607	44,279
1978		1,211	-	2,981	35,281	12,257	51,730
1979		747	-	8,487	25,247	11,975	46,456
1980		1,397	-	8,625	63,778	19,622	93,422
1981		2,021	38	13,416	28,741	32,866	77,082
1982		1,011	8	14,612	54,249	18,580	88,460
1983	b	1,942	86	8,799	21,894	11,492	44,213
1984	b	1,733	17	8,470	34,600	8,231	53,051
1985	b	1,830	119	6,496	5,312	18,457	32,214
1986	b	150	107	688	8,720	8,085	17,750
1987	b	200	107	1,100	1,251	8,394	11,052
1988	b	63	133	1,076	2,159	5,952	9,383
1989	b	24	131	5,150	18,424	4,787	4,947
1990	b	58	234	510	2,233	4,246	7,281
1991	b	395	166	3,432	3,749	6,375	14,117
1992	b	252	163	2,762	13,503	2,944	19,624
1993	b	420	80	3,287	2,599	3,401	9,787
1994		7,375	1,162	22,124	71,065	25,020	126,746
1995		7,274	3,532	21,088	37,984	39,709	109,587
1996		7,245	1,013	25,816	62,432	32,540	129,046
1997		8,989	1,843	16,267	27,088	24,503	78,690
1998		8,295	1,214	19,007	51,933	20,032	100,480
1999		6,144	1,177	14,343	19,917	19,397	60,978
2000		4,148	681	17,064	38,308	17,283	77,484
2001		5,576	767	14,543	30,253	20,208	71,347
2002		5,469	763	15,086	64,353	17,817	103,488
2003		4,728	522	11,446	46,336	9,498	72,530
2004	b	4,420	458	10,904	71,015	3,598	90,395
2005	b	3,305	794	11,846	54,174	4,961	75,080
2006	b	2,876	572	17,242	56,579	5,992	83,261
2007		2,646	938	12,023	21,039	12,048	48,694
5 year avg.	c	4,159.6	621.8	13,304.8	58,491.4	8,373.2	84,950.8
10 year avg.	d	5,395.0	879.1	14,774.8	45,995.6	14,328.9	81,373.3

[a] Subsistence totals include data from Savoonga and Gamble.
[b] Not all subdistricts were surveyed.
[c] 2002-2006.
[d] 1997-2006.

Figure 2-27 Annual Subsistence Chinook Salmon Catch, Norton Sound District, 1977-2007



The decline in Norton Sound areas subsistence Chinook catch in recent years is shown in Figure 2-27. It is important to note that subsistence surveys were not collected in all subdistricts until 1994. In 1994, recorded subsistence catch increased dramatically, likely as a result of complete surveys. In the years since the 1997 peak subsistence Chinook catch has trended downward and is now well below both the 5 year and 10 year averages.

Within the Norton Sound area, the subdistricts that have been most affected by declining Chinook salmon runs have been the Shaktoolik and Unalakleet subdistricts. Table 2-16 provides historic Chinook salmon subsistence catch for these subdistricts. Figure 2-28 and Figure 2-29 provide graphical representations of the recent catch levels. In the Shaktoolik district, 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. Figure 2-29 depicts this drop and the fact that this level is well below the 5 and 10 year averages.

Table 2-16 Subsistence Chinook Salmon Catch, for the Shaktoolik and Unalakleet Subdistricts, 1964–2007

Year	Shaktoolik	Unalakleet
1964	77	488
1965	31	521
1966	142	90
1967	262	490
1968	10	186
1969	40	324
1970	43	495
1971	87	911
1972	64	643
1973	51	323
1974	93	313
1975	18	163
1976	24	142
1977	49	723
1978	81	1,044
1979	62	640
1980	57	1,046
1981	8	869
1982	68	913
1983	a	1,868
1984	a	1,650
1985	298	1,397
1986	a	a
1987	a	a
1988	a	a
1989	a	a
1990	a	2,476
1991	a	a
1992	a	a
1993	a	a
1994	1,175	5,294
1995	1,275	5,049
1996	1,114	5,324
1997	1,146	6,325
1998	982	5,915
1999	818	4,504
2000	440	2,887
2001	936	3,662
2002	1,230	3,044
2003	881	2,585
2004	943	2,801
2005	807	2,115
2006	382	2,155
2007	515	1,665
5 year avg.	**849**	**2,540**
10 year avg.	**857**	**3,599**

[a] Subsistence surveys were not conducted.

Figure 2-28 Shaktoolik Subsistence Chinook Salmon Catch, 1964-2007

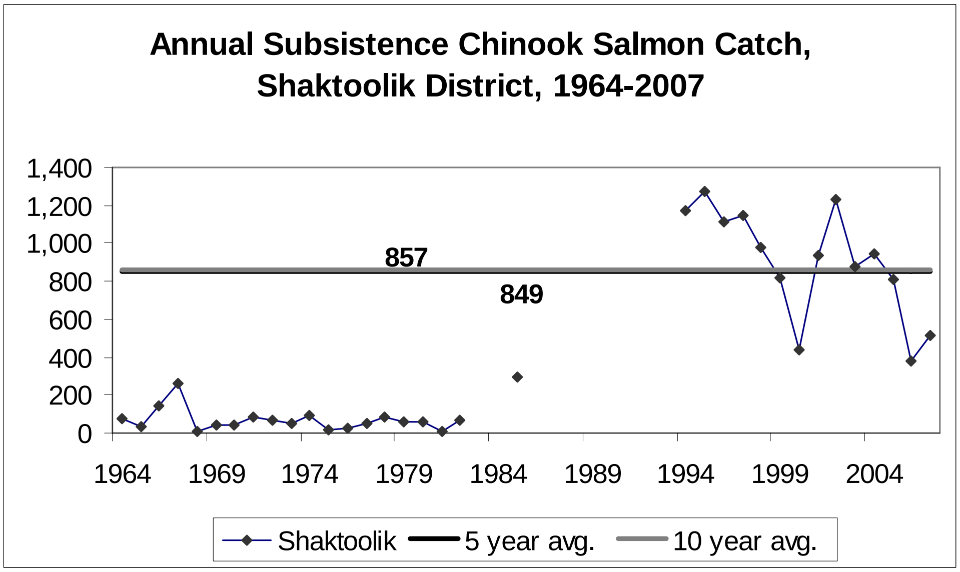
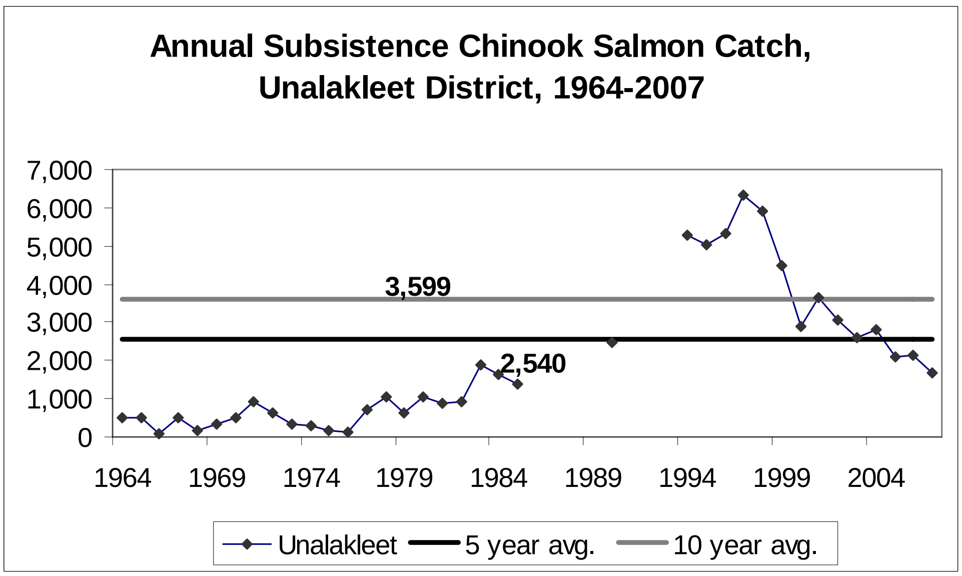


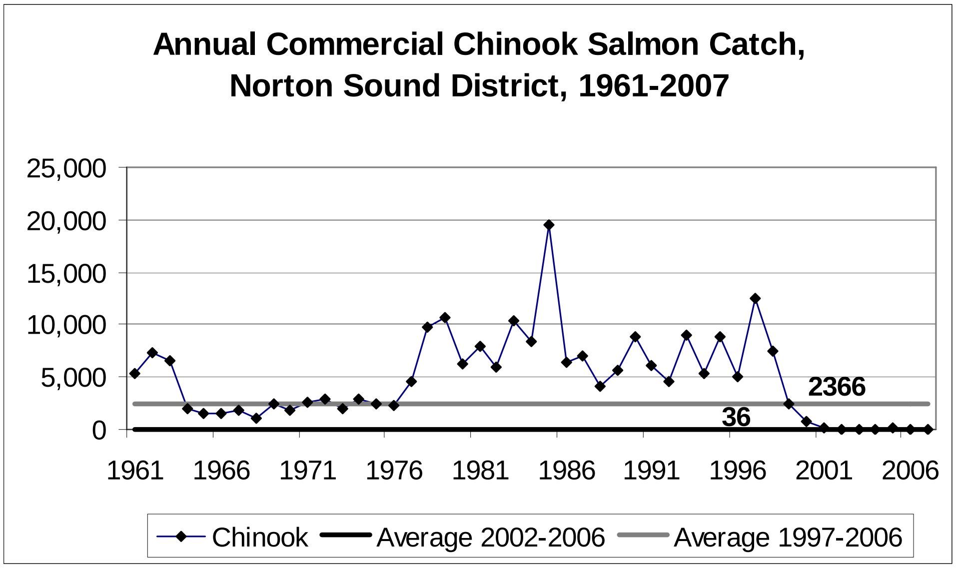
Figure 2-29 Unalakleet Subsistence Chinook Salmon Catch, 1964-2007.



Commercial Fishery Situation and Outlook

Table 2-17 provides historic Chinook salmon catches, by species, 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 Figure 2-30.

Figure 2-30 Norton Sound Commercial Chinook Salmon Catch, 1961-2007



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 the department expects 10,000 sockeye salmon to be harvested if there is sufficient fishing effort in the Port Clarence District.

Table 2-17 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: Norton Sound Annual Management Report, and Jim Menard, ADF&G.

Table 2-18 provides the value of commercial Chinook salmon harvest compared to total value of Norton Sound commercial salmon harvest from 1961 through 2004. The decline in catch, combined with declining salmon prices since the early 1980s, have depressed overall fishery value, from a peak of over $1 million in 1982, to a period low of just $2,941 in 2002. Over this time, Chinook value peaked in 1985 at $452,877, when it represented more then 55% of the overall value. Chinook value has fluctuated since the 1980s and rose to $225,136 in 1997 when it was nearly 62% 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 form from Chinook target fisheries and just $113 was earned from incidental catch in other salmon fisheries.

Table 2-18 Historical Value of Commercial Chinook Catch, Norton Sound, 1967-2007

Year	Chinook Value	Reported Total Value	Chinook Value % of Total
1967	$8,371	$44,038	19.01%
1968	$5,739	$63,700	9.01%
1969	$11,317	$95,297	11.88%
1970	$9,526	$99,019	9.62%
1971	$10,778	$101,000	10.67%
1972	$15,572	$102,225	15.23%
1973	$15,574	$308,740	5.04%
1974	$21,773	$437,127	4.98%
1975	$10,386	$413,255	2.51%
1976	$17,048	$285,283	5.98%
1977	$66,522	$546,010	12.18%
1978	$144,933	$907,330	15.97%
1979	$204,149	$878,792	23.23%
1980	$100,378	$572,125	17.54%
1981	$205,228	$761,658	26.94%
1982	$121,569	$1,069,723	11.36%
1983	$203,023	$946,232	21.46%
1984	$202,925	$738,064	27.49%
1985	$452,877	$818,477	55.33%
1986	$117,182	$546,452	21.44%
1987	$157,058	$517,894	30.33%
1988	$84,606	$760,641	11.12%
1989	$76,525	$319,489	23.95%
1990	$170,432	$474,064	35.95%
1991	$93,561	$413,479	22.63%
1992	$37,997	$448,395	8.47%
1993	$109,083	$322,117	33.86%
1994	$100,462	$863,060	11.64%
1995	$115,349	$356,164	32.39%
1996	$51,729	$340,347	15.20%
1997	$225,136	$363,908	61.87%
1998	$94,595	$358,982	26.35%
1999	$39,705	$76,860	51.66%
2000	$14,612	$149,907	9.75%
2001	$3,803	$56,921	6.68%
2002	$20	$2,941	0.66%
2003	$87	$64,473	0.14%
2004		$122,506	0.00%
2005	$3,063	$296,154	1.03%
2006	$249	$389,707	0.06%
2007	$113	$572,195	0.02%

Historic Chinook value, total value, and the percentage of Chinook value in total value is displayed in Figure 2-31. 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.

Figure 2-31 Norton Sound Commercial Chinook Value, Total Value, and Percent Chinook Value in Total Value, 1967-2007

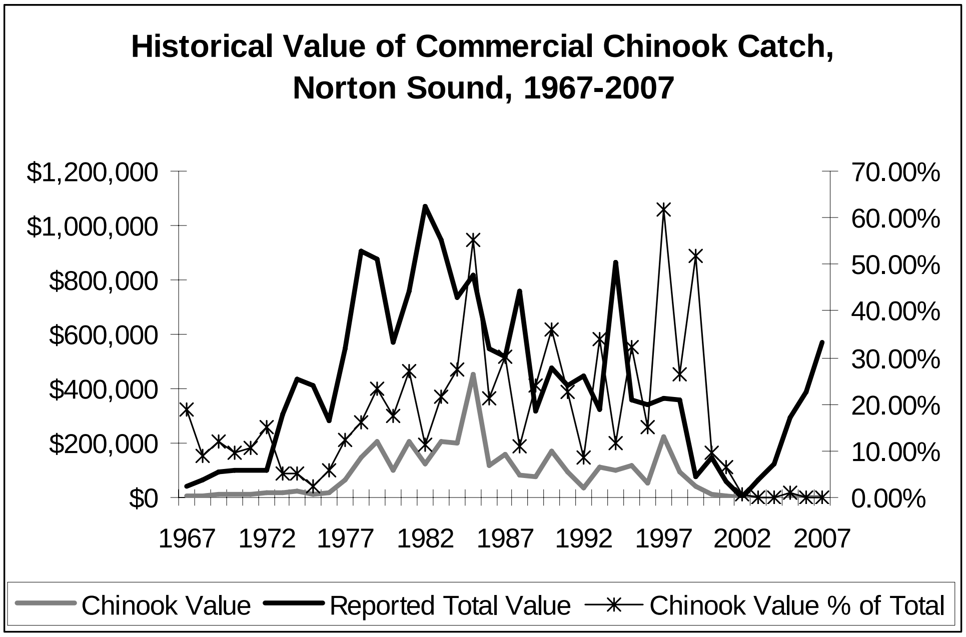


Table 2-19 shows that commercial fishery participation declined to 12 permit holders in 2002. Since 2002, the overall value of the fishery has improved due to strong coho returns, improving chum returns, and market improvements. As a result, participation increased to 71 permit holders by 2007. However, the commercial Chinook fishery remains closed.

Table 2-19 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**

[a] District total is the number of fishers that actually fished in Norton Sound; some fishers 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 8 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 Figure 2-32 and in Figure 2-33.

Table 2-20 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

Figure 2-32 Shaktoolik Commercial Chinook Salmon Catch, 1961-2007.

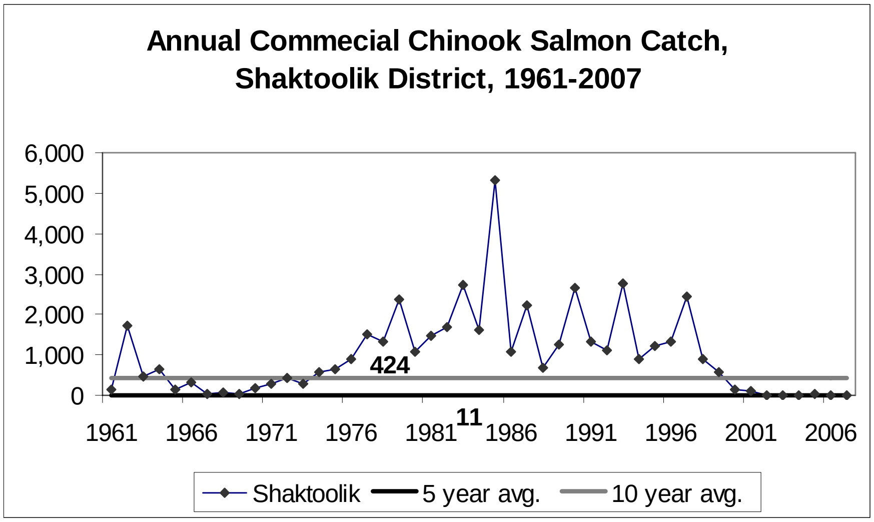
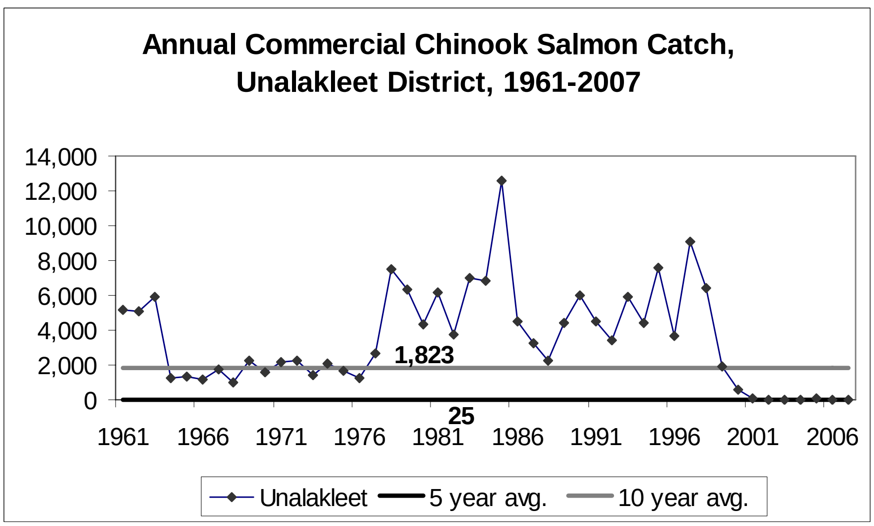


Figure 2-33 Unalakleet Commercial Chinook Salmon Catch, 1961-2007



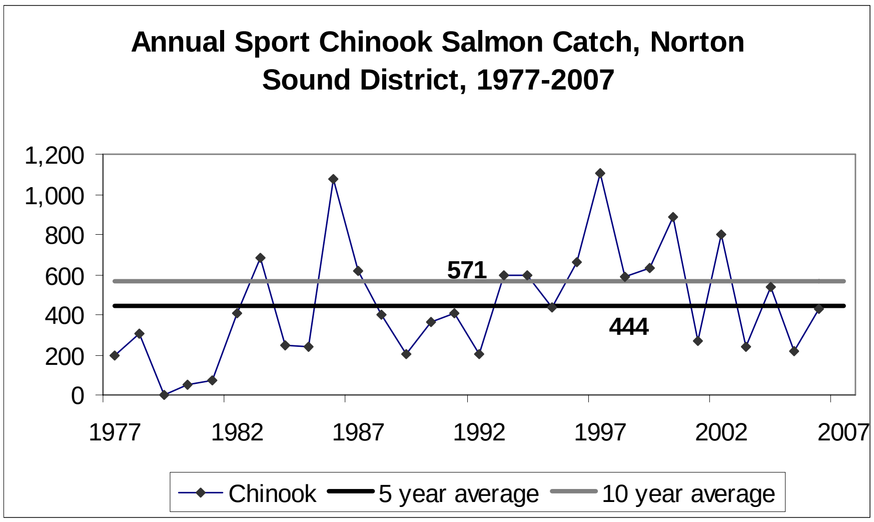
Recreational Fishery Situation and Outlook

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.

Figure 2-34 Norton Sound Region Sport Chinook Salmon Catch, 1977-2007.



Norton Sound region sport salmon catch, by species, from 1977 through 2006 are shown in Table 2-21. 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 (Figure 2-34). Overall; however, sport catch in 2006 was the second highest number on record largely due to a record coho catch.

Table 2-21 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**

2.2.3 Northern Region Community Dependence on Fisheries.

Table 2-22 reprints an Alaska Department of Labor and Workforce Development (Windish-Cole, 2008) analysis of local resident crew members by census areas with the region defined by ADOL 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. ADOL estimates that 168 of those licenses were used in local fisheries.

Table 2-22 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 Alaska Department of Labor.

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 2-23. Overall, in the Northern Region 263 permit holders were active in 2005 with 109 of these coming from the Nome Census area. ADOL estimates that 202 of those permits were used in local fisheries in 2006.

Table 2-23 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 Alaska Department of Labor
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.

ADOL 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 2-24. 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 2-24 Fish Harvesting Employment and Gross Earnings by Gear Type, 2000-2005, Northern Region.

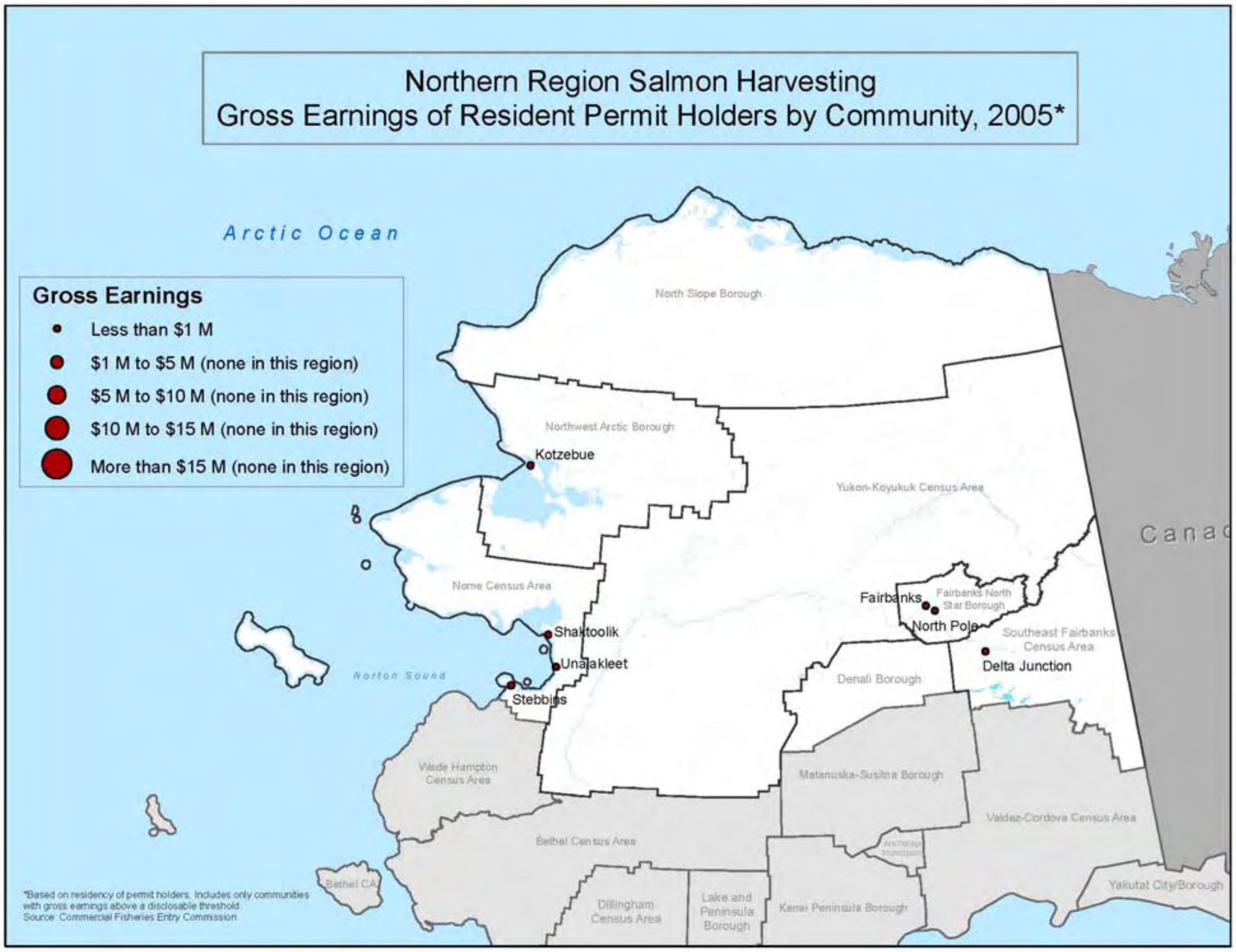
Year	Gear Type	Vessels[1]	Total Estimated Workforce[2]	Total Gross Earning of Permit Holders[3]	Percent of Gross Earnings Earned by Nonresident Permit Holders
2000	Gillnet	87	218	$696,579	32
2001	Gillnet	65	163	$323,491	27.5
2002	Gillnet	32	80	$128,430	ND
2003	Gillnet	26	65	$148,152	ND
2000	Pot Gear	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 Alaska Department of Labor.

Figure 2-35 depicts Northern Region resident permit holder salmon fishery gross earnings by community, as tabulated by ADOL. None of the communities in the region have gross earnings of resident permit holders that exceed $1 million from the salmon fisheries.

Figure 2-35 Northern Region Salmon Harvesting, Gross Earnings of Resident Permit Holders by Community, 2005.



Northern Region Fish harvesting employment by species and month, also tabulated by ADOL, are shown in Table 2-25. 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 2-25 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. 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

Figure 2-36 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.

Figure 2-36 Northern Region Canneries and Land Based Seafood Processors.

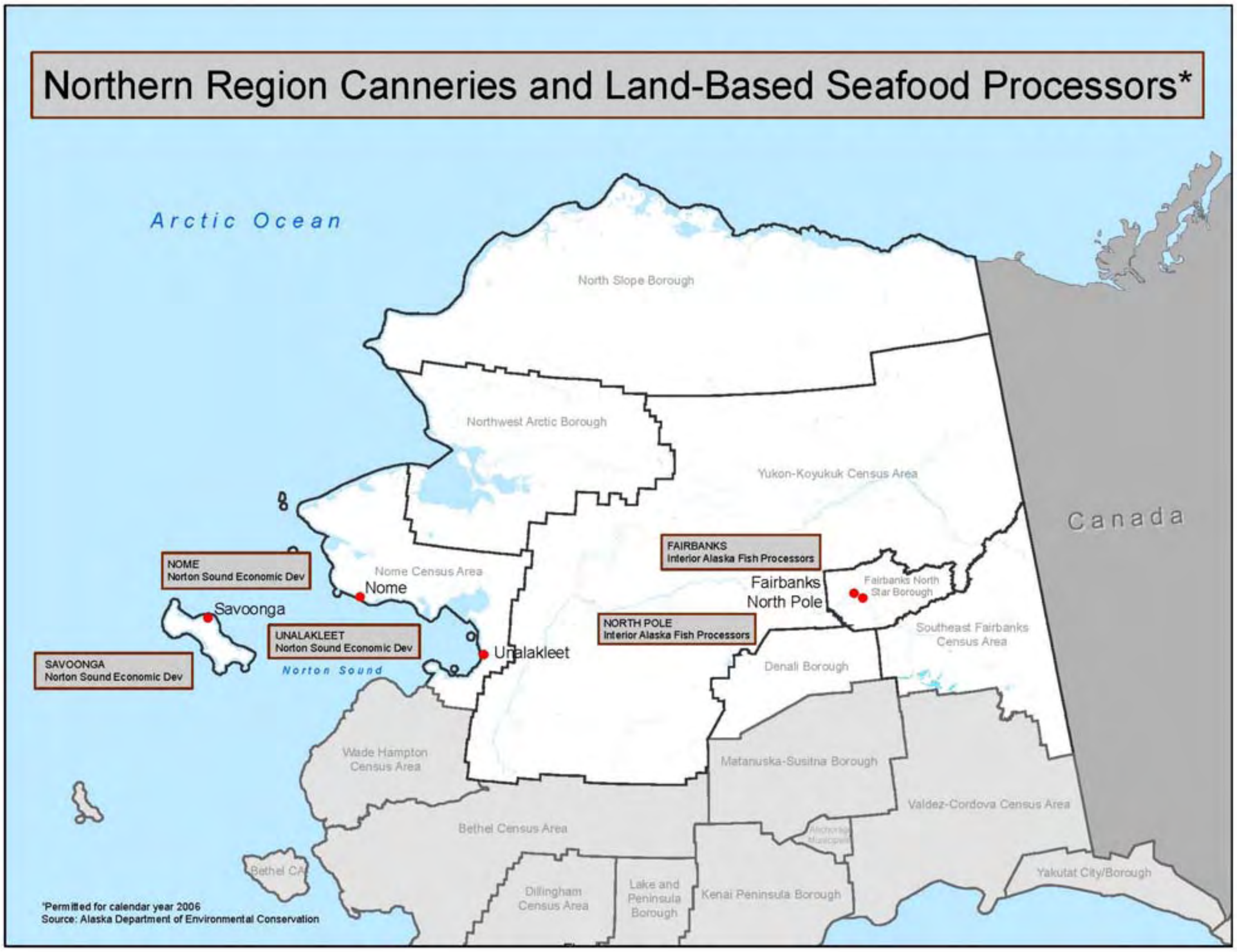


Table 2-26 provides estimated seafood processing employment and percent of non-resident workers and percent of non-resident earnings in the Northern Region. The total worker count in the Northern Region seafood processing sector declined continuously from 2000 to 2004. In 2000, the area's fisheries supported 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 complied at present. Non-resident workers have made up a relatively small proportion of about 20% 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 for non-resident workers.

Table 2-26 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: Alaska Department of Labor and Workforce Development, Research and Analysis Section and CFEC

2.2.4 Kuskokwim River, Kuskokwim Bay

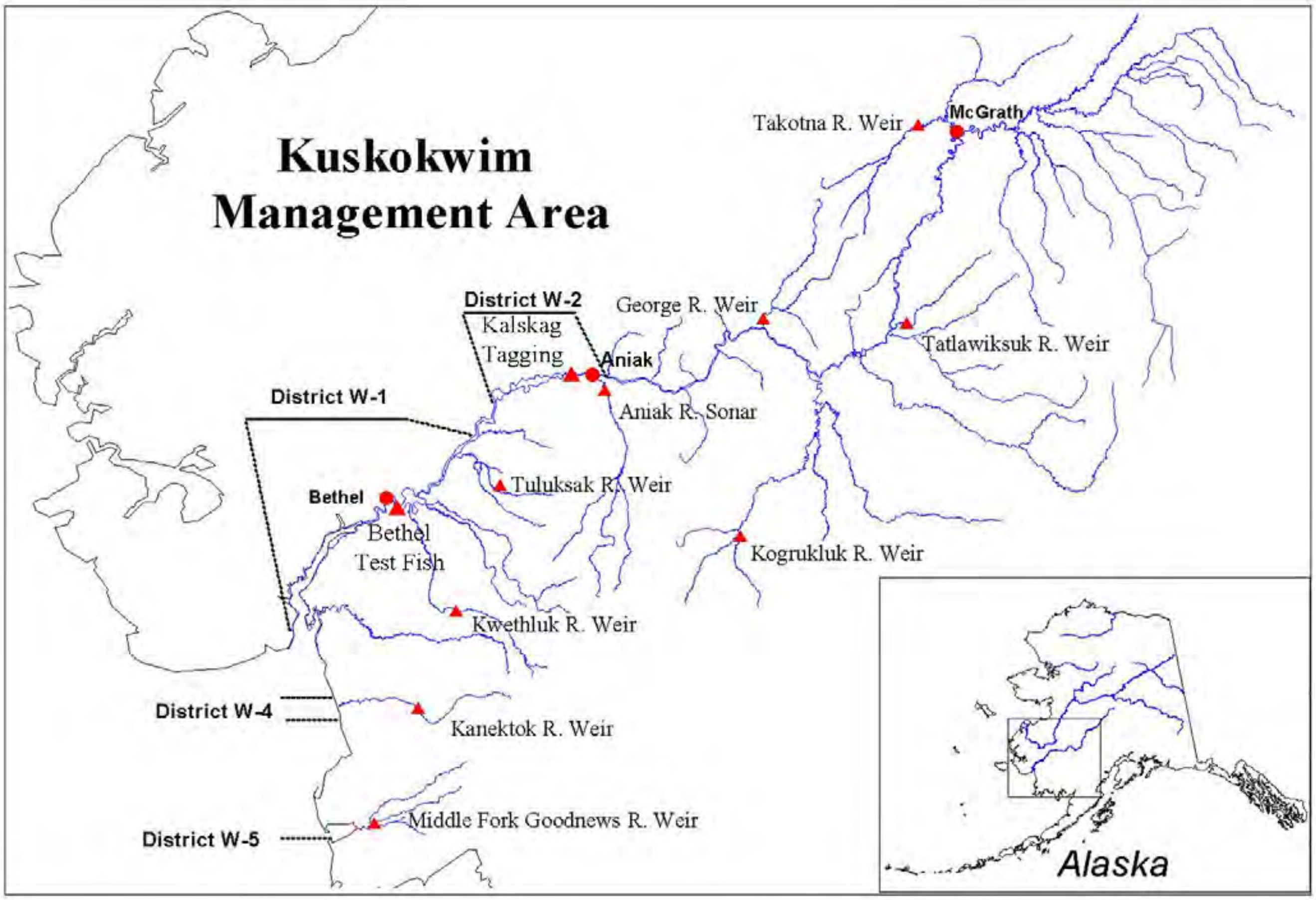
The Kuskokwim Area includes the Kuskokwim River drainage, all waters of Alaska that flow into the Bering Sea between Cape Newenham and the Naskonat Peninsula, and Nunivak and St. Matthew Islands (Figure 2-37). The 2007 Kuskokwim River salmon fisheries were managed according to the Kuskokwim River Salmon 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 is 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 Alaska Board of Fisheries 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 fishers, 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 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 fishers 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 unselfish participation by area fishers 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 is expected to have been achieved throughout the area.

Figure 2-37 Kuskokwim Management Area and Salmon Run Assessment Projects



Status of Runs and Conservation Concerns

The Alaska Board of Fisheries (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. The Kuskokwim Area has no formal forecast for salmon returns, but broad expectations are developed based on parent-year escapements and recent year trends.

Subsistence Fishery Situation and Outlook

There are 38 communities consisting of approximately 4,500 households within the Kuskokwim Area. Approximately 75% of the approximately 4,500 households in the region are situated within the drainage of the Kuskokwim River (ADF&G, Division of Subsistence 2003). Bethel is the largest community in the region, containing approximately 1,500 households. Much of the salmon fishing effort occurs within the mainstem of the Kuskokwim River; however, fishing also occurs in many of the tributaries that contain salmon. Residents of Quinhagak, Goodnews Bay, and Platinum, located along the south shore of Kuskokwim Bay, harvest salmon stocks primarily from the Kanektok, Arolik, and Goodnews River systems. Residents of Kipnuk, Kwigillingok and Kongiganak, located on the north Kuskokwim Bay harvest salmon from within the Kuskokwim River drainage and from local drainages that drain into Kuskokwim Bay. Residents of Toksook Bay, Nightmute, Tununak, Newtok, Chefornak and Mekoryuk, situated near the Bering Sea Coast, harvest salmon from coastal waters as well as local tributaries.

The Alaska National Interest Lands Conservation Act (ANILCA) of 1980 mandates that rural subsistence users have a priority over other users to take fish and wildlife on Federal public lands and waters and required the creation of Regional Advisory Councils to enable rural residents to have a meaningful role in Federal Subsistence Management. On October 1, 1999, the Secretaries of Interior and Agriculture published regulations to expand Federal Management of subsistence fisheries to Alaskan rivers and lakes and limited marine waters within and adjacent to Federal public lands. The Secretary of Interior and the Secretary of Agriculture delegated their authority in Alaska to the Federal Subsistence Board to manage fish and wildlife resources for subsistence uses on Federal public land, including waters running through or next to these lands. Federal subsistence fishing regulations are adopted by the Federal Subsistence Board (FSB). The Regional Advisory Councils provide recommendations and information to the FSB, review policies and management plans, provide a public forum and deal with other matters relating to subsistence uses. The FSB may close fishing for other uses in these waters to a priority for Federally qualified rural subsistence users if it is determined that there are subsistence or conservation concerns.

Federal subsistence fishing schedules, openings, closings, and fishing methods are established in regulations (DOI 2005). In general, the regulations are the same as those issued for the subsistence taking of fish under Alaska Administrative Code. However, differences in regulations do exist in some cases, primarily when a Federal Special Action supersedes State regulations.

Kuskokwim River:

The subsistence-fishing schedule was not implemented in 2007 given anticipated above average runs of Chinook and chum salmon and recent action by the Board of Fisheries (BOF) that discontinued the stock of concern designations for Kuskokwim River Chinook and chum salmon. Subsistence fishing in the Kuskokwim River was allowed 7 days a week throughout the season with the exception of closed periods 6 hours before, during, and 3 hours after commercial fishing periods. Subsistence harvest was described as poor to normal for Chinook and sockeye salmon and normal to very good for chum salmon. The “poor” descriptions for Chinook and sockeye salmon are likely the result of late run timing for these species and the extremely low and clear water conditions that persisted through the majority of June.

Many subsistence fishers described difficulties in harvesting fish with drift and set gillnets attributed to fish avoidance in clear water and fish running deeper in the water column because of the extreme low water conditions. Although subsistence fishing was described as difficult at times, amounts necessary for subsistence use is expected to have been achieved because of adequate run abundance and improving fishing conditions in late June and into July.

In 2007, the BOF also adopted a proposal to daily bag and possession limits in the Aniak River hook and line subsistence fishery upstream of Doestock Creek by aligning subsistence hook and line bag and possession limits with sport fishing bag and possession limits. The BOF action exempts subsistence hook and line fishers from the sport fishing annual possession and length limits on Chinook salmon.

Subsistence fishing in the Quinhagak and Goodnews Bay areas was allowed 7 days per week throughout the season with the exception of closed periods 16 hours before, during, and 6 hours after commercial fishing periods. Subsistence harvests were characterized as adequate and amounts necessary for subsistence use is expected to have been achieved.

Kuskokwim Bay: District 4 (Quinhagak) and District 5 (Goodnews Bay)

Subsistence fishing in the Quinhagak and Goodnews Bay areas was allowed 7 days per week throughout the season with the exception of closed periods 16 hours before, during, and 6 hours after commercial fishing periods. Subsistence harvests were characterized as adequate and amounts necessary for subsistence use is expected to have been achieved.

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.

Table 2-27 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		503		
2002-2006 avg.	**2,018**	**69,646**	**470**	**644**	**72,778**
1997-2006 avg.	**4,313**	**72,277**	**314**	**653**	**77,557**

[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.

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.

A total of 366 individual permit holders recorded landings in District 1 during the 2007 season (Table 2). This level of fishing effort was 19% below the recent 10-year average of 452 fishers. District 1 commercial harvest in 2007 was 179 Chinook, 703 sockeye, 141,049 coho, and 10,763 chum salmon from 12 periods (Table 1). Chinook, sockeye, and chum salmon harvests were below the recent 10-year averages as harvest of these species occurred well after the bulk of their respective runs had passed through the district. Coho salmon harvest was below average compared to historical harvests and was approximately 28% below the recent 10-year average. Total ex-vessel value of the fishery was $380,842, 44% below the recent 10-year average value.

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 fishers 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 Preliminary 2007 Kuskokwim Area Salmon Fishery Summary September 26, 2007 Alaska Department of Fish and Game 4 Division of Commercial Fisheries 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 (Table 2). This level of fishing effort was 27% below the recent 10-year average of 172 fishers.

A total of 125 individual permit holders recorded landings in District 4 during the 2007 season. This level of fishing effort was 27% below the recent 10-year average of 172 fishers. 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% above the recent 10-year average. Chum salmon harvest was above average over all years and was 50% 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% below the recent 10-year average. The total ex-vessel value of the District 4 fishery was $660,865, approximately 40% 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% below the recent 10-year average of 40 fishers. 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 1). Chinook, sockeye, and coho salmon harvest was approximately 25%, 42% and 16% above the recent 10-year average respectively, and chum salmon harvest was approximately 4% 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% above the recent 10-year average value.

Recreational 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 fishers 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.

2.2.5 Yukon River

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. The Alaska Department of Fish and Game 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 (YRJTC, 2008) (This section is 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 (Figure 2-38). The Alaska Department of Fish and Game (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 fishers 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 Yukon River Drainage Fisheries Association (YRDFA), State of Alaska Advisory Committees, Federal Regional Advisory Councils, and other interested and affected Parties.

Figure 2-38 Yukon River Fisheries Management Areas.

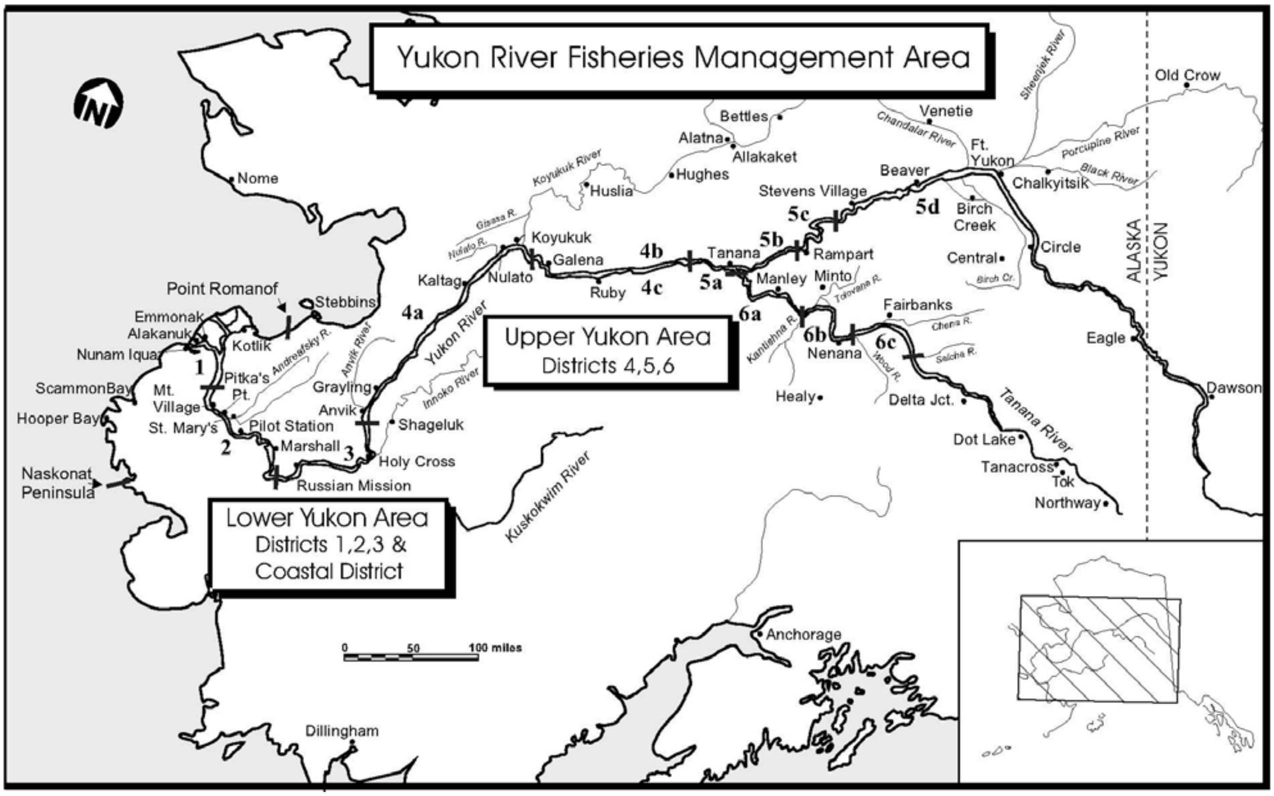


Table 2-28 and Table 2-29 provide historic Alaska Yukon and Canadian Yukon Catch statistics for all catch sectors. These data will be discussed in more detail in the discussion and graphics in the sections on subsistence, commercial and recreational fisheries that appear below.

Table 2-28 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

[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 department 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 2-29 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

[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.

Subsistence Fishery Situation and Outlook

Subsistence fishing occurs throughout most of the Yukon River Area and has the highest priority among all uses of the resource in the State of Alaska. When salmon stocks are abundant and commercial fishing will occur, it is necessary to place some restrictions on the subsistence fishery in order to enforce commercial fishing regulations. For example, subsistence salmon fishing is closed in most areas 24 hours prior to the commercial salmon fishing season to discourage the illegal sale of subsistence caught salmon or salmon roe. However, substantially more fishing time is allowed throughout the fishing season for subsistence than for commercial activities.

Since 2001, the subsistence salmon fishery has been based on a schedule implemented chronologically by ADF&G consistent with migratory timing as the run progresses upstream. The subsistence salmon fishing schedule is based on current or past fishing schedules and provides reasonable opportunity for subsistence during years of normal to below average runs. The objectives of the schedule are to (1) reduce harvest early in the run when there is a higher level of uncertainty, (2) spread the harvest throughout the run to reduce harvest impacts on any particular component of the run and (3) provide subsistence fishing opportunity among all users during years of low salmon runs. Table 6 shows the 2007 subsistence fishing schedule based in regulation 5AAC 01.210 and 5AAC 05.360. Depending on run strength, the schedule is subject to change.

Table 2-30 Yukon Area subsistence salmon fishing schedule, 2008.

Note: this schedule is subject to change depending on run strength.

Area	Regulatory subsistence salmon fishing periods	Schedule to begin	Days of the week
Coastal District	7 days/week	by regulation	M/T/W/TH/F/SA/SU – 24 hours
District 1	Two 36-hour periods/week	May 26, 2007	Mon. 8 pm to Wed. 8 am /Thu. 8 pm to Sat. 8 am
District 2	Two 36-hour periods/week	May 28, 2007	Wed. 8 pm to Fri. 8 am / Sun. 8 pm to Tue. 8 am
District 3	Two 36-hour periods/week	May 30, 2007	Fri. 8 am to Sat. 8 pm / Tue. 8 am to Wed. 8 pm
District 4	Two 48-hour periods/week	June 8, 2007	Sun. 6 pm to Tue. 6 pm / Wed. 6 pm to Fri. 6 pm
Koyukuk River	7 days/week	By Regulation	M/T/W/TH/F/SA/SU – 24 hours
Subdistricts 5-A, B, C	Two 48-hour periods/week	June 17, 2007	Tue. 6 pm to Thu. 6 pm /Fri. 6 pm to Sun. 6 pm
Subdistrict 5-D	7 days/week	By Regulation	M/T/W/TH/F/SA/SU – 24 hours
District 6	Two 42-hour periods/week	By Regulation	Mon. 6 pm to Wed. Noon /Fri. 6 pm to Sun. Noon
Old Minto Area	5 days/week	By Regulation	Friday 6pm to Wednesday 6pm

Source: ADF&G 2008 Yukon River Salmon Fisheries Outlook Information sheet.

Once it has been determined there is a harvestable surplus of salmon in excess of subsistence uses, the subsistence fishing schedule may revert to the schedule specified in 5AAC 01.210, (c-h) FISHING SEASONS AND PERIODS.

During closed subsistence salmon fishing periods, subsistence fishing for whitefish, suckers, and other non-salmon species will be allowed throughout the drainage. Gillnets with greater than 4 inch mesh must be removed from the water and fish wheels may not be operated during closed subsistence salmon fishing periods in an effort to avoid salmon species. In addition, gillnets used to take species other than salmon during subsistence salmon closures are limited to 60 feet in length. This opportunity to target non-salmon species, while protecting salmon stocks of concern, may be discontinued if found ineffective at adequately reducing salmon harvest.

The summer and fall chum salmon management plans adopted by the BOF provide guidelines for managing subsistence salmon fisheries based on inseason run size projections. If subsistence harvest reductions are necessary, efforts will be made to spread the burden of conservation throughout the drainage. Potential harvest reduction measures include gear restrictions, reductions in fishing time, or extended periods of closed fishing. Conservation of salmon may require fish wheels to be equipped with a live box or live chute.

Subsistence fishing permits are required for Subdistricts 6-A and 6-B and upper Tanana River in the Tanana River drainage, portions of District 5 in the upper Yukon River drainage near the Haul Road Bridge, and from above the community of Fort Yukon to the U.S./Canada border. ADF&G requires fishermen to keep track of their subsistence salmon harvests on their permit in permit areas. Subsistence fishers in permit areas are reminded that they must have their permit in possession while fishing. In non-permit areas, ADF&G conducts a postseason harvest survey and encourages fishermen to use catch calendars to keep track of their harvest. Non-permitted fishermen who did not receive a subsistence salmon calendar by mail may obtain one by contacting ADF&G in Emmonak or Fairbanks. ADF&G has prepaid postage for the calendar in an effort to encourage fishermen to use and return catch calendars. Additionally, a lottery awarding six $100 cash prizes will be conducted following the season for which all households that have returned properly filled out calendars will be entered.

Districts 1, 2, and 3

The subsistence salmon fishing schedule in Districts 1, 2, and 3 will begin with two, 36-hour periods per week. During the Chinook and summer chum salmon commercial fishing season, subsistence salmon fishing will be closed 18 hours before, during, and 12 hours following a commercial salmon fishing period. During the fall season, subsistence salmon fishing will be closed 12 hours before, during, and 12 hours following each District 1, 2, or 3 commercial salmon fishing period. If commercial fishing periods become frequent in the fall, the amount of subsistence fishing closure time may be reduced to 6 hours before, during and 6 hours after each commercial fishing period to offset lost subsistence fishing opportunity. Also during the commercial season, the two lobes of the caudal fin (both tips of the tail) are required to be removed from subsistence caught Chinook salmon.

District 4

The subsistence salmon fishing schedule in District 4 is two, 48-hour periods per week. Regulations separate subsistence fishing periods from commercial fishing periods in Subdistrict 4-A. By regulation, during the commercial salmon fishing season, subsistence salmon fishing with set nets and fish wheels will be closed 12 hours before, during, and 12 hours following each Subdistrict 4-A commercial salmon fishing period. Also by regulation, subsistence fishing for Chinook salmon with drift gillnets will be allowed for two 48-hour periods each week by emergency order during the commercial fishing season. However, if a small commercial fishery with little effort occurs in Subdistrict 4-A, subsistence fishing may be allowed 5 days per week and uninterrupted by commercial periods.

If the commercial salmon fishing season is opened in Subdistricts 4-B and 4-C, managers will attempt to coincide allowable commercial salmon fishing periods with the traditional subsistence salmon fishing schedule of two 48-hour periods per week. If subsistence salmon fishing opportunities in District 4 are not sufficient to meet needs due to the commercial fishing schedule, additional subsistence-only fishing time will be allowed. When ADF&G announces a commercial fishing closure that will last longer than 5 days in duration during the commercial salmon season in District 4, subsistence salmon fishing will be allowed 5 days per week, unless modified by emergency order.

From November 1 through June 31, waters open for subsistence fishing in the Koyukuk River drainage are expanded to include the Middle Fork of the Koyukuk River upstream of its confluence with the North Fork, and the South Fork of the Koyukuk River upstream from the mouth of the Jim River. A household subsistence fishing permit is required as a condition of this increased fishing opportunity to harvest non-salmon species. Only gillnet gear is allowed and the mesh size may not exceed 3½ inches. This was done in an effort to protect salmon species in known spawning area with road access.

District 5

The Subdistricts 5-A, 5-B, and 5-C subsistence fishing schedule is two, 48-hour fishing periods per week. Attempts will be made to coincide the subsistence salmon fishing schedule with commercial periods. Additionally, "subsistence only" salmon fishing periods may also be scheduled. When ADF&G announces a commercial fishing closure that will last longer than 5 days in duration during the commercial salmon season in Subdistricts 5-A, 5-B, and 5-C, subsistence salmon fishing will be allowed 5 days per week, unless modified by emergency order. In Subdistrict 5-D, subsistence salmon fishermen may harvest salmon 7 days per week throughout the season unless restricted by emergency order.

Subsistence fishing permits are required on the Yukon River from the western tip of Garnet Island to the Dall River including the community of Rampart and the Haul Road bridge area. Permits are also required for portions of the Yukon River near the communities of Circle and Eagle from Twenty-two Mile Slough to the U.S./Canada border. Subsistence fishermen must obtain a permit prior to subsistence fishing which can be done by contacting ADF&G's office in Fairbanks. Permits can be issued in person, by mail, and more recently by email. All permit holders are required to report harvest information on their permits and return their permits to ADF&G at the end of the fishing season.

District 6

Within the majority of Subdistricts 6-A and 6-B, the subsistence salmon fishing schedule is two, 42-hour periods per week from 6:00 p.m. Monday until 12 noon Wednesday and from 6:00 p.m. Friday until 12 noon Sunday. Exceptions are within the Old Minto Area where subsistence salmon fishing is allowed 5 days a week from 6:00 p.m. Friday until 6:00 p.m. Wednesday and within the Kantishna River, which is open 7 days per week.

Regulations require subsistence salmon permits in District 6, the Tanana River drainage, except for Subdistrict 6-C, which is managed under personal use regulations (see Section 3.3). Subsistence salmon fishermen can obtain a permit by contacting the ADF&G office in Fairbanks. Subsistence permit holders in that portion of Subdistrict 6-B, from a point 3 miles upstream of the mouth of Totchaket Slough to the upper boundary of Subdistrict 6-B, are required to report to ADF&G the number of salmon harvested each week. Permit holders can report their weekly catch on a message recording at (907) 459-7388. All Tanana River subsistence permit holders are required to record their harvest information on their permit and return expired permits to ADF&G's office in Fairbanks at the end of the fishing season.

Table 2-31 provides historic subsistence Chinook catch numbers in the lower Yukon River, by district. As shown in Table 2-31 there was an increasing trend in overall Lower Yukon 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 catche 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

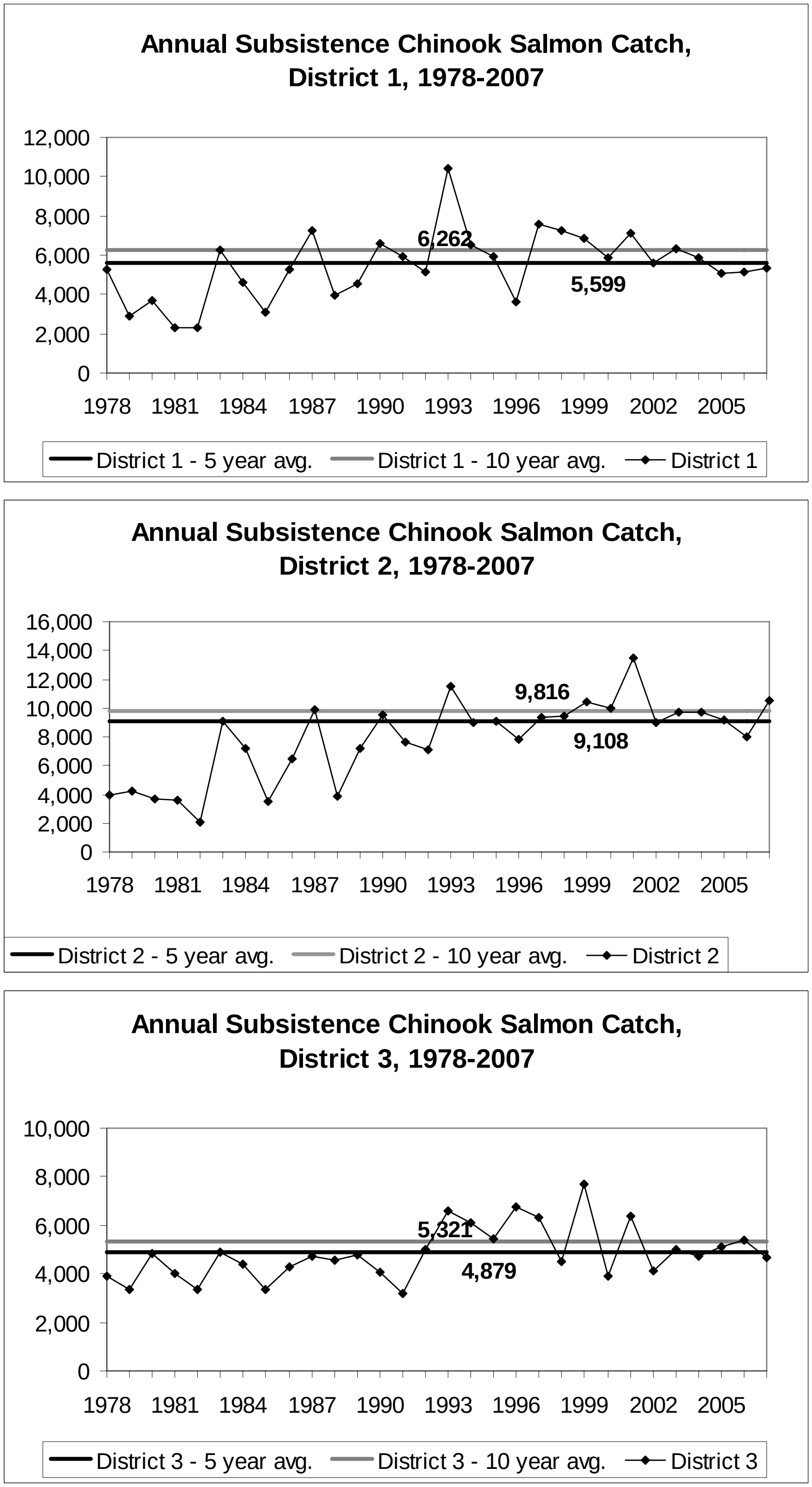
10 year averages; however, the 2007 district 2 subsistence Chinook catch of 10,496 was the greatest since 2001 and well above both the 5 and 10 year averages. These data are depicted graphically in Figure 2-39.

Table 2-31 Subsistence Chinook Salmon Catch, by year, Lower Yukon Districts, 1961-2007

Year	District 1	District 2	District 3	Lower Yukon Total
1978	5,246	3,964	3,902	13,112
1979	2,879	4,268	3,325	10,472
1980	3,669	3,674	4,818	12,161
1981	2,282	3,580	4,011	9,873
1982	2,311	2,109	3,359	7,779
1983	6,263	9,065	4,910	20,238
1984	4,624	7,172	4,394	16,190
1985	3,071	3,468	3,342	9,881
1986	5,275	6,483	4,305	16,063
1987	7,278	9,866	4,708	21,852
1988	3,938	3,823	4,547	12,308
1989	4,565	7,147	4,778	16,490
1990	6,619	9,546	4,093	20,258
1991	5,925	7,617	3,187	16,729
1992	5,141	7,074	4,991	17,206
1993	10,408	11,513	6,592	28,513
1994	6,540	8,956	6,124	21,620
1995	5,960	9,037	5,419	20,416
1996	3,646	7,780	6,783	18,209
1997	7,550	9,350	6,311	23,211
1998	7,242	9,455	4,514	21,211
1999	6,848	10,439	7,715	25,002
2000	5,891	9,935	3,914	19,740
2001	7,089	13,442	6,361	26,892
2002	5,603	8,954	4,139	18,696
2003	6,332	9,668	5,002	21,002
2004	5,880	9,724	4,748	20,352
2005	5,058	9,156	5,131	19,345
2006	5,122	8,039	5,374	18,535
2007*	5,367	10,496	4,651	20,514
5 year avg.	**5,599**	**9,108**	**4,879**	**19,586**
10 year avg.	**6,262**	**9,816**	**5,321**	**21,399**

Source: ADF&G

Figure 2-39 Lower Yukon Annual Subsistence Chinook Catch by District, 1978-2007.



Source: AFG&G.

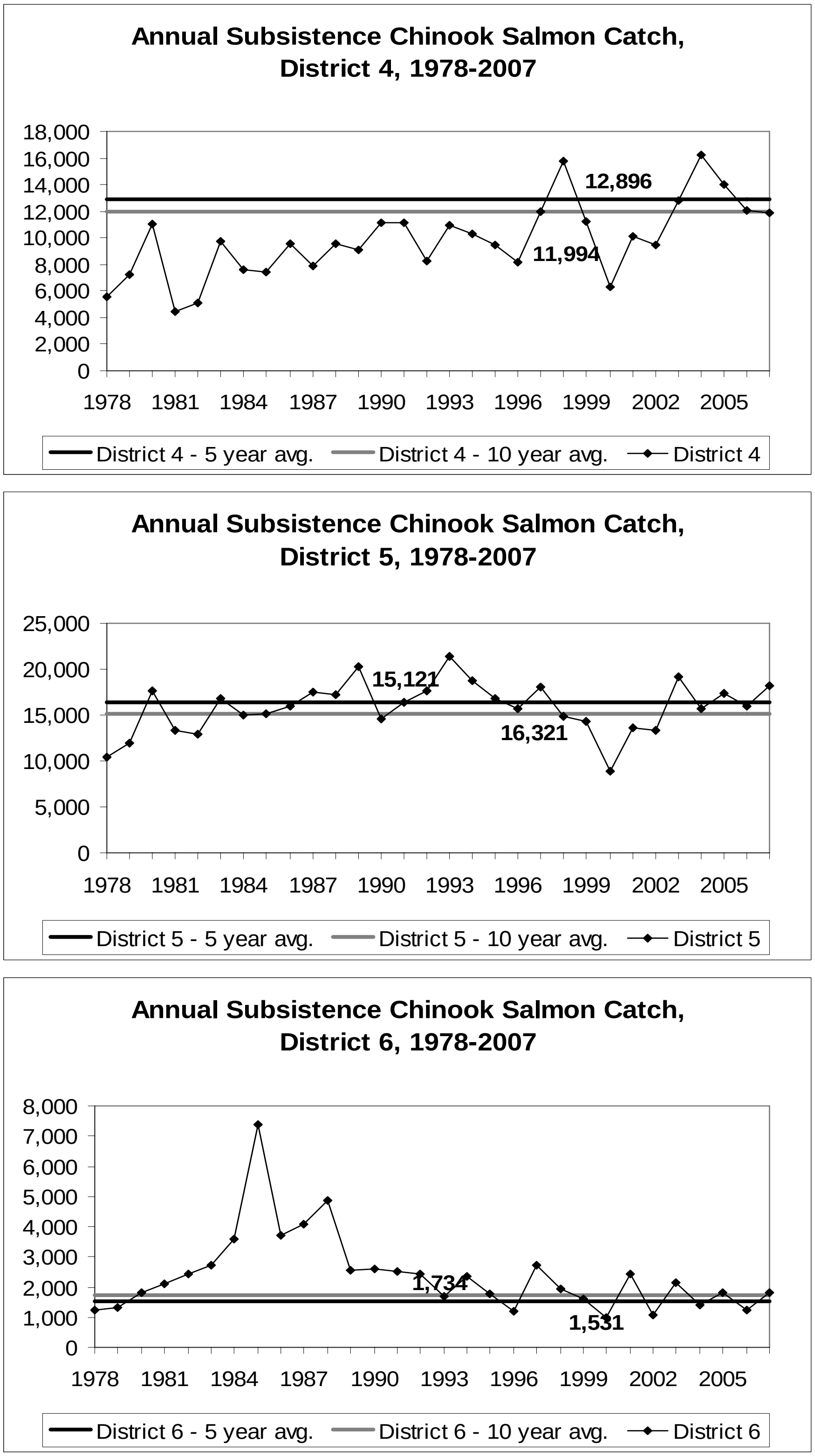
Table 2-32 provides historic subsistence Chinook catch numbers in the Upper Yukon River, by district. As shown (Figure 2-40), total Upper Yukon subsistence Chinook catches have been at historically high levels during the early to mid 2000s, and above averages in 2007. District 4 2007 catches were below the 5 years average and close to the 10 year average, while Districts 5 and 6 had catches greater than both averages in 2007. Total subsistence catch trends for the Lower and Upper Yukon as well as the Combined total for the entire Alaska Yukon are shown in Figure 2-41 below.

Figure 2-42 displays annual subsistence 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 2-29 at the beginning of this section. Canadian Yukon aboriginal subsistence harvest has historically been much lower than the subsistence Chinook harvests in the U.S. portion of the Yukon River. Peak Mainstem Candian Yukon aboriginal subsistence harvests occurred in the 1980s and 1990s; however, a cyclical pattern shows wide swings in catch above and below the five and ten year averages. Similar to other areas of the Yukon, 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.

Table 2-32 Subsistence Chinook Salmon Catch, by year, Upper Yukon Districts, 1961-2007

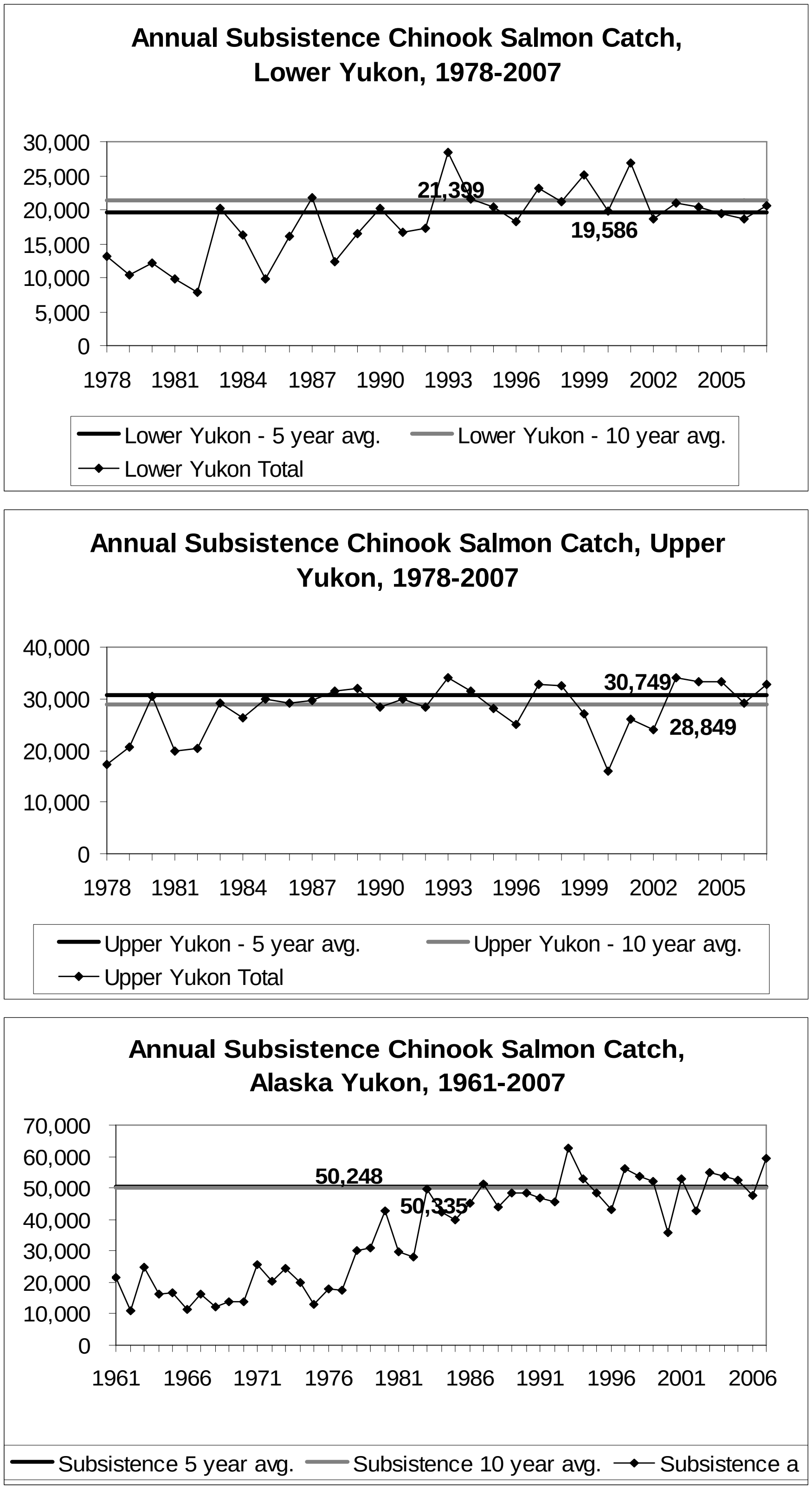
Year	District 4	District 5	District 6	Upper Yukon Total
1978	5,549	10,405	1,231	17,185
1979	7,203	11,997	1,333	20,533
1980	11,053	17,684	1,826	30,563
1981	4,432	13,300	2,085	19,817
1982	5,077	12,859	2,443	20,379
1983	9,754	16,780	2,706	29,240
1984	7,650	14,989	3,599	26,238
1985	7,425	15,090	7,375	29,890
1986	9,530	15,944	3,701	29,175
1987	7,914	17,556	4,096	29,566
1988	9,515	17,200	4,884	31,599
1989	9,074	20,336	2,546	31,956
1990	11,122	14,589	2,618	28,329
1991	11,100	16,429	2,515	30,044
1992	8,291	17,691	2,438	28,420
1993	10,936	21,365	1,672	33,973
1994	10,327	18,760	2,370	31,457
1995	9,474	16,866	1,779	28,119
1996	8,193	15,727	1,177	25,097
1997	12,006	18,049	2,712	32,767
1998	15,801	14,802	1,919	32,522
1999	11,238	14,330	1,624	27,192
2000	6,264	8,854	983	16,101
2001	10,152	13,566	2,449	26,167
2002	9,456	13,401	1,067	23,924
2003	12,771	19,191	2,145	34,107
2004	16,269	15,666	1,388	33,323
2005	13,964	17,424	1,828	33,216
2006	12,022	15,924	1,229	29,175
2007*	11,831	18,145	1,835	32,813
5 year avg.	12,896	16,321	1,531	30,749
10 year avg.	11,994	15,121	1,734	28,849

Figure 2-40 Upper Yukon Annual Subsistence Chinook Catch by District, 1978-2007.



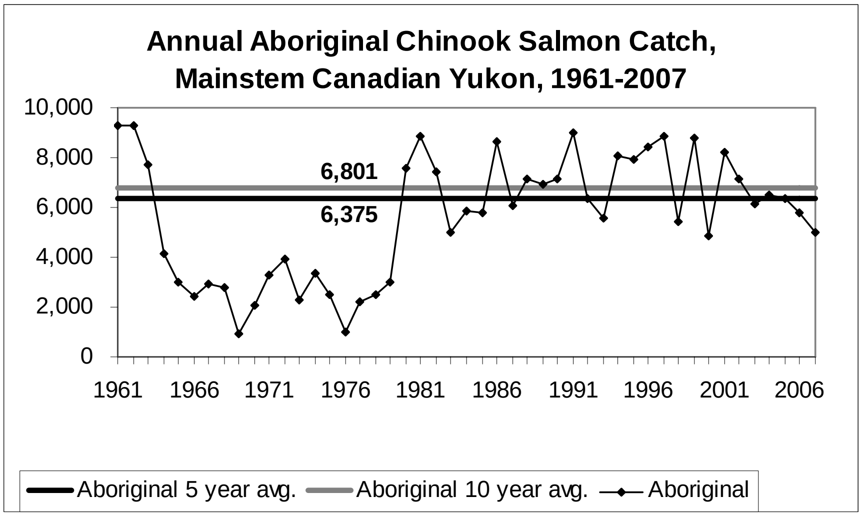
Source: AFG&G.

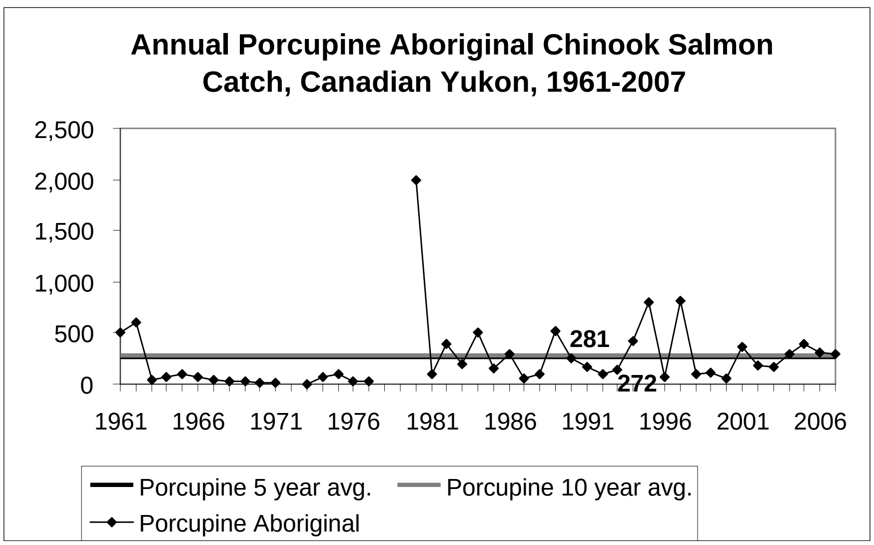
Figure 2-41 Lower, Upper, and Alaska Yukon Total Annual Subsistence Chinook Salmon Catch, 1978-2007



Source: AFG&G.

Figure 2-42 Mainstem Canadian Yukon Aboriginal and Porcupine Aboriginal Total Annual Subsistence Chinook Salmon Catch, 1961-2007





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 foregone commercial harvest opportunities. The preferred strategy for managing commercial fisheries is to spread the harvest over the middle 50% 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% 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. The department'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 Alaska Board of Fisheries (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 catch per unit effort (CPUE) data, approximately 50% (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 (Fig. 2). The Pilot Station sonar preliminary passage estimate was approximately 125,553 Chinook salmon (Appendix Table 2). 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 (Fig. 2). 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 (Fig. 2). 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 2-33 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 Figure 2-43, 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.

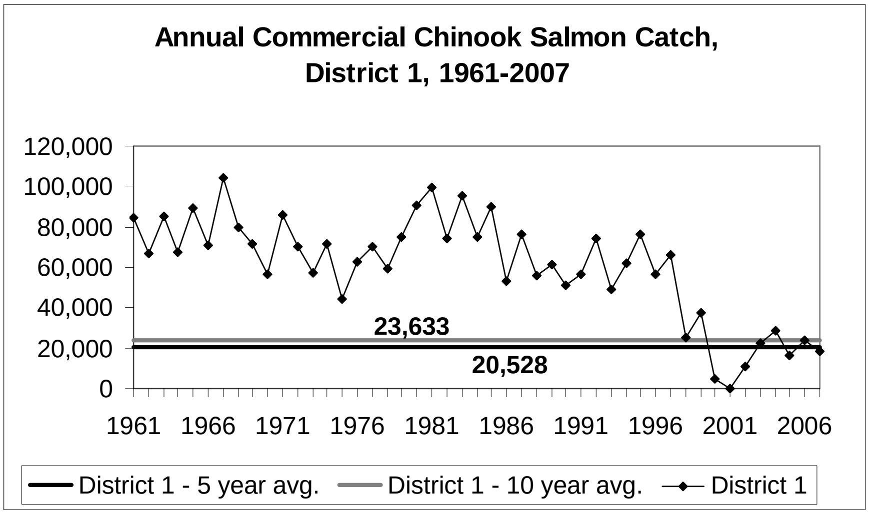
The Upper Yukon River has historically accounting for a much smaller proportion of the total commercial Chinook catch (Table 2-34). District 4, has historically had commercial catches as high as 3,582 fish but there has been no commercial harvest in District 4 in recent years. Overall, upper Yukon commercial 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 Figure 2-44.

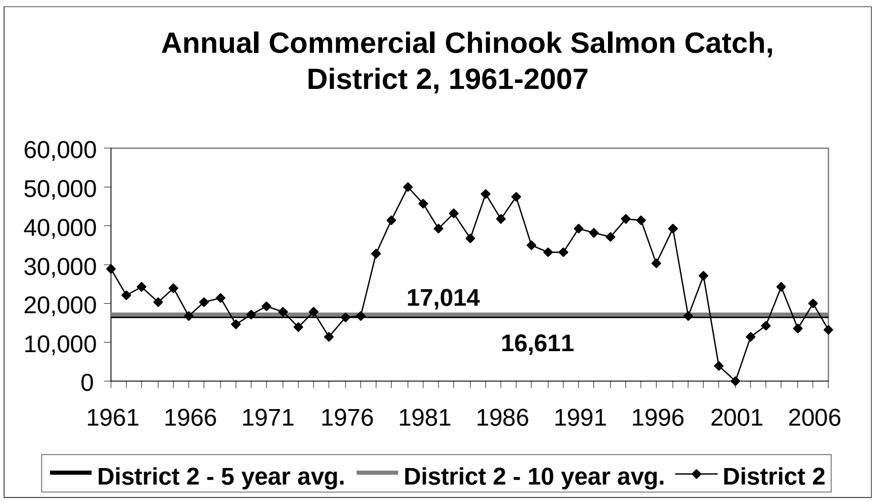
Table 2-33 Commercial Chinook Salmon Catch, by year, Lower Yukon Subdistricts, 1961-2007

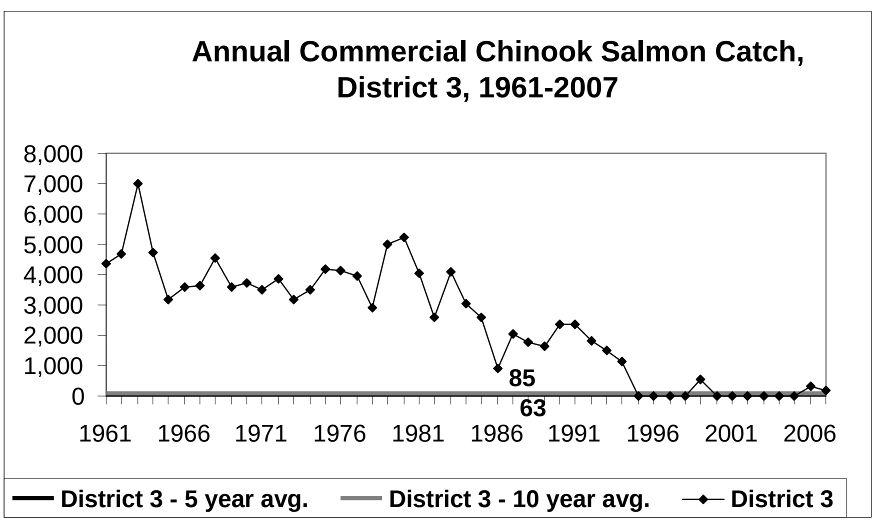
Year	District 1	District 2	District 3	Lower Yukon Total
1961	84,466	29,026	4,368	117,860
1962	67,099	22,224	4,687	94,010
1963	85,004	24,221	7,020	116,245
1964	67,555	20,246	4,705	92,506
1965	89,268	23,763	3,204	116,235
1966	70,788	16,927	3,612	91,327
1967	104,350	20,239	3,618	128,207
1968	79,465	21,392	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: ADF&G

Figure 2-43 Lower Yukon Annual Commercial Chinook Catch by District, 1961-2007







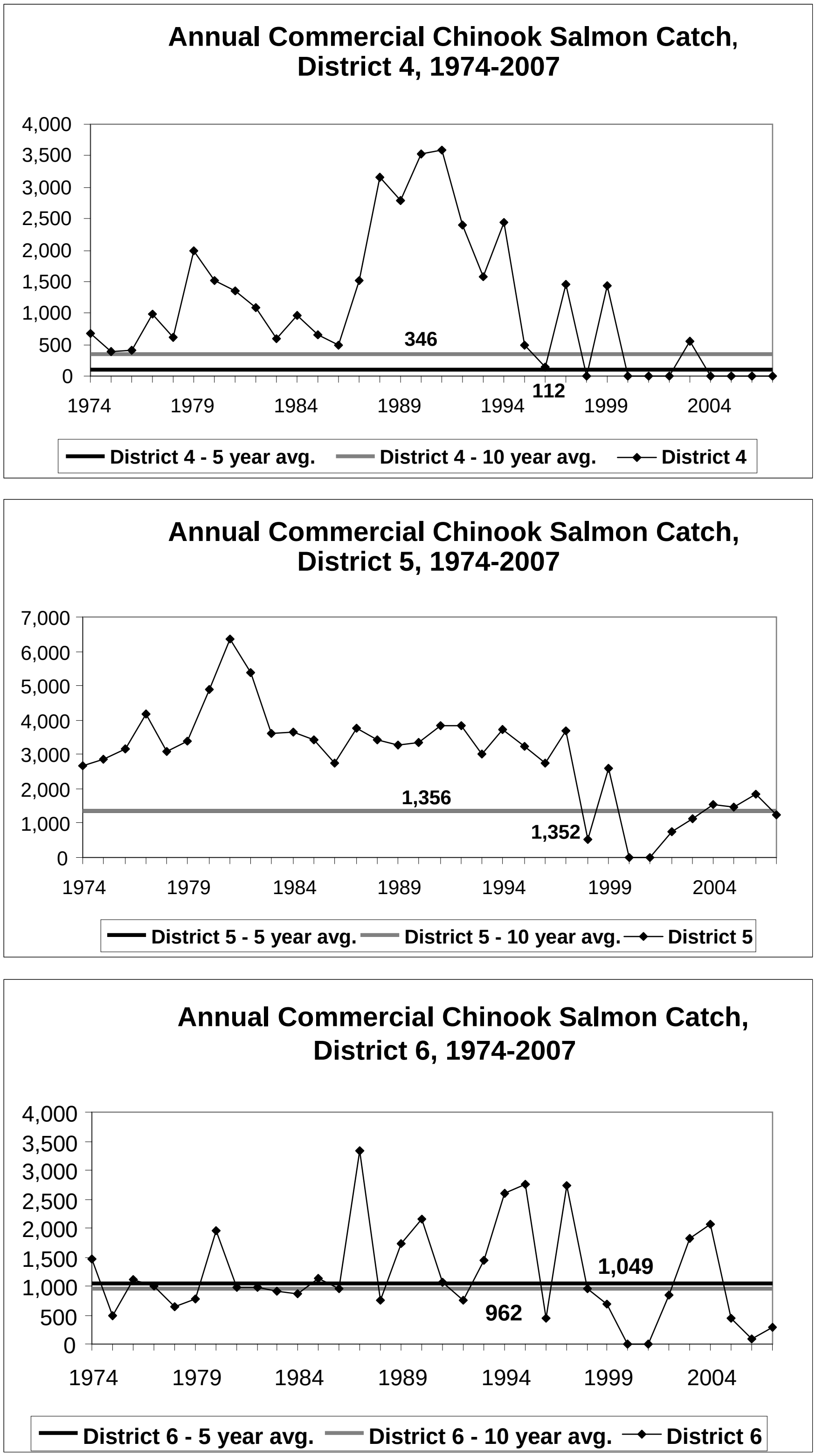
Source: AFG&G

Table 2-34 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**

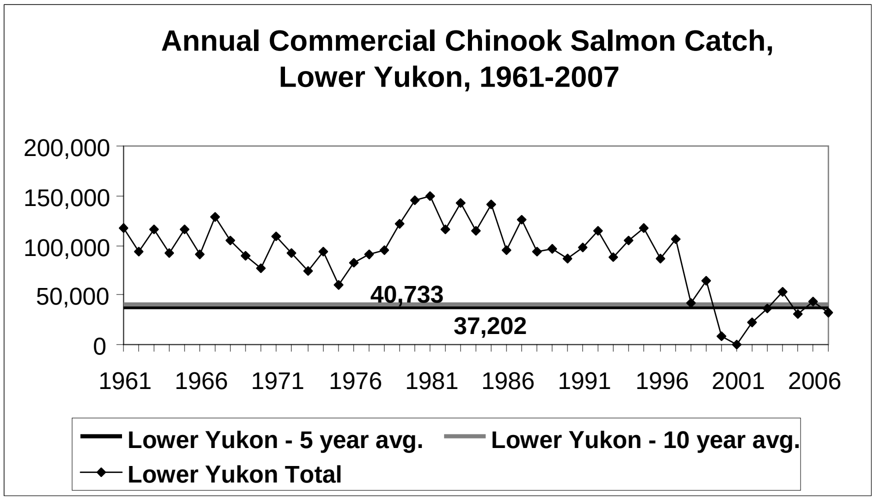
Source: ADF&G

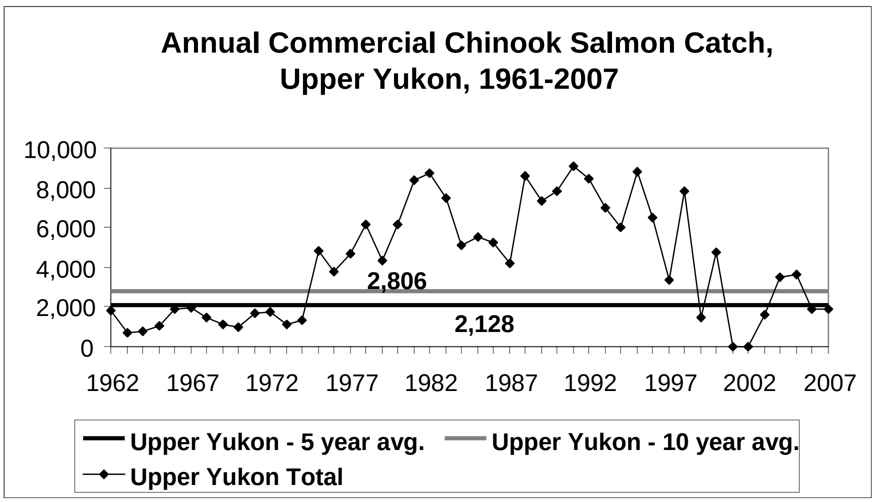
Figure 2-44 Upper Yukon Annual Commercial Chinook Catch by District, 1961-2007

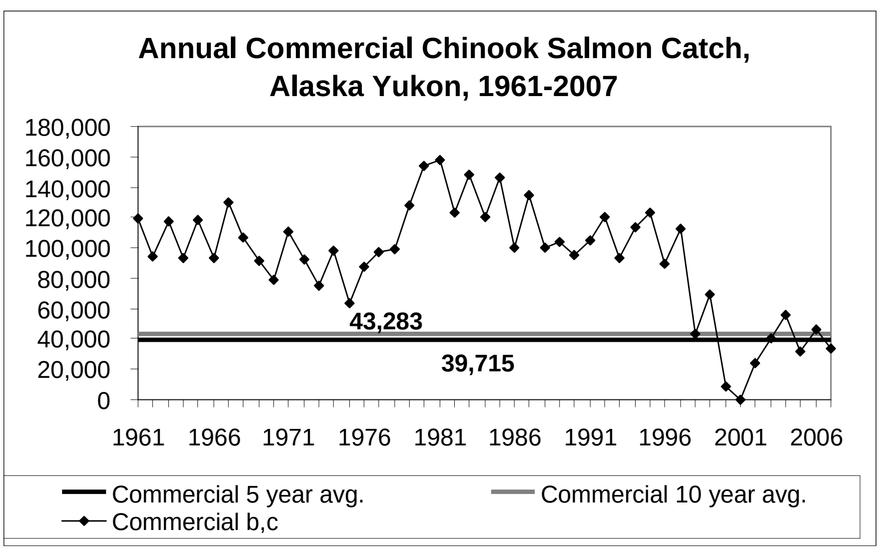


Source: AFG&G

Figure 2-45 Lower, Upper, and Alaska Yukon Total Annual Commercial Chinook Salmon Catch, 1961-2007







Source: AFG&G

Figure 2-46 Annual Commercial Chinook Salmon Catch, Mainstem Canadian Yukon, 1961-2007

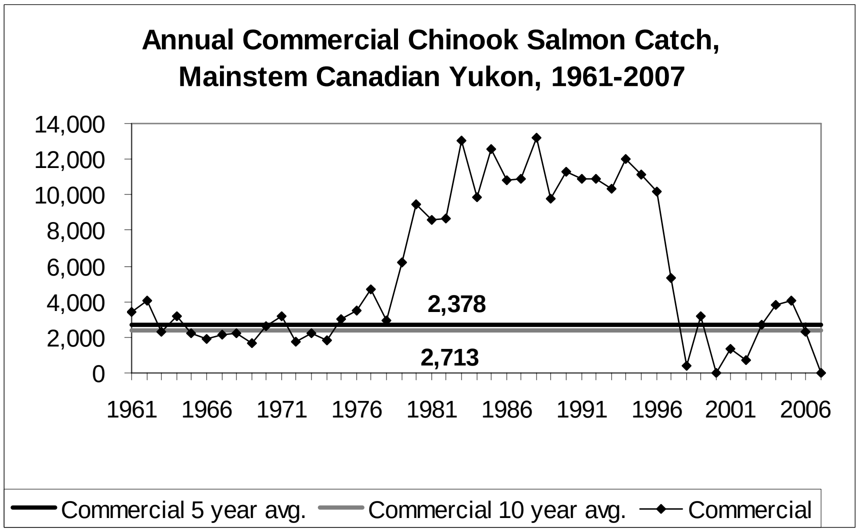


Figure 2-46 displays annual commercial Chinook salmon catch for the mainstem of the Yukon River in Canada from 1961-2007. The underlying data for this figure is displayed in Table 2-29 at the beginning of this section. Canadian Yukon commercial harvest has historically been much lower than the commercial 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 2-35 (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 over $10 million, approximately 99% 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 then 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 2-36 provides historic data on Yukon fall chum and coho commercial fisheries. The data shows that these fisheries have fallen in value from historic highs in the 1980s and have had several periods of no commercial harvest since them. From 2000 through 2002, there were no commercial harvest of fall chum and coho in the Yukon River. Since then, harvests have been allowed and the value of these fisheries now exceeds five and ten year averages, although total value is well below historic highs and shows similar declines in 2007 as seen in Chinook and summer Chum values.

Table 2-35 Value of commercial salmon fishery to Yukon Area fishermen, Summer Season, 1977-2007.

	Yukon Chinook			Yukon Summer Chum			
Year	Lower Value	Upper Value	Subtotal	Lower Value	Upper Value	Subtotal	Total Season
1977	$1,841,033	$148,766	$1,989,799	$1,007,280	$306,481	$1,313,761	$3,303,560
1978	$2,048,674	$66,472	$2,115,146	$2,071,434	$655,738	$2,727,172	$4,842,318
1979	$2,763,433	$124,230	$2,887,663	$2,242,564	$444,924	$2,687,488	$5,575,151
1980	$3,409,105	$113,662	$3,522,767	$1,027,738	$627,249	$1,654,987	$5,177,754
1981	$4,420,669	$206,380	$4,627,049	$2,741,178	$699,876	$3,441,054	$8,068,103
1982	$3,768,107	$162,699	$3,930,806	$1,237,735	$452,837	$1,690,572	$5,621,378
1983	$4,093,562	$105,584	$4,199,146	$1,734,270	$281,883	$2,016,153	$6,215,299
1984	$3,510,923	$102,354	$3,613,277	$926,922	$382,776	$1,309,698	$4,922,975
1985	$4,294,432	$82,644	$4,377,076	$1,032,700	$593,801	$1,626,501	$6,003,577
1986	$3,165,078	$73,363	$3,238,441	$1,746,455	$634,091	$2,380,546	$5,618,987
1987	$5,428,933	$136,196	$5,565,129	$1,313,618	$323,611	$1,637,229	$7,202,358
1988	$5,463,800	$142,284	$5,606,084	$5,001,100	$1,213,991	$6,215,091	$11,821,175
1989	$5,181,700	$108,178	$5,289,878	$2,217,700	$1,377,117	$3,594,817	$8,884,695
1990	$4,820,859	$105,295	$4,926,154	$497,571	$506,611	$1,004,182	$5,930,336
1991	$7,128,300	$97,140	$7,225,440	$782,300	$627,177	$1,409,477	$8,634,917
1992	$9,957,002	$168,999	$10,126,001	$606,976	$525,204	$1,132,180	$11,258,181
1993	$4,884,044	$113,217	$4,997,261	$226,772	$203,762	$430,534	$5,427,795
1994	$4,169,270	$124,270	$4,293,540	$79,206	$396,685	$475,891	$4,769,431
1995	$5,317,508	$87,059	$5,404,567	$241,598	$1,060,322	$1,301,920	$6,706,487
1996	$3,491,582	$47,282	$3,538,864	$89,020	$966,277	$1,055,297	$4,594,161
1997	$5,450,433	$110,713	$5,561,146	$56,535	$96,806	$153,341	$5,714,487
1998	$1,911,370	$17,285	$1,928,655	$26,415	$821	$27,236	$1,955,891
1999	$4,950,522	$74,475	$5,024,997	$19,687	$1,720	$21,407	$5,046,404
2000	$725,606	$0	$725,606	$8,633	$0	$8,633	$734,239
2001 [a]	$0	$0	$0	$0	$0	$0	$0
2002	$1,691,105	$20,744	$1,711,849	$4,342	$6,176	$10,518	$1,722,367
2003	$1,871,202	$40,957	$1,912,159	$1,585	$6,879	$8,464	$1,920,623
2004	$3,063,667	$38,290	$3,101,957	$8,884	$9,645	$18,529	$3,120,486
2005	$1,952,109	$24,415	$1,976,524	$11,004	$13,479	$24,483	$2,001,007
2006	$3,290,367	$32,631	$3,322,998	$23,862	$42,988	$66,850	$3,389,848
2007 [b]	$1,939,114	$27,190	$1,966,304	$220,715	$34,421	$255,136	$2,221,440
2002-2006 Average	$2,373,690	$31,407	$2,405,097	$9,935	$15,833	$25,769	$2,430,866
1997-2006 Average	$2,490,638	$35,951	$2,526,589	$16,095	$17,851	$33,946	$2,560,535

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

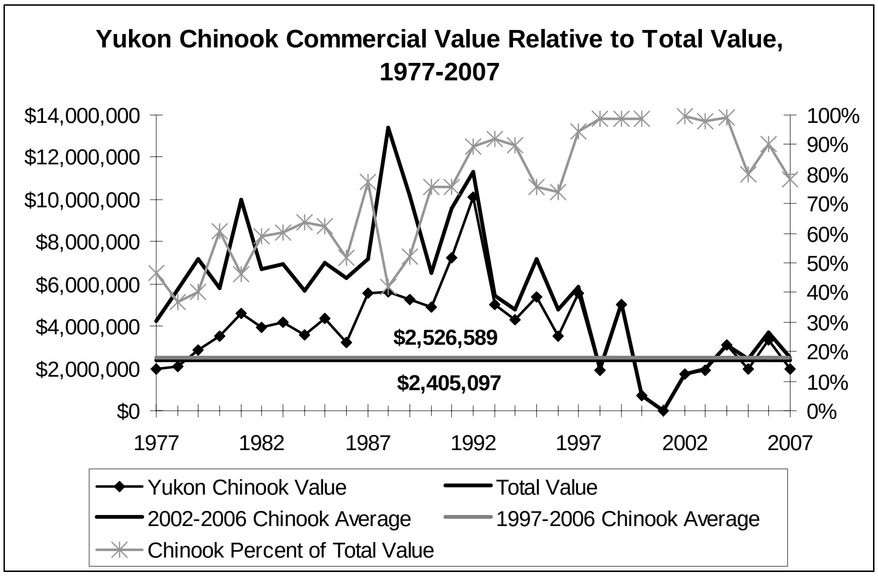
Figure 2-47, below, depicts the comparison between Yukon Chinook commercial value and total commercial value from all salmon fisheries from 1977-2007. Also shown is the percent of total value that the commercial Chinook value represents. Since the early 1990s, Chinook has accounted for 70% to nearly 100% 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 2-36 Value of commercial salmon fishery to Yukon Area fishermen, Summer Season, 1977-2007.

Year	Yukon Fall Chum Lower Value	Yukon Fall Chum Upper Value	Yukon Fall Chum Subtotal	Yukon Coho Lower Value	Yukon Coho Upper Value	Yukon Coho Subtotal	Total Season
1977	$718,571	$102,170	$820,741	$140,914	$2,251	$143,165	$963,906
1978	$691,854	$103,091	$794,945	$96,823	$6,105	$102,928	$897,873
1979	$1,158,485	$347,814	$1,506,299	$83,466	$6,599	$90,065	$1,596,364
1980	$394,162	$198,088	$592,250	$17,374	$2,374	$19,748	$611,998
1981	$1,503,744	$356,805	$1,860,549	$87,385	$4,568	$91,953	$1,952,502
1982	$846,492	$53,258	$899,750	$135,828	$18,786	$154,614	$1,054,364
1983	$591,011	$128,950	$719,961	$17,497	$11,472	$28,969	$748,930
1984	$374,359	$103,417	$477,776	$256,050	$12,823	$268,873	$746,649
1985	$634,616	$178,125	$812,741	$176,254	$26,797	$203,051	$1,015,792
1986	$399,321	$30,309	$429,630	$211,942	$556	$212,498	$642,128
1987	$0	$0	$0	$0	$0	$0	$0
1988	$638,700	$151,300	$790,000	$734,400	$34,116	$768,516	$1,558,516
1989	$713,400	$223,996	$937,396	$323,300	$33,959	$357,259	$1,294,655
1990	$238,165	$174,965	$413,130	$137,302	$37,026	$174,328	$587,458
1991	$438,310	$157,831	$596,141	$300,182	$21,556	$321,738	$917,879
1992	$0	$54,161	$54,161	$0	$19,529	$19,529	$73,690
1993	$0	$0	$0	$0	$0	$0	$0
1994	$0	$8,517	$8,517	$0	$8,739	$8,739	$17,256
1995	$185,036	$167,571	$352,607	$80,019	$11,292	$91,311	$443,918
1996	$48,579	$45,438	$94,017	$96,795	$13,020	$109,815	$203,832
1997	$86,526	$7,252	$93,778	$79,973	$1,062	$81,035	$174,813
1998	$0	$0	$0	$0	$0	$0	$0
1999	$35,639	$876	$36,515	$3,620	$0	$3,620	$40,135
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	$5,993	$3,398	$9,391	$18,168	$5,095	$23,263	$32,654
2004	$1,126	$848	$1,974	$2,774	$6,372	$9,146	$11,120
2005	$316,698	$48,159	$364,857	$83,793	$19,182	$102,975	$467,832
2006	$202,637	$33,806	$236,443	$50,299	$11,137	$61,436	$297,879
2007 [b]	$144,256	$16,907	$161,163	$127,869	$1,368	$129,237	$290,400
2002-2006 Average	$105,291	$17,242	$122,533	$31,007	$8,357	$39,364	$161,897
1997-2006 Average	$64,862	$9,434	$74,296	$23,863	$4,285	$28,148	$102,443

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

Figure 2-47 Yukon Chinook Commercial Value Relative to Total Value, 1977-2007.



Yukon River Chinook Salmon Run Outlooks, 2008

Drainage-Wide Chinook Salmon

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. Initial U.S. management will be based on preseason projections and shifted to inseason project assessment as the run develops.

The management strategy for 2008 will be to continue the regulatory subsistence salmon fishing schedule until run assessment indicates a harvestable surplus for additional subsistence opportunity and other uses. From 2002–2005, ADF&G delayed commercial fishing until near the midpoint of the run to ensure escapement and subsistence needs would be met due to the uncertainty of the runs during these years. Because of the unexpected weak run in 2007, Chinook salmon directed commercial fishing in 2008 will be delayed until the projected midpoint of the run. At that time, Chinook salmon directed openings will only be considered if a surplus can be identified, based on the current run assessment information. However, there is a possibility that the run may not be large enough to support even a small directed commercial fishery. 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.

Canadian-Origin Upper Yukon Chinook Salmon

Spawning escapements in 2002 and 2003, the brood years producing age-6 and age-5 fish returning in 2008, respectively, were near average and well above average in Canada. However, 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 applicable to Eagle sonar total run estimates. This is based on a stock-recruitment (S/R) model developed from estimates of total spawning escapement and age-specific returns. 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.

Personal Use and Recreational 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 Figure 2-48, and sport catch in the mainstem Canadian Yukon is shown in Figure 2-49. 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.

Figure 2-48 Annual Sport and Personal Use Chinook Salmon Catch, Alaska Yukon, 1977-2006

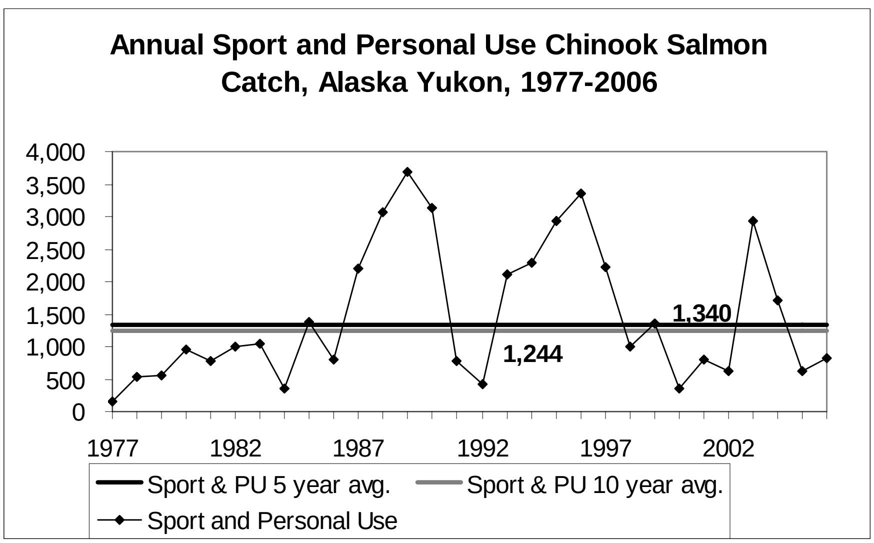
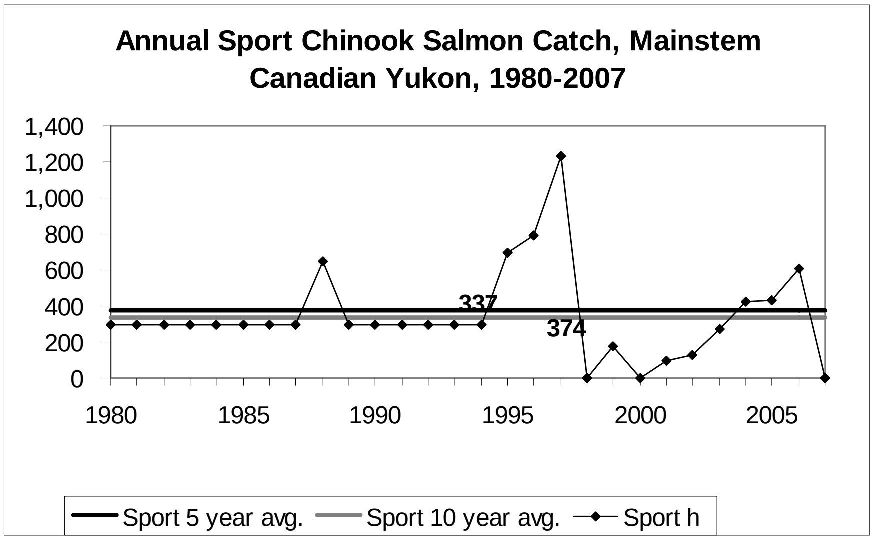


Figure 2-49 Sport and Personal Use Chinook Salmon Catch, Alaska Yukon, 1980-2006



2.2.6 Yukon Region Community Importance of the Salmon Fisheries

Table 2-37 reprints an Alaska Department of Labor and Workforce Development analysis of local resident crew members by census areas with the region defined by ADOL 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 2-37 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 2-38. 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 2-38 Fishermen by Residency, Yukon Region, 2001–2006

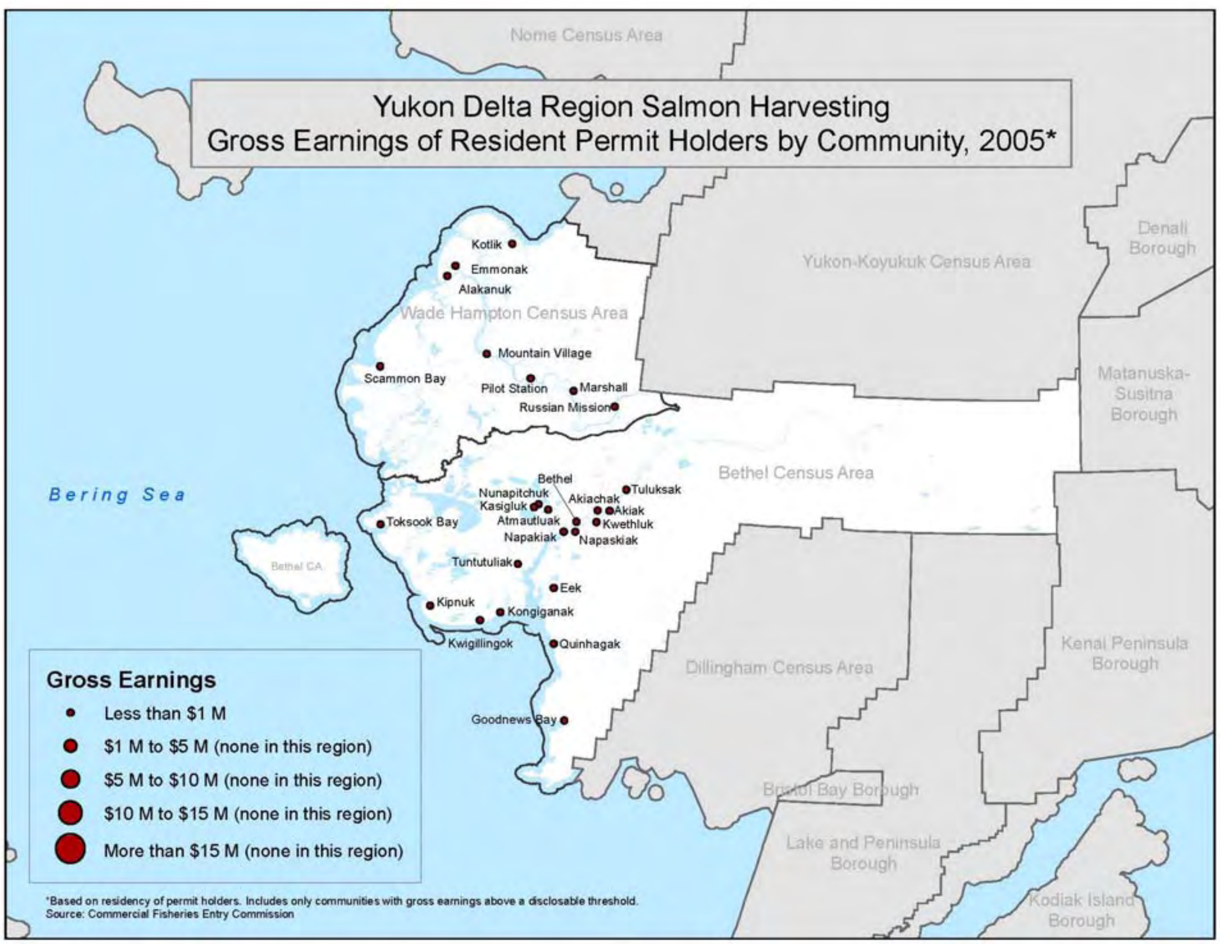
Borough/Census Area	Residents Who Fished Their Permits					
	2001	2002	2003	2004	2005	2006
Bethel Census Area	803	635	667	676	693	658
Wade Hampton Census Area	44	535	549	520	547	545
Local Resident Total	847	1,170	1,216	1,196	1,240	1,203
Region's Harvest Total	595	1,007	1,045	1,055	1,092	1,048

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

Figure 2-50 depicts Yukon Delta Region resident permit holder salmon fishery gross earnings by community, as tabulated by ADOL. 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.

Figure 2-50 Yukon Delta Region Salmon Harvesting Gross Earnings of Resident Permit Holders by Community, 2005



ADOL 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 2-39. 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 ADOL 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, ADOL has not compiled this data for 2006 or 2007.

Table 2-39 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.

Figure 2-51 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 ADOL, are shown in Table 2-40. 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.

Figure 2-51 Yukon Delta Region Canneries and Land Based Seafood Processors.

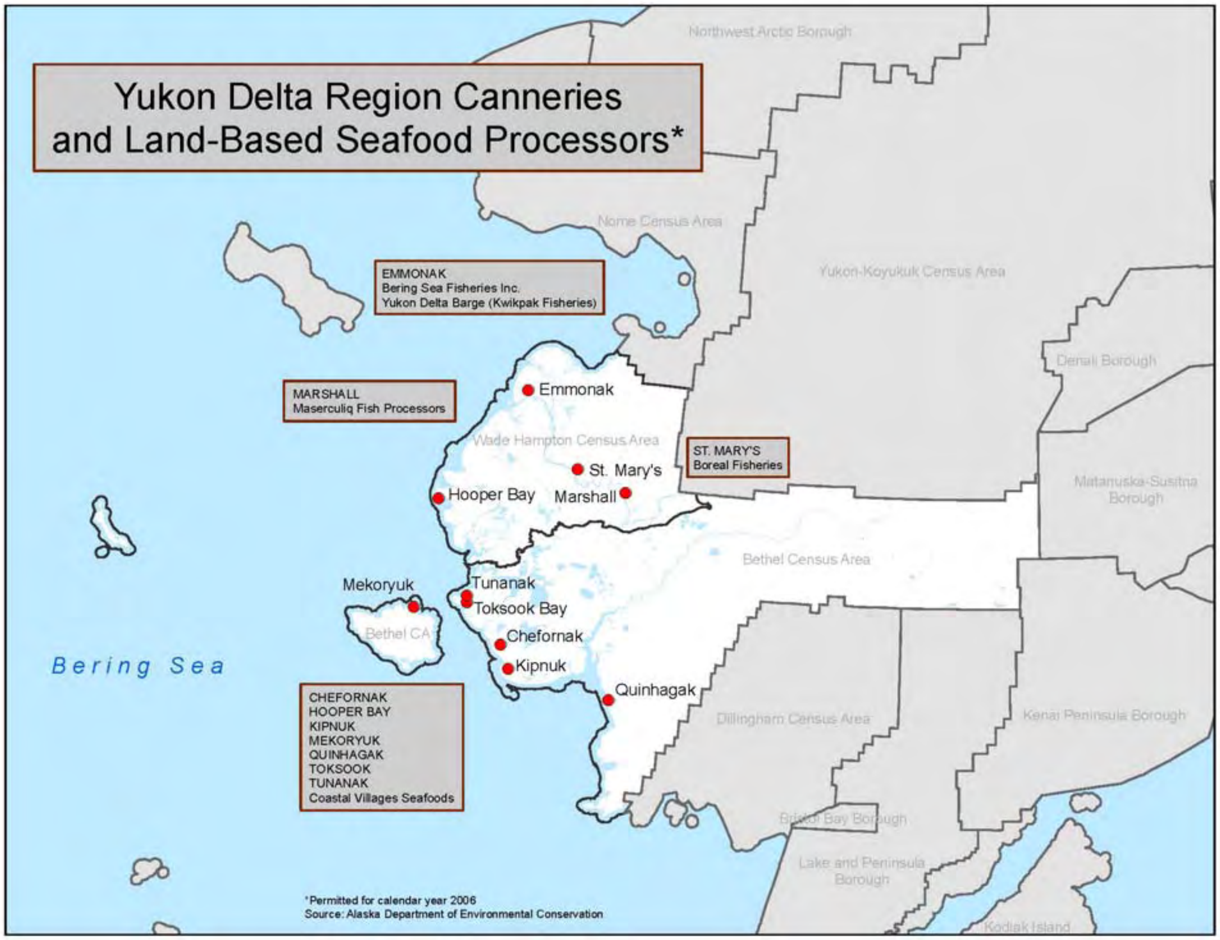


Table 2-40 Fish Harvesting Employment by Species and Month, 2000 - 2006 Yukon Region

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 Alaska Department of Labor and Workforce Development, Research and Analysis Section

Table 2-41 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% 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% and 16.5% 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 2-41 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

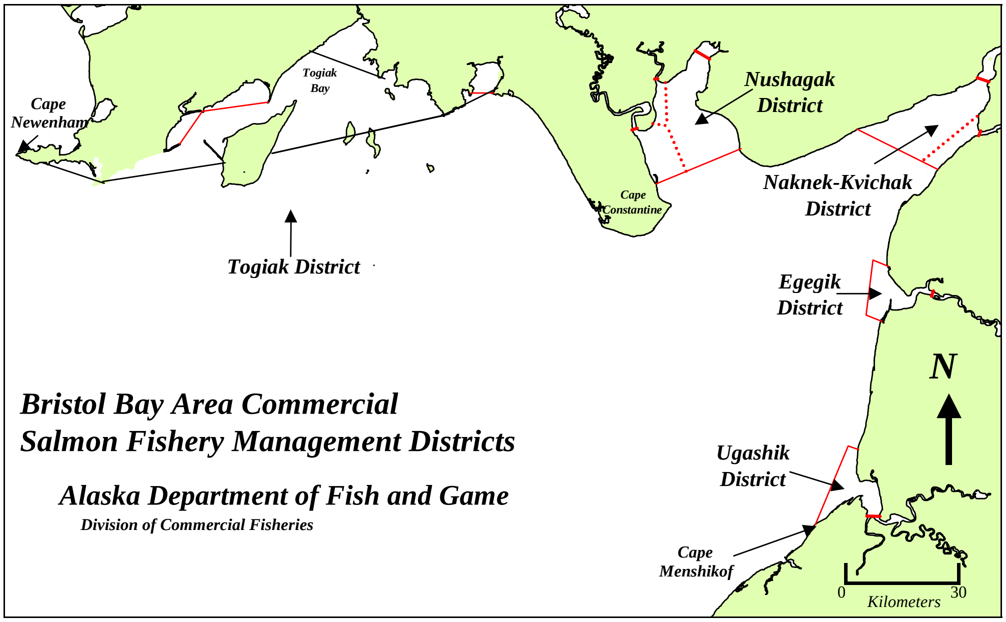
Source: Alaska Department of Labor and Workforce Development, Research and Analysis Section and CFEC.

2.2.7 Bristol Bay

Bristol Bay

The Bristol Bay management area includes all coastal and inland waters east of a line from Cape Newenham to Cape Menshikof (Figure 2-52). 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 is developed from Dye and Schwanke, 2006, Fall and Krieg, 2006, Sands et.al, 2008, and data supplied by ADF&G).

Figure 2-52 Bristol Bay area commercial fisheries salmon management districts.



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 (Appendices A3–A7). 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 (Appendix A25). Subsistence catches are comprised primarily of sockeye salmon and average approximately 145,000 salmon (Appendix A27). 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 Alaska Board of Fisheries (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% 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 the department 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, the department 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 the department to allow pulses of Chinook salmon into the Nushagak River that were not exposed to commercial fishing gear, was added to the NMCSMP.

The department 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 (Appendix A20). 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.

Subsistence Fishery Situation and Outlook

Subsistence harvests in the Bristol Bay area are among the largest in the state, and very diverse. Based on the results of systematic household surveys conducted by the Division of Subsistence, the estimated annual area-wide harvest of wild foods in the 1980s and 1990s was 422 pounds usable weight per capita and 1,439 pounds per household. Salmon made up 51% of this harvest, land mammals (mostly moose and caribou) were 31%, fish other than salmon comprised 10%, and other resources, such as marine mammals, birds and eggs, marine invertebrates, and wild plants provided the remaining 8%.

Wild resource harvests are generally higher in the smaller communities of the Bristol Bay Area than in the 2 regional centers. The area-wide estimate for these smaller communities for the 1980s/1990s period was 587 pounds per person per year, with a household average of 2,284 pounds. For this period, the composition of subsistence harvests in the smaller communities was very similar to that of the area overall: 49% salmon, 31% land mammals, 11% other fish, and 9% other.

The importance of subsistence harvests to the economy of the Bristol Bay region is evident when considering the potential cost of purchasing replacements for the foods produced by local hunting, fishing, and gathering. At a replacement cost of $5/pound, the annual value of the average household subsistence harvest in the region is $7,195; for village households it is $11,420. Using the $5/pound figure, it would cost the average Bristol Bay household 16% of its cash income to purchase replacements for lost subsistence harvests; the average village household would spend 36% of its cash income to buy replacement food. Of course, this exercise ignores the cultural, social, and nutritional costs of replacing subsistence foods with imported substitutes. Indeed, it is unlikely that adequate substitutes can be purchased for most of the subsistence foods that are produced in the region (ADF&G 2006X)

Permits are required to harvest salmon for subsistence purposes in Bristol Bay. Since 1990, under state regulations, all Alaska State residents have been eligible to participate in subsistence salmon fishing in all Bristol Bay drainages, except the Lake Clark area. Prior to 2007, with a few exceptions, only gillnets were recognized as legal subsistence gear. In the Togiak District, spear fishing was also allowed. In portions of Naknek Lake in the Naknek District, spears and dipnets, in addition to gillnets, could be used during designated periods, primarily to harvest spawning sockeye salmon (“redfish”). In the Bristol Bay area, gillnet lengths were limited to 10 fathoms in the Naknek, Egegik, and Ugashik rivers, Dillingham beaches, and within the Nushagak commercial fishing district during openings regulated by EO. Up to 25 fathoms could be used in the remaining areas, except that nets were limited to 5 fathoms in the special “redfish” harvest areas in the Naknek District.

At its regulatory meeting in Dillingham in December 2006, the Alaska Board of Fisheries made three changes to the subsistence salmon fishing regulations that affected portions of the Bristol Bay area. The first change allowed salmon to be taken with a drift gillnet no more than 10 fathoms in length in the Togiak River between the mouth of the river and upstream approximately 2 miles. The second change allowed spears to be used to take salmon in Lake Clark. The third change allowed beach seines and gillnets to be used to take salmon in Iliamna Lake, Six Mile Lake, and Lake Clark.

In Nushagak, Togiak, Naknek, Egegik, and Ugashik Districts, subsistence fishing is permitted in all commercial districts during commercial openings. In addition, all commercial districts were open for subsistence fishing in May and October, from Monday to Friday. In the late 1990s and early 2000s, declining Chinook and coho stocks resulted in longer commercial closures and some residents had difficulty obtaining fish for home use. Recent years, beginning in 2004 have seen improvements in abundance of all species. The Nushagak commercial district, starting in 1988, has been opened for subsistence fishing by EO during extended commercial closures.

The Alaska Department of Fish and Game issues Bristol Bay subsistence salmon permits to any Alaska resident who requests one. In 2001, the superintendent of Lake Clark National Park and Preserve, announced that the National Park Service (NPS) was prohibiting subsistence fishing with nets in the park and preserve, including all of Lake Clark, except by federally qualified residents. This prohibition was a new enforcement action of a NPS regulation and applied to anyone who was not a permanent resident of Iliamna, Lime Village, Newhalen, Nondalton, Pedro Bay, or Port Alsworth, or who did not have a Section 13.44 subsistence use permit issued by the park superintendent. The department informs Bristol Bay subsistence salmon permit applicants that they need to take this NPS closure into account if they intend to subsistence fish in waters of the park and preserve.

A permit system was gradually introduced throughout the Bristol Bay region in the late 1960s to document the harvest of salmon for subsistence. Much of the increase in the number of permits issued during these years reflects: (1) a greater compliance with the permitting and reporting requirements, (2) an increased level of effort expended by the department in making permits available (including a local system of vendors), contacting individuals, and reminding them to return the harvest forms, and (3) a growing regional population. Most fishermen are obtaining permits and reporting their catches, and overall permit returns have averaged between 85% and 90% annually. However, fish removed for home use from commercial catches are not included in most reported subsistence harvest totals. Also, fish caught later in the season, such as coho and spawning salmon are probably not documented as consistently as Chinook and sockeye.

Table 2-42 (ADF&G 2007 data request) provides historic data on subsistence salmon participation and harvests, by species, by district, and area wide. Participation was greatest among residents of the Naknek-Kvichak and Nushagak districts. Total permits issued in 2007, number 1,100, which is slightly below the 20-year average of 1,126. Harvest numbers show that sockeye salmon dominates the subsistence catch in all districts, but that subsistence sockeye harvests have been declining in recent years. 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, just above the 10 year average, in 2007. Historic trends of subsistence Chinook catch for each district and overall are shown in Figure 2-53 and Figure 2-54.

Table 2-42 Subsistence salmon harvest, by district and species, Bristol Bay, 1987–2007.

Year [a]	Permits Issued	Sockeye	Chinook	Chum	Pink	Coho	Total
NAKNEK KVICHAK DISTRICT							
1987	407	86,706	1,289	756	490	1,106	90,347
1988	391	88,145	1,057	588	917	813	91,520
1989	411	87,103	970	693	277	1,927	90,970
1990	466	92,326	985	861	1,032	726	95,930
1991	518	97,101	1,152	1,105	191	1,056	100,605
1992	571	94,304	1,444	2,721	1,601	1,152	101,222
1993	560	101,555	2,080	2,476	762	2,025	108,898
1994	555	87,662	1,843	503	460	1,807	92,275
1995	533	75,644	1,431	1,159	383	1,791	80,407
1996	540	81,305	1,574	816	794	1,482	85,971
1997	533	85,248	2,764	478	422	1,457	90,368
1998	567	83,095	2,433	784	1,063	1,592	88,967
1999	528	85,315	1,567	725	210	856	88,674
2000	562	61,817	894	560	845	937	65,053
2001	506	57,250	869	667	383	740	59,909
2002	471	52,805	837	909	1,137	943	56,632
2003	489	61,443	1,221	259	198	812	63,934
2004	481	71,110	1,075	469	1,080	566	74,300
2005	462	69,211	1,047	546	275	1,224	72,302
2006	468	69,097	881	341	757	720	71,796
20 Year Ave.	501	79,412	1,371	871	969 [b]	1,187	83,504
1987-1996 Ave.	495	89,185	1,383	1,168	961 [b]	1,389	93,815
1997-2006 Ave.	507	69,639	1,359	574	976 [b]	985	73,193
2007 [c]	474	64,733	1,012	505	689	853	67,793
EGEGIK DISTRICT							
1987	49	3,350	87	139	2	284	3,862
1988	52	1,405	97	87	54	333	1,976
1989	50	1,636	50	33	1	414	2,134
1990	61	1,105	53	85	39	331	1,613
1991	70	4,549	82	141	32	430	5,234
1992	80	3,322	124	270	51	729	4,496
1993	69	3,633	128	148	15	905	4,829
1994	59	3,208	166	84	153	857	4,468
1995	60	2,818	86	192	100	690	3,886
1996	44	2,321	99	89	85	579	3,173
1997	34	2,438	101	21	5	740	3,304
1998	36	1,795	44	33	52	389	2,314
1999	42	2,434	106	35	2	806	3,384
2000	31	842	16	11	0	262	1,131
2001	57	2,493	111	105	16	928	3,653
2002	53	1,892	65	34	12	356	2,359
2003	62	3,240	84	32	10	297	3,663
2004	46	2,618	169	410	91	1,423	4,711
2005	45	2,267	81	231	2	526	3,106
2006	41	1,641	94	34	7	641	2,418
20 Year Ave.	52	2,450	92	111	54 [b]	596	3,286
1987-1996 Ave.	59	2,735	97	127	76 [b]	555	3,567
1997-2006 Ave.	45	2,166	87	95	32 [b]	637	3,004
2007 [c]	49	2,332	99	148	24	649	3,251

-continued-

Table 2-42, Page 2 of 3.

Year	Permits Issued	Sockeye	Chinook	Chum	Pink	Coho	Total
UGASHIK DISTRICT							
1987	22	892	104	51	29	272	1,348
1988	23	1,400	84	55	35	330	1,904
1989	22	1,309	32	35	2	214	1,592
1990	37	1,578	51	143	120	280	2,172
1991	38	1,403	121	168	42	614	2,348
1992	37	2,348	106	79	8	397	2,938
1993	39	1,766	86	107	24	495	2,478
1994	31	1,587	126	42	38	579	2,372
1995	20	1,513	56	18	6	290	1,883
1996	26	1,247	50	21	7	298	1,623
1997	28	2,785	169	39	23	311	3,327
1998	27	1,241	59	75	82	485	1,942
1999	25	1,365	35	5	0	271	1,675
2000	31	1,927	51	34	1	467	2,481
2001	24	1,197	61	8	2	357	1,624
2002	23	1,294	51	14	2	460	1,821
2003	23	1,113	31	30	0	392	1,567
2004	21	804	64	9	4	234	1,116
2005	22	818	27	18	2	249	1,114
2006	25	962	41	6	16	339	1,364
20 Year Ave.	27	1,427	70	48	31 [b]	367	1,934
1987-1996 Ave.	30	1,504	82	72	42 [b]	377	2,066
1997-2006 Ave.	25	1,351	59	24	21 [b]	356	1,803
2007 [c]	23	998	43	15	5	335	1,396
NUSHAGAK DISTRICT							
1987	474	40,900	12,200	6,000	200	6,200	65,500
1988	441	31,086	10,079	8,234	6,316	5,223	60,938
1989	432	34,535	8,122	5,704	407	8,679	57,447
1990	441	33,003	12,407	7,808	3,183	5,919	62,320
1991	528	33,161	13,627	4,688	292	10,784	62,552
1992	476	30,640	13,588	7,076	3,519	7,103	61,926
1993	500	27,114	17,709	3,257	240	5,038	53,358
1994	523	26,501	15,490	5,055	2,042	5,338	54,426
1995	484	22,793	13,701	2,786	188	3,905	43,373
1996	481	22,935	15,941	4,704	1,573	5,217	50,370
1997	538	25,080	15,318	2,056	218	3,433	46,106
1998	562	25,217	12,258	2,487	1,076	5,316	46,355
1999	548	29,387	10,057	2,409	124	3,993	45,969
2000	541	24,451	9,470	3,463	1,662	5,983	45,029
2001	554	26,939	11,760	3,011	378	5,993	48,080
2002	520	22,777	11,281	5,096	1,179	4,565	44,897
2003	527	25,491	18,686	5,064	403	5,432	55,076
2004	511	17,491	15,610	3,869	1,944	4,240	43,154
2005	502	23,916	12,529	5,006	793	5,596	47,841
2006	461	20,773	9,971	4,448	1,591	3,590	40,373
20 Year Ave.	502	27,209	12,990	4,611	2,409 [b]	5,577	51,754
1987-1996 Ave.	478	30,267	13,286	5,531	3,327 [b]	6,341	57,221
1997-2006 Ave.	526	24,152	12,694	3,691	1,490 [b]	4,814	46,288
2007 [c]	504	22,090	13,615	4,696	1,182	4,685	46,268

-continued-

Table 2-42, page 3 of 3.

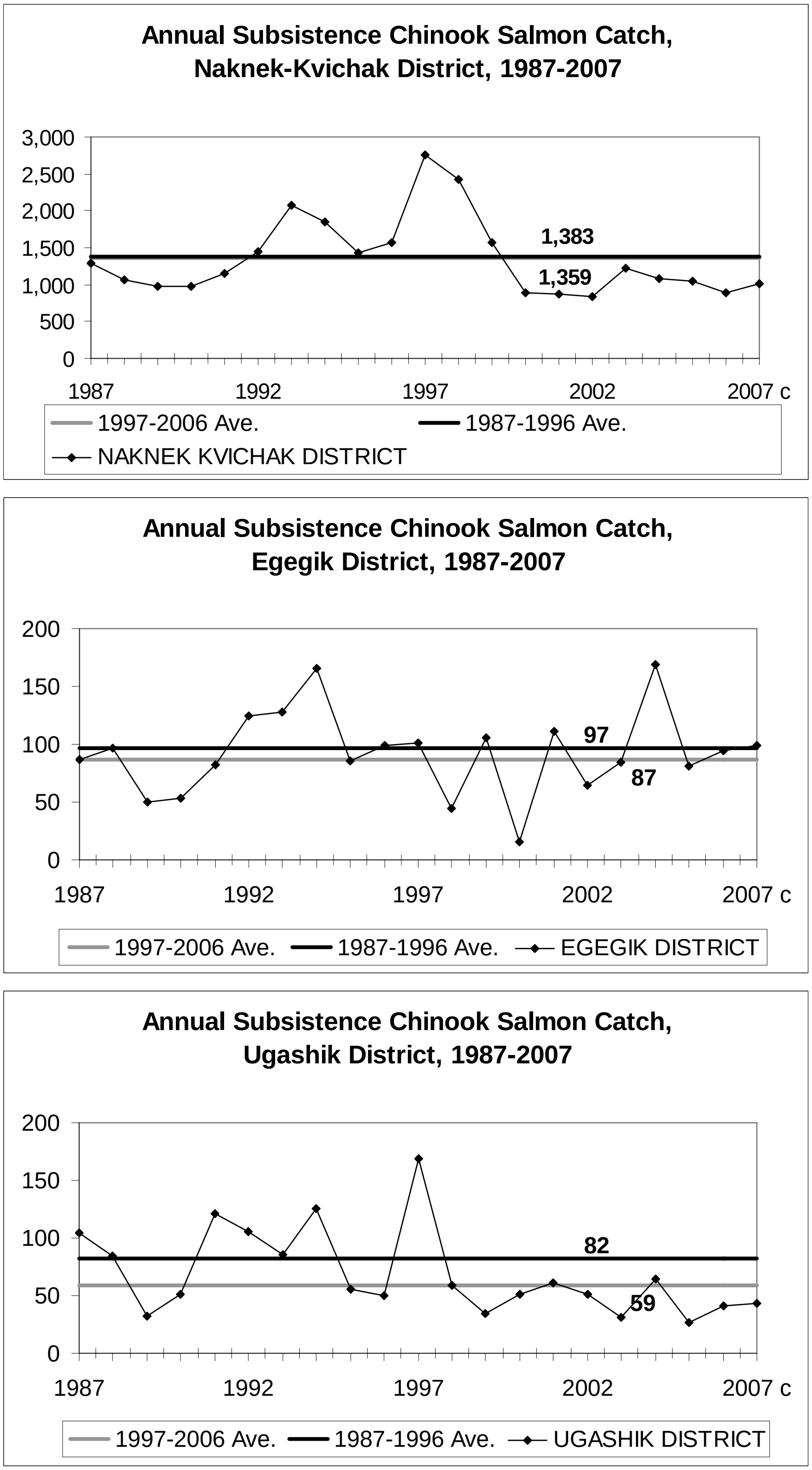
Year	Permits Issued	Sockeye	Chinook	Chum	Pink	Coho	Total
TOGIAK DISTRICT							
1987	46	3,600	700	1,000	0	1,600	6,900
1988	29	2,413	429	716	45	792	4,395
1989	40	2,825	551	891	112	976	5,355
1990	37	3,689	480	786	60	1,111	6,126
1991	43	3,517	470	553	27	1,238	5,805
1992	40	3,716	1,361	626	135	1,231	7,069
1993	38	2,139	784	571	8	743	4,245
1994	25	1,777	904	398	77	910	4,066
1995	22	1,318	448	425	0	703	2,894
1996	19	662	471	285	59	199	1,676
1997	31	1,440	667	380	0	260	2,747
1998	42	2,211	782	412	76	310	3,791
1999	76	3,780	1,244	479	84	217	5,804
2000	54	3,013	1,116	569	90	342	5,130
2001	92	4,162	1,612	367	61	388	6,590
2002	36	2,319	703	605	10	241	3,878
2003	92	4,403	1,208	483	451	883	7,428
2004	46	1,795	1,094	383	108	204	3,584
2005	45	2,299	1,528	301	26	295	4,448
2006	61	2,728	1,630	492	355	408	5,613
20 Year Ave.	46	2,690	909	536	102 [b]	653	4,877
1987-1996 Ave.	34	2,566	660	625	75 [b]	950	4,853
1997-2006 Ave.	58	2,815	1,158	447	128 [b]	355	4,901
2007 [c]	56	2,709	1,233	453	190	406	4,990
TOTAL BRISTOL BAY AREA							
1987	998	135,493	14,356	7,895	689	9,453	167,886
1988	936	124,449	11,746	9,680	7,367	7,491	160,733
1989	955	127,408	9,725	7,356	799	12,210	157,498
1990	1,042	131,701	13,976	9,683	4,434	8,367	168,161
1991	1,197	139,731	15,452	6,655	584	14,122	176,544
1992	1,204	134,330	16,623	10,772	5,314	10,612	177,651
1993	1,206	136,207	20,787	6,559	1,049	9,206	173,808
1994	1,193	120,735	18,529	6,082	2,770	9,491	157,607
1995	1,119	104,086	15,722	4,580	677	7,378	132,443
1996	1,110	108,470	18,136	5,915	2,518	7,775	142,813
1997	1,166	116,991	19,159	2,974	668	6,201	145,992
1998	1,234	113,560	15,576	3,792	2,349	8,093	143,368
1999	1,219	122,281	13,009	3,653	420	6,143	145,506
2000	1,219	92,050	11,547	4,637	2,599	7,991	118,824
2001	1,226	92,041	14,412	4,158	839	8,406	119,856
2002	1,093	81,088	12,936	6,658	2,341	6,565	109,587
2003	1,182	95,690	21,231	5,868	1,062	7,816	131,667
2004	1,100	93,819	18,012	5,141	3,225	6,667	126,865
2005	1,076	98,511	15,212	6,102	1,098	7,889	128,811
2006	1,050	95,201	12,617	5,321	2,726	5,697	121,564
20 Year Ave.	1,126	113,192	15,438	6,174	3,564 [b]	8,379	145,359
1987-1996 Ave.	1,096	126,261	15,505	7,518	4,481 [b]	9,611	161,514
1997-2006 Ave.	1,157	100,123	15,371	4,830	2,648 [b]	7,147	129,204
2007 [c]	1,100	92,862	16,002	5,818	2,090	6,927	123,699

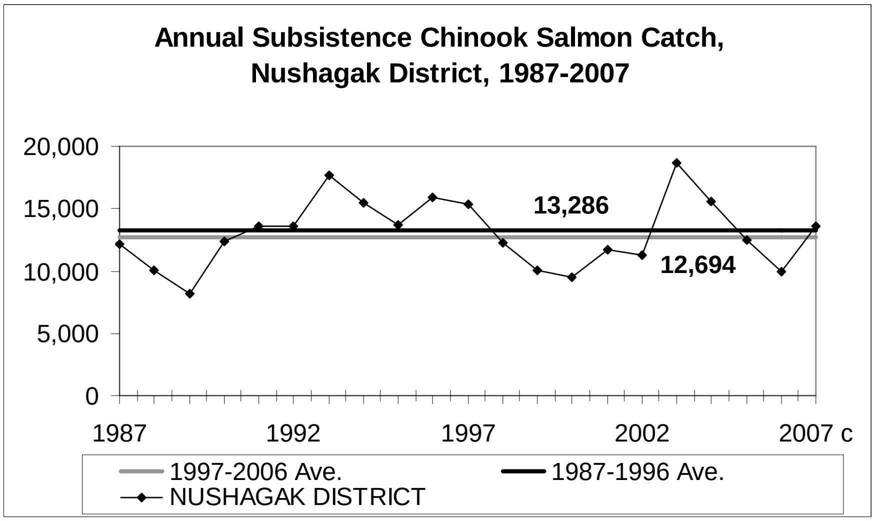
[a] Permit and harvest estimates prior to 1989 are based on the community where the permit was issued; estimates from 1989 to the present are based on the area fished, as first recorded on the permit.

[b] Includes even years only.

[c] A 5 year average was used as data was not available at the time of publication.

Figure 2-53 Bristol Bay Annual Subsistence Chinook Catch by District, 1987-2007





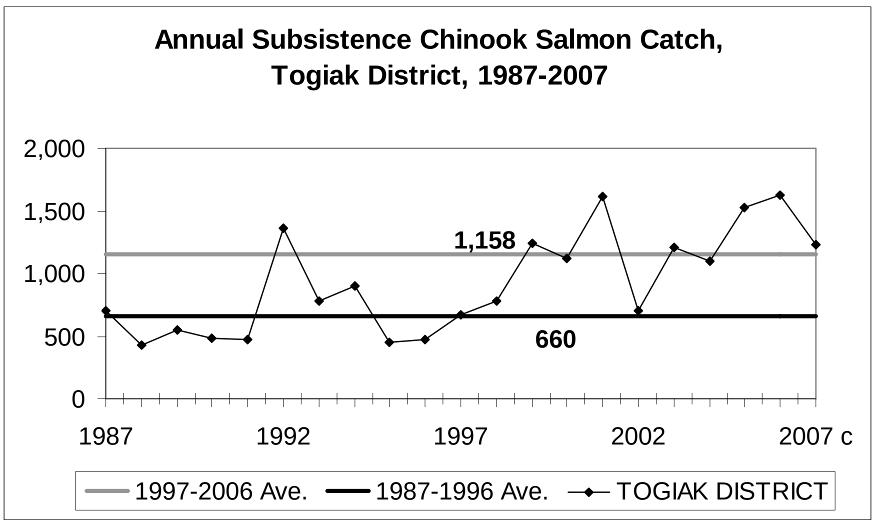
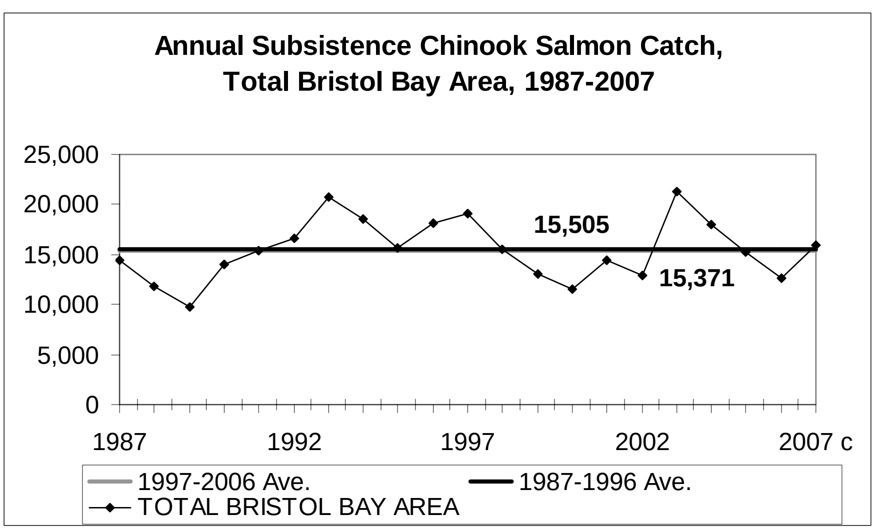


Figure 2-54 Bristol Bay Annual Subsistence Chinook Catch, Total All Districts, 1987-2007



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. The department 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 (ADF&G, 2007X) 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% below the 20-year average of 1,195(Table 2-43). The Ugashik District harvest of 1,445 Chinook salmon was 16% below the recent 20-year average of 1,705. Total Chinook harvest for the Togiak 7,755 fish, which was 92% 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.

Table 2-43 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

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. Figure 2-55 shows the historic trend in Bristol Bay commercial Chinook catches from 1987 through 2007, and Figure 2-56 provides a District level view.

Figure 2-55 Bristol Bay Annual Commercial Chinook Catch, Total All Districts, 1987-2007

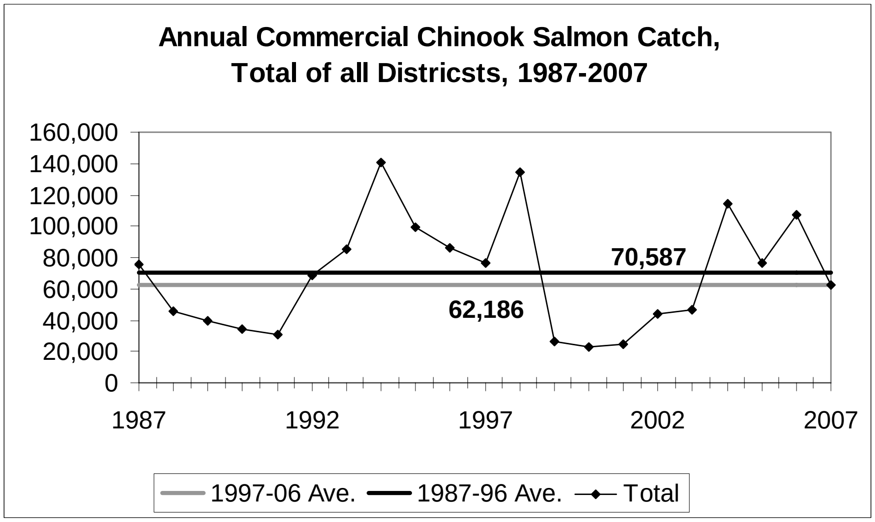
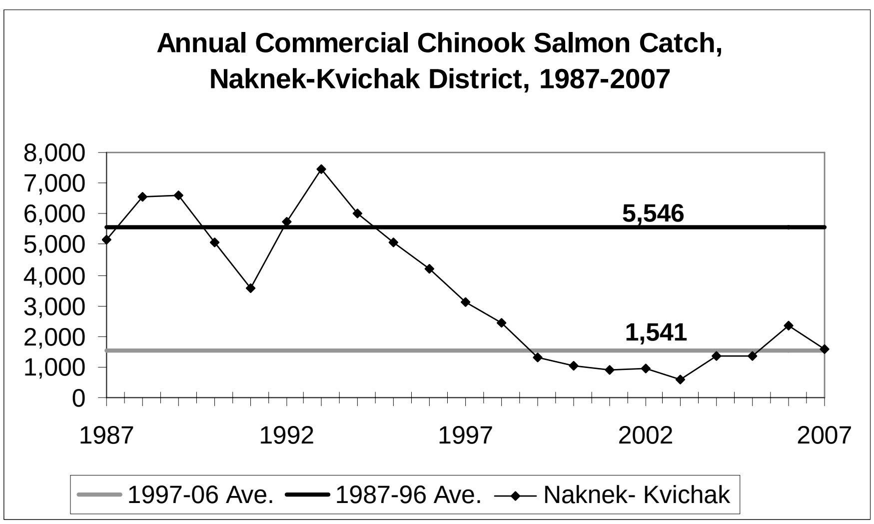
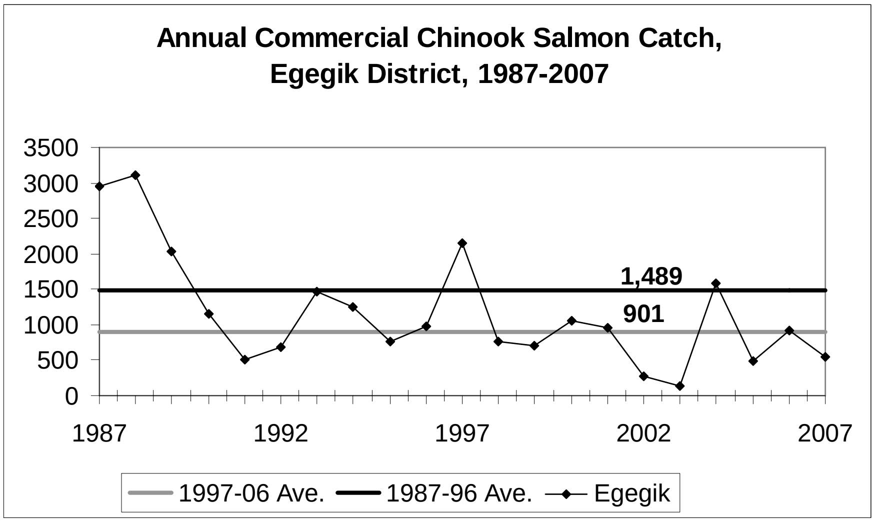
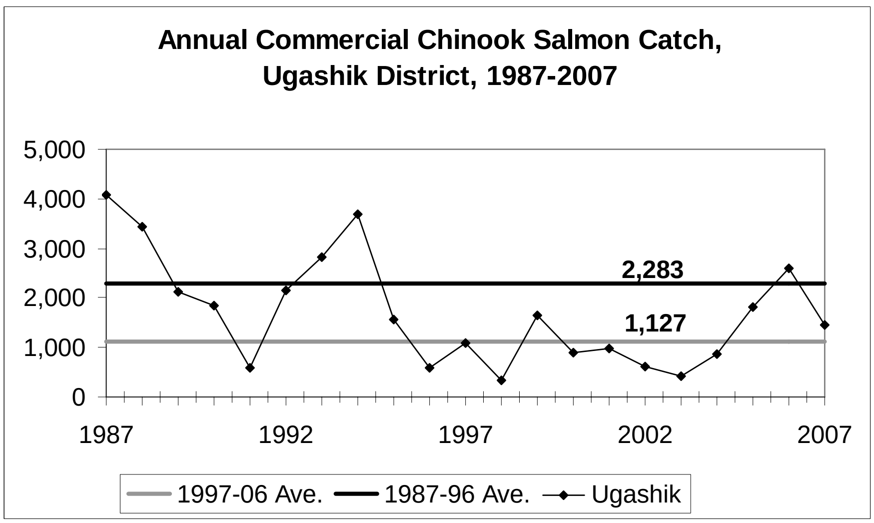
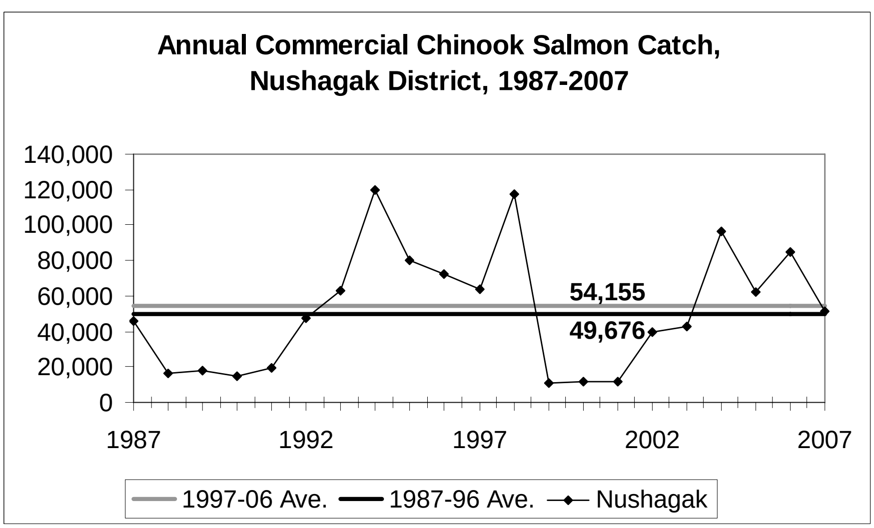


Figure 2-56 Bristol Bay Annual Commercial Chinook Catch by District, 1987-2007




Annual Commercial Chinook Salmon Catch,
Egegik District, 1987-2007
3500
3000
2500
2000
1500
1000
500
0
1,489
901
1987
1992
1997
2002
2007
1997-06 Ave.
1987-96 Ave.
Egegik


Annual Commercial Chinook Salmon Catch,
Ugashik District, 1987-2007
5,000
4,000
3,000
2,000
1,000
0
2,283
1,127
1987
1992
1997
2002
2007
1997-06 Ave.
1987-96 Ave.
Ugashik


Annual Commercial Chinook Salmon Catch,
Nushagak District, 1987-2007
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
54,155
49,676
1987
1992
1997
2002
2007
1997-06 Ave.
1987-96 Ave.
Nushagak

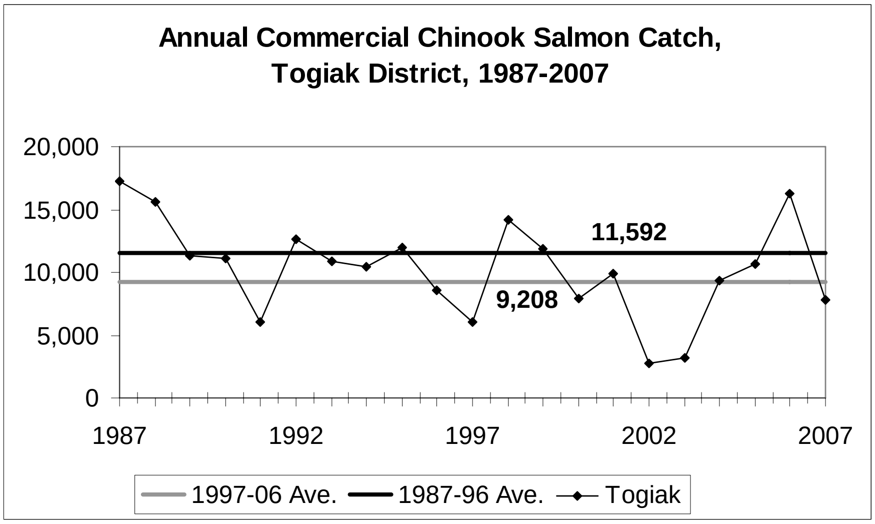


Table 2-44 provides the historic estimated ex-vessel value of Bristol Bay commercial salmon catch, by species, in thousands of dollars. It is evident that the Sockeye fishery dwarfs the Chinook fishery in terms of total value. Also evident is a significant decline in Chinook value since the mid-1990s. Chinook value fell from a peak of $1.6 million in 1994 to $132,000 in 2001. Since 2001, Chinook value has improved and the 2006 value of $1.3 million was greater than the 5, 10, and 20 year averages.

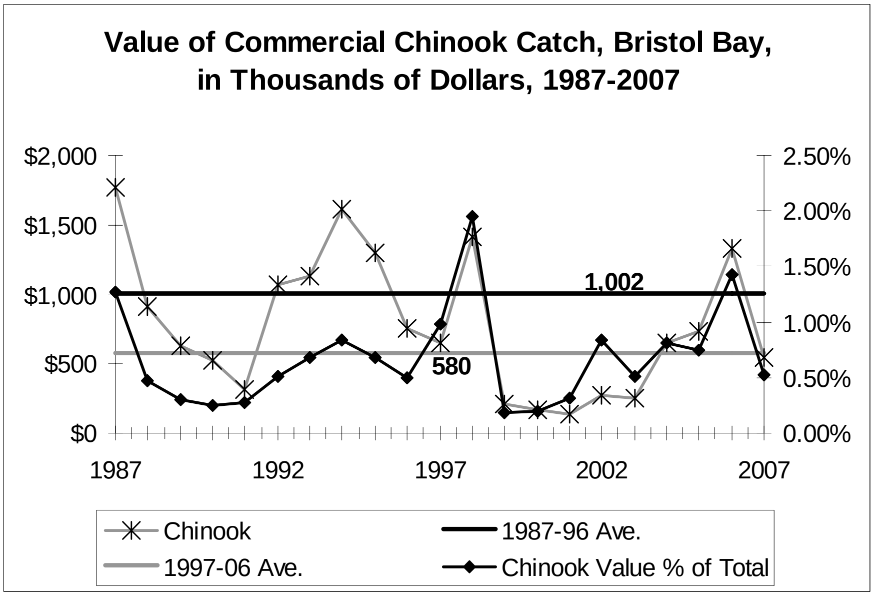
Figure 2-57 depicts the historical trends in commercial Chinook value as well as the percent of total value (right vertical axis) that Chinook value represents. Historically, Chinook value has never exceeded 2% of the total commercial value in Bristol Bay, and in 2007 it represented only about a half a percent.

Table 2-44 Estimated Ex-Vessel Value of the Commercial Salmon Catch by Species, in thousands of dollars, Bristol Bay, 1987-2007

Year	Sockeye	Chinook	Chum	Pink[a]	Coho	Total
1987	134,179	1,774	2,988		326	139,267
1988	185,153	909	4,815	1,205	2,108	194,190
1989	205,654	627	2,028		1,263	209,573
1990	210,057	524	1,740	553	564	213,439
1991	112,114	316	1,758		492	114,680
1992	204,604	1,073	1,526	251	792	208,245
1993	163,089	1,133	1,194		263	165,679
1994	188,918	1,616	1,201	41	1,019	192,796
1995	187,863	1,295	1,262		142	190,562
1996	150,968	754	606	7	336	152,671
1997	65,743	652	198		183	66,777
1998	70,529	1,414	234	7	503	72,688
1999	114,504	207	407		97	115,215
2000	83,940	165	232	16	403	84,756
2001	40,395	132	679		40	41,246
2002	31,899	272	290	0	19	32,479
2003	47,993	249	482		77	48,801
2004	77,897	647	398	19	158	79,119
2005	96,650	738	962		154	98,503
2006	90,233	1,330	1,350	19	178	93,110
20 Year Ave.	123,119	791	1,218	193	456	125,690
1987-96 Ave.	174,260	1,002	1,912	343	731	178,110
1997-06 Ave.	71,978	580	523	12	181	73,269
2007	103,192	549	1,288	0	127	105,156

Note: Value paid to fishermen, derived from price per pound times commercial catch. Blank cells represent no data.
a: Included even-years only.

Figure 2-57 Historical Value of Commercial Chinook Catch, Bristol Bay, 1987-2007



Recreational Fishery Situation and Outlook

This section has been excerpted from ADF&G special publication No. 06-29; Report to the Alaska Board of Fisheries for the Recreational Fisheries of Bristol Bay, 2004, 2005, and 2006 (ADF&G 2006x). 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% 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 2-45). Chinook salmon typically account for approximately 20-30% 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 (Westing et al. 2005). The 2005 sport harvest was about 11% 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 2-45 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: Statewide Harvest Survey database, and Mills 1979-1980, 1981a-b, 1982-1994; Howe et al. 1995, 1996, 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, In prep. a-b. 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.

2.2.8 Community Importance of the Bristol Bay Salmon Fisheries

Table 2-46, and the other tables and figures in this section, are reprinted from an ADOL analysis of local resident crew members, by census areas, with the region defined by ADOL 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 2-46 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 2-47. Overall, in the Bristol Bay Region, 669 resident permit holders and a total of 2,405 permit holder were active in 2006.

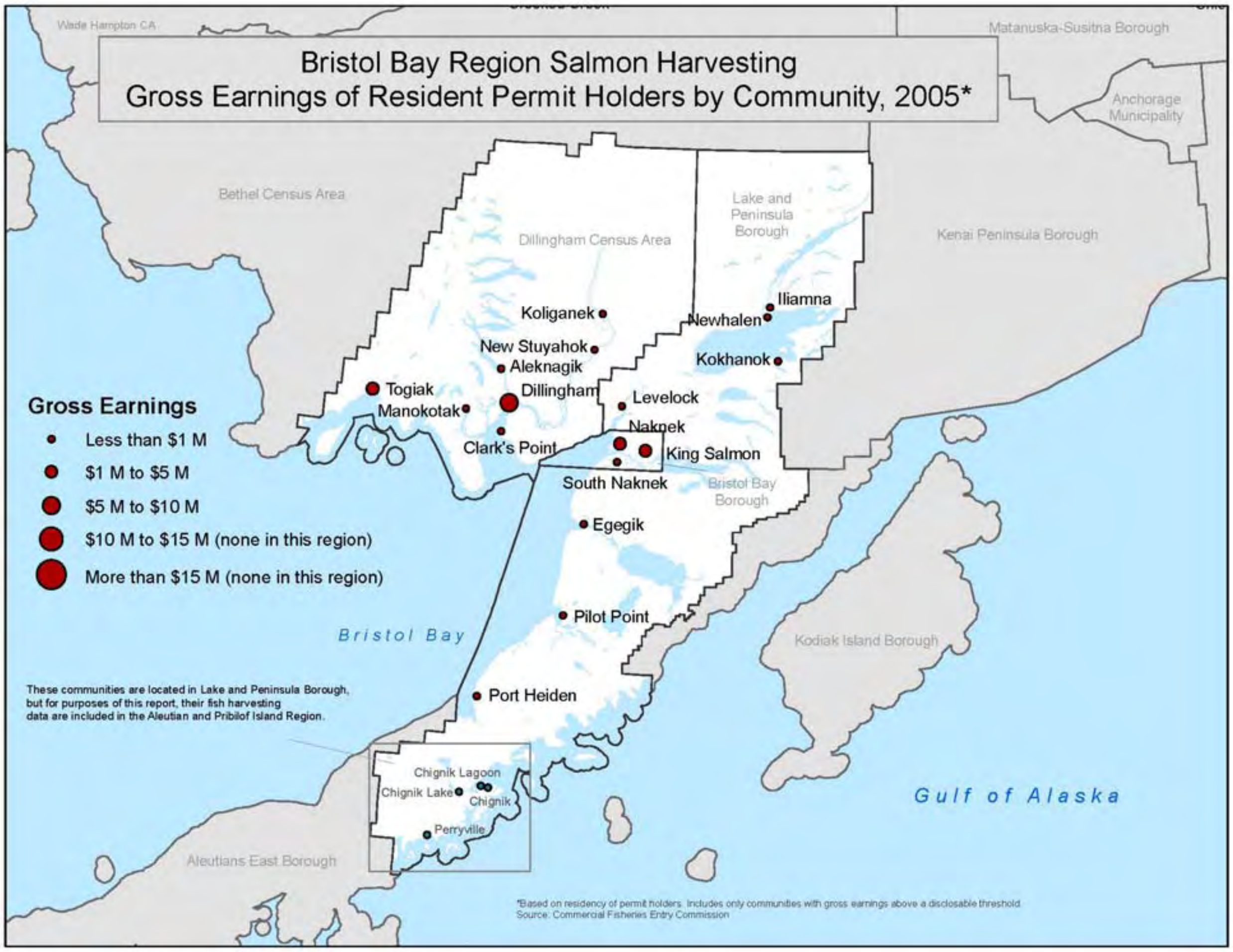
Table 2-47 Fishermen by Residency, Bristol Bay Region, 2001 - 2006

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.

Figure 2-58 depicts Bristol Bay Region resident permit holder salmon fishery gross earnings by community, as tabulated by ADOL. 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.

Figure 2-58 Bristol Bay Region Salmon Harvesting Gross Earnings of Resident Permit Holders by Community, 2005.



ADOL has also tabulated data on fish harvesting employment and earning by gear type in the Bristol Bay Region, which is shown in Table 2-48. 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. ADOL has not compiled this data for 2006 or 2007.

Table 2-48 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 ADOL, are shown in Table 2-49. 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 2-49 Fish Harvesting Employment by Species and Month, 2000 - 2006, Bristol Bay Region

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mo. Avg.
All Species[1]													
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 Alaska Department of Labor and Workforce Development, Research and Analysis Section

Figure 2-59 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.

Figure 2-59 Bristol Bay Region Canneries and Land-Based Seafood Processors

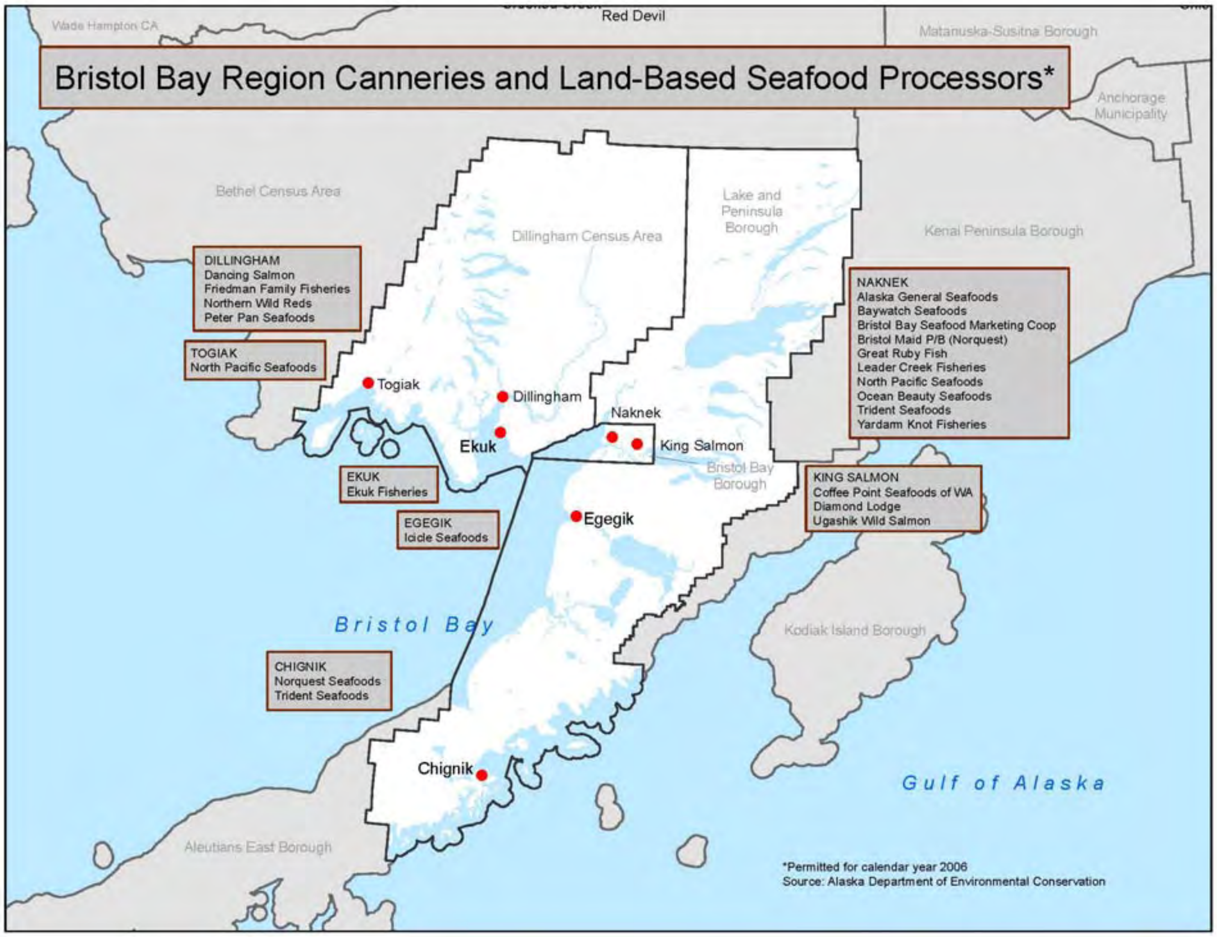


Table 2-50 provides estimated seafood processing employment, percent of non-resident workers, and percent of non-resident earnings in the Bristol Bay Region. The total worker count in the Bristol Bay Region seafood processing sector declined during the early 2000s. In 2000, the area's fisheries supported 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% 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 2-50 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 Alaska Department of Labor and Workforce Development, Research and Analysis Section

3 ALTERNATIVES CONSIDERED

The alternatives under consideration are discussed in detail in Chapter 2 of the EIS. That discussion also considers alternatives that have been considered by the Council, but have been eliminated from the current analysis.

3.1 Alternative 1: Status Quo

Alternative 1 retains the current program of Chinook Salmon Savings Area (SSA) closures triggered by separate non-CDQ and CDQ Chinook caps, along with the groundfish fleet's exemption to these closures as per regulations for Amendment 84.

The Chinook Salmon Savings Areas were established under BSAI Amendment 21b and revised under BSAI Amendment 58. If 29,000[4] Chinook salmon are caught by vessels participating in the pollock fisheries, the directed pollock fishing becomes prohibited in the savings areas. The timing of the closure depends upon when the limit is reached:

1. If the limit is triggered before April 15, the areas close immediately, through April 15. After April 15, the areas re-open, but are again closed from September 1-December 31.
2. If the limit is reached after April 15, but before September 1, the areas would close on September 1 through the end of the year.
3. If the limit is reached after September 1, the areas close immediately through the end of the year.

BSAI amendment 58 modified the initial Chinook salmon savings area measures (established under amendment 21b, ADF&G 1995a). Modifications resulting from amendment 58, implemented in 1999, included: a revised Chinook trigger limit, reduced from 48,000 to 29,000 over a four year period; year-round accounting of Chinook bycatch in the pollock fishery beginning on January 1 of each year; revised boundaries for the savings area closures; and new closure dates. The initial Chinook Salmon Savings Areas included an area south of the Pribilof Islands. This area was removed as a savings area under Amendment 58 (NMFS 1999). The revision to the closure dates under amendment 58 specified an additional closure from September 1-December 31, under the conditions listed in bullets 1-3 above.

Amendment 84 to the BSAI groundfish FMP exempted vessels from closures of both the Chum and Chinook SSAs provided they participate in the salmon bycatch inter-cooperative agreement (ICA) with the voluntary rolling hot spot (VRHS) system (NPFMC 2005). The VRHS system enables participants in the pollock fisheries to be responsive to current bycatch rates, and to fish in areas with relatively lower salmon bycatch rates, rather than rely on the static closure areas that were established based on historical bycatch rates.

Under the status quo, the CDQ Program receives allocations of 7.5% of the BS and AI Chinook salmon PSC limits. The CDQ allocation is further allocated among the six CDQ groups based on percentage allocations approved by NMFS on August 8, 2005. Each CDQ group would continue to be prohibited from fishing inside the Chinook salmon saving areas once that group's salmon bycatch limit is reached. In addition, the CDQ groups would continue to be exempt from the salmon savings area closures if they participate in the salmon bycatch ICA.

The status quo program also retains the current program of Chum Salmon Savings Area (SSA) closures triggered by separate non-CDQ and CDQ chum caps, with the fleet's exemption to these closures as per regulations for Amendment 84.

[4] This number includes the allocation of 2,175 Chinook salmon (7.5% of the limit) to the CDQ Program. The remaining 26,825 Chinook salmon are allocated as a prohibited species catch limit to the non-CDQ pollock fisheries.

For chum salmon, the Chum Salmon Savings Area was established in 1994 by emergency rule, and then formalized in the BSAI Groundfish FMP in 1995 under Amendment 35 (ADF&G 1995b). This area is closed to directed fishing for pollock from August 1 through August 31. Additionally, if 42,000[5] "other" salmon are caught in the Catcher Vessel Operational Area (CVOA) during the period August 15-October 14, the Chum Salmon Savings Area remains closed to directed fishing for pollock for the remainder of the period September 1 through October 14. As catcher processors are prohibited from fishing in the CVOA during the "B" season, unless they are participating in a CDQ fishery, only catcher vessels and CDQ fisheries are affected by the chum salmon PSC limit.

3.2 Alternative 2: Hard Cap

Alternative 2 would establish a Chinook salmon bycatch cap on the pollock fishery which, when reached, would require all directed pollock fishing to cease. Only those Chinook 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. Several different options as to the scale of management for the hard cap are provided under this alternative: 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 level (the sector-level cap for the inshore sector is further subdivided and managed at the individual cooperative level).

Hard caps are 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).

3.2.1 Component 1: Hard Cap Formulation

Component 1 would establish the annual hard cap number by one of two methodologies: option 1, based upon averages of historical numbers and other considerations as noted below, or option 2, which uses a modeling methodology to establish a framework for periodically setting the cap based upon relative impact rates on salmon returns. Component 1 sets the way the overall cap is formulated; this can be either applied to the fishery as a whole, or applying components 2 and 4, may be subdivided by sector (component 2) and cooperative (component 4). All annual caps are apportioned by season.

Suboptions to Option 1:

The following provides the originating rationale (by suboption number) for each cap listed in Chapter 2 of the EIS. 87,500 Chinook salmon (suboption i) represents the upper end of the range included in the BSAI fishery Incidental Take Statement (ITS). This amount is related to the ESA consultation on the incidental catch of ESA-listed salmonids in the BSAI groundfish trawl fisheries. The ITS represents a recent range of observations for Chinook bycatch in the BSAI trawl fisheries (NMFS 1-11-07 supplemental Biological Opinion). An ITS specifies the expected take of an ESA-listed species for the activity consulted on. The ESA-listed salmonids originate in the Pacific northwest; none are from Alaska or Western Alaska stocks. Additional information on the listed stocks, their relative contribution to the overall bycatch of Chinook salmon in the BSAI groundfish fisheries, and the ESA consultation, are covered in the EIS section on ESA-listed species.

[5] This number includes the allocation of 4,494 non-Chinook salmon to the CDQ Program. The remaining 37,506 non-Chinook salmon are allocated as a prohibited species catch limit to the non-CDQ pollock fisheries.

Suboptions ii-vi refer to average bycatch numbers by the pollock pelagic trawl fishery over a range of historical year combinations, from 1997 through 2006. Suboption ii) is the three year average from 2004-2006; iii) is the 5 year average from 2002-2006; iv) is the 10 year average (1997-2006), with the lowest year (2000) dropped prior to averaging, as an injunction on the fishery altered normal fishing patterns in that year. Suboption v) is the straight 10 year average (including all years 1997-2006), while vi) is the 10 year average (1997-2006), but with the highest year of bycatch (2006) dropped prior to averaging, providing contrast with subption iv).

The final two suboptions under consideration are the 5 year average from 1997-2001 (suboption vii) and the 10 year average 1992-2001 (suboption viii). These year combinations were chosen to include consideration of bycatch levels prior to accession to the Yukon River Agreement (signed in 2002). Additional information on the Yukon River Agreement and the Pacific Salmon Treaty itself are contained in Chapter 1.

For analytical purposes only, a subset of the numbers included in the 8 suboptions will be used in this document to assess the impacts on the pollock fishery of operating under a hard cap. This subset approximates the upper and lower endpoints of the suboption range, and two equidistant midpoints (Table 3-1).

Table 3-1 Range of Chinook salmon hard caps, in numbers of fish, for use in the analysis of impacts

	Chinook	CDQ	Non-CDQ
i)	87,500	6,563	80,938
ii)	68,100	5,108	62,993
iii)	48,700	3,653	45,048
iv)	29,300	2,198	27,103

3.2.1.1 Option 2: Index Cap (cap set relative to salmon returns)

Under this option, hard caps will be based on analysis and will consider run-size impacts. Since this approach involves a number of uncertain components (e.g., river-of-origin, ocean survival, future expected run-size), the cap could be derived from estimated probabilities that account for this uncertainty. This option provides a framework so that the hard cap regulation could be modified as scientific information improves. Such changes in the cap are envisioned on a periodic basis (say every 2-5 years) as data and input variables critical to the model calculations improve and merit revising the cap levels. Variables and data that are likely to change with improved scientific information include river of origin information on the stock composition of bycatch samples, stock size estimates by river system, and age-specific survival of salmon returning to individual river systems.

3.2.1.2 Seasonal distribution of caps

Any hard cap will be apportioned between the pollock A and B seasons, according to one of the following seasonal distribution options (A/B season):

Option 1-1 70/30

Option 1-2 58/42 (based on the 2000-2007 average distributional ratio of salmon bycatch between A and B seasons)

Option 1-3 55/4

Option 1-4 50/50

In analyzing the alternatives, Option 1-3 (55/45) is not evaluated in detail as the effects of this seasonal distribution are similar to 58/42 split. This option would not provide much contrast compared to the other seasonal distribution options, and its impacts are evaluated qualitatively in comparison to Option 1-2.

Suboption: Rollover the available salmon from the A to B season, within each management year.

3.2.2 Component 2: Sector Allocation

If this component is selected, the hard cap would be managed at the sector level for the fishery. This would result in separate sector level caps for the CDQ sector, the inshore catcher vessel (CV) sector, the mothership sector, and the offshore catcher processor (CP) sector.

Options for hard caps are as specified under component 1, with explicit seasonal distribution of caps as described in options 1-1 through 1-4. If component 2 is selected, the resulting overall fishery hard cap would then be subdivided into sector level caps using one of the following: option 1, or option 2a-2d, described below.

For analytical purposes, a subset of the sector allocation options which provides the greatest contrast will be used for detailed analysis. Option 1, option 2a, and option 2d encompass the range of impacts (high, medium, and low) for each sector. The impacts of options 2b and 2c will be assessed qualitatively in comparison to the other options.

3.2.2.1 Option 1: Sector allocation based on pollock allocation under AFA

Option 1) 10% of the cap to the CDQ sector, and the remaining allocated as follows: 50% inshore CV fleet; 10% for the mothership fleet; and 40% for the offshore CP fleet. This results in allocatons of 45% inshore CV, 9% mothership and 36% offshore CP.

This option is intended to follow the percentage allocation established for pollock under the AFA. Application of these percentages results in the following range of caps by sector, based upon the range of caps in component 1, option 1). Note that here the CDQ allocation of salmon is higher than under status quo (10% rather than 7.5%).

3.2.2.2 Option 2: Historical average of bycatch use by sector

There are four suboptions for Option 2.

Option 2) Historical average of percent bycatch by sector based on:

a) 3 year (2004-2006) average: CDQ 3%; inshore CV fleet 70%; mothership fleet 6%; offshore CP fleet 21%.
b) 5 year (2002-2006) average: CDQ 4%; inshore CV fleet 65%; mothership fleet 7%; offshore CP fleet 24%.
c) 10 year (1997-2006) average: CDQ 4%; inshore CV fleet 62%; mothership fleet 9%; offshore CP fleet 25%.
d) Midpoints of the ranges provided by Option 1 and Options 2(a-c) by sector: CDQ 6.5%; inshore CV fleet 57.5%; mothership fleet 7.5%; offshore CP fleet 28.5%

Under option 2, the subdivision of caps to each sector is based upon historical average percent bycatch, by sector, over 3, 5, and 10 year time periods, and using a mid-point between these ranges and those under option 1. Similar to the years included for the overall cap formulation, the historical years do not consider the most recent (and historical high) year of 2007. Detailed tables showing the breakout of these options and their effects on cap levels and cap allocations can be found in Chapter 2 of the EIS and will not be repeated here.

3.2.3 Component 3: Sector Transfer

Options under this component may be selected only if the Council recommends allocating salmon bycatch among the sectors under Component 2.

If the Council does recommend salmon bycatch allocations to the sectors under Component 2 but does not select one of these options, the salmon bycatch available to each sector could not change during the year and NMFS would close directed fishing for pollock once each sector reached its Chinook salmon bycatch allocation. The CDQ allocations would continue to be managed as they are under status quo, with further allocation of the salmon bycatch cap among the six CDQ groups, transferable allocations within the CDQ Program, and a prohibition against a CDQ group exceeding is salmon bycatch allocation.

Options 1 and 2 are mutually exclusive, which means that the Council may select Option 1 to allow transferable salmon bycatch allocations at the sector level or Option 2 to require NMFS to manage the reapportionment of salmon bycatch from one sector to another.

3.2.3.1 Option 1: Transferable salmon bycatch caps

Option 1) Allocate salmon bycatch caps to each sector and allow the entity representing each non-CDQ sector and the CDQ groups to transfer salmon bycatch trigger caps among the sectors and CDQ groups. (NMFS does not actively manage the salmon bycatch allocations).

Suboption: Limit transfers to the following percentage of salmon that is available to the transferring entity at the time of transfer:

a) 50%
b) 70%
c) 90%

Transfers are voluntary requests, initiated by the entity receiving a salmon bycatch cap, for NMFS to move a specific amount of a salmon bycatch cap from one entity to another entity.

Option 1 would require that each sector receiving a transferable salmon bycatch cap be represented by a legal entity that could:

- represent all vessels eligible to participate in the particular AFA sector and receive an annual permit for a specific amount of salmon bycatch on behalf of all of those vessels,
- be authorized by all members of the sector to transfer all or a portion of the sector’s salmon bycatch cap to another sector or to receive a salmon bycatch transfer from another sector on behalf of the members of the sector,
- be responsible for any penalties assessed for exceeding the sector’s salmon bycatch cap (i.e., have an agent for service of process with respect to all owners and operators of vessels that are members of the legal entity).

Once transferable salmon bycatch hard caps are allocated to a legal entity representing an AFA sector or to a CDQ group, NMFS does not actively manage these allocations. Each entity receiving a transferable hard cap would be prohibited from exceeding that cap and would be responsible to control its pollock fishing to prevent exceeding its salmon bycatch cap. Any overages of the salmon bycatch cap would be reported to NMFS Enforcement for possible enforcement action against the responsible entity.

3.2.3.1.1 Salmon bycatch monitoring suboptions under Option 1

Suboption 1: NMFS's recommendations

To ensure effective monitoring and enforcement of transferable salmon bycatch caps, NMFS recommends the following additional monitoring requirements be implemented for the inshore sector and the CDQ sector (if catcher vessels delivering to shoreside processors harvest pollock on behalf of CDQ groups in the future):

- Each catcher vessel, regardless of size, must have 100% observer coverage.
- Chinook salmon could be discarded at-sea only if first reported to the vessel observer.
- Shoreside processor monitoring requirements may have to be adjusted to incorporate a higher standard for salmon bycatch accounting. This could include such changes as modifying observer sampling protocols or reducing the flow of pollock into the factory to ensure that salmon do not pass the observer's sampling area without being counted.
- Electronic (video) monitoring in lieu of observers on catcher vessels would be allowed after a comprehensive assessment of the effectiveness of electronic monitoring to verify that salmon are not discarded.

Existing monitoring requirements in place for catcher/processors and motherships participating in the AFA pollock fisheries, including the directed fisheries for pollock CDQ, are adequate to obtain the salmon bycatch information needed to account for and transfer Chinook salmon among industry sectors.

Suboption 2: Council's February 2008 motion

In order to allow for effective monitoring and management requirements, except for catcher vessels that deliver unsorted cod ends, participation in the pollock fishery for vessels would require a minimum of 100% observer coverage or video monitoring to ensure no at-sea discards.

3.2.3.2 Option 2: Rollover unused salmon bycatch

Option 2) NMFS actively manages the salmon bycatch allocations to the non-CDQ sectors and would rollover unused salmon bycatch to other sectors still fishing based on the proportion of pollock remaining for harvest.

A "rollover" is a management action taken by NMFS to "reapportion" or move salmon bycatch from one sector to another through a notice in the Federal Register. Rollovers are an alternative to allowing each sector to voluntarily transfer salmon bycatch to another sector.

Under this option, if a non-CDQ AFA sector has completed harvest of its pollock allocation without using all of its salmon bycatch allocation, and sufficient salmon bycatch remains to be reapportioned, NMFS would reapportion the unused amount of salmon bycatch to other AFA sectors, including CDQ, through notification in the Federal Register. Any reapportionment of salmon bycatch by NMFS would be based on the proportion by sector of the total amount of pollock remaining for harvest by all sectors through the end of the year. Successive reapportionment actions would occur as each non-CDQ sector completes harvest of its pollock allocation.

The CDQ groups could receive rollovers of salmon bycatch from other sectors. However, because the CDQ groups will each receive a specific, transferable allocation of salmon bycatch (as occurs under status quo), unused salmon bycatch would not be reapportioned from an individual CDQ group to other CDQ groups or other AFA sectors.

3.2.4 Component 4: Cooperative provisions

Options under this component may be selected only if the Council recommends allocating salmon bycatch among the sectors under Component 2 and makes an allocation of salmon bycatch to the inshore sector. Component 4 would allow further allocation of transferable or non-transferable salmon bycatch allocations to the inshore cooperatives.

Each inshore cooperative and the inshore open access fishery (if the inshore open access fishery existed in a particular year) would receive a salmon allocation managed at the cooperative level. If the cooperative or open access fishery salmon cap is reached, the cooperative or open access fishery must stop fishing for pollock.

The initial allocation of salmon by cooperative within the shore-based CV fleet or to the open access fishery would be based upon the proportion of total sector pollock catch associated with the vessels in the cooperative or open access fishery. The annual pollock quota for this sector is divided up by applying a formula in the regulations which allocates catch to a cooperative or the open access fishery according to the specific sum of the catch history for the vessels in the cooperative or the open access fishery. Under 679.62(e)(1), the individual catch history of each vessel is equal to the sum of inshore pollock landings from the vessel's best 2 of the 3 years 1995 through 1997, and includes landings to catcher/processors for vessels that made landings of 500 mt or more to catcher/processors from 1995 through 1997. Each year, fishing permits are issued by cooperative, with the permit application listing the vessels added or subtracted. Fishing in the open access fishery is possible should a vessel leave their cooperative, and the shore-based CV quota allocation is partitioned to allow for an allocation to an open access fishery under these circumstances.

The range of cooperative level allocations in this analysis is based upon the 2008 pollock quota allocations, and the options for the range of sector splits for the shore-based CV fleet based upon component 2, options 1 and 2 applied to component 1 options 1 and 2   The cooperative level allocations are listed in Chapter 2 of the EIS. All inshore sector catcher vessels have been part of a cooperative since 2005. However, if this component is selected by the Council, regulations would accommodate allocations of an appropriate portion of the salmon bycatch cap to the open access fishery if, in the future, a vessel or vessels did not join a cooperative.

For analytical purposes, the range of cooperative allocations will be analyzed using a subset of the full range under consideration, as indicated previously. Allocations as shown in Chapter 2 of the EIS and are based upon annual cap suboptions only. However, these annual allocations are further apportioned by season according to options 1-1 through 1-4. The range of inshore cooperative and open access fishery level allocations resulting from application of the sector split options to the range of seasonal apportionments for the subset of caps for analysis are shown in Chapter 2 of the EIS

3.2.4.1 Cooperative transfer options

These options would only apply if the Council selected sector allocations under Component 2 and further allocated the inshore sector allocation among the cooperatives and the inshore open access fishery (if the inshore open access fishery existed in a particular year) under Component 4.

When a salmon cooperative cap is reached, the cooperative must stop fishing for pollock and may:

Option 1) Transfer (lease) its remaining pollock to another inshore cooperative for the remainder of the season or year. Allow inter-cooperative transfers of pollock to the degree currently authorized by the AFA.

Option 2) Transfer salmon bycatch from other inshore cooperatives (industry initiated)

Suboption: Limit transfers to the following percentage of salmon that is available to the transferring entity at the time of transfer:

a) 50%
b) 70%
c) 90%

The Council could select Option 1 or Option 2 or both.

3.2.4.1.1 Salmon bycatch monitoring suboptions under Option 2

Suboption 1: NMFS's recommendations

To ensure effective monitoring and enforcement of transferable salmon bycatch caps, NMFS recommends the following additional monitoring requirements be implemented for the inshore sector and the CDQ sector (if catcher vessels delivering to shoreside processors harvest pollock on behalf of CDQ groups in the future):

- Each catcher vessel, regardless of size, must have 100% observer coverage.
- Chinook salmon could be discarded at-sea only if first reported to the vessel observer.
- Shoreside processor monitoring requirements may have to be adjusted to incorporate a higher standard for salmon bycatch accounting. This could include such changes as modifying observer sampling protocols or reducing the flow of pollock into the factory to ensure that salmon do not pass the observer's sampling area without being counted.
- Electronic (video) monitoring in lieu of observers on catcher vessels would be allowed after a comprehensive assessment of the effectiveness of electronic monitoring to verify that salmon are not discarded.

Existing monitoring requirements in place for catcher/processors and motherships participating in the AFA pollock fisheries, including the directed fisheries for pollock CDQ, are adequate to obtain the salmon bycatch information needed to account for and transfer Chinook salmon among industry sectors.

Suboption 2: Council's February 2008 motion

In order to allow for effective monitoring and management requirements, except for catcher vessels that deliver unsorted cod ends, participation in the pollock fishery for vessels would require a minimum of 100% observer coverage or video monitoring to ensure no at-sea discards.

3.3 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 a way similar to those 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.

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% of the BS 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.

Five components are included under this alternative. 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).

3.3.1 Component 1: Trigger cap formulation

The trigger cap amount would be within the range of hard caps established under Alternative 2

Suboption: Distribution of the trigger cap to the A and B season closures shall be as specified under Alternative 2, Component 1, option 1, seasonal distribution of caps suboptions.

3.3.2 Component 2: Management

Triggered area closures could be managed in a number of different ways depending on the combination of components and options selected by the Council.

Under Component 2, without Option 1 (intercooperative agreement management) or Components 3 and 4, NMFS would manage a single trigger cap for the non-CDQ pollock fisheries. Once the trigger cap was reached, NMFS would close the areas selected by the Council under Component 5 to directed fishing for pollock by all vessels fishing for the non-CDQ sectors. The trigger cap allocation to the CDQ Program would be further divided among the six CDQ groups as occurs under status quo. Each CDQ group would be prohibited from fishing inside the closure area(s) once the group's trigger cap is reached.

If the Council selected sector allocations under Component 3, NMFS would issue closures of the area(s) selected under Component 5 to each non-CDQ sector individually and separately.

If the Council selected transferable sector allocations under Component 4, option 1, NMFS would not actively manage the pollock fisheries by issuing 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 the area(s) selected under Component 5 after the sector's trigger cap is reached.

3.3.2.1 Option 1: Allow ICA management of triggered closures

Under Option 1, a NMFS-approved salmon bycatch reduction intercooperative agreement (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 subdivision of the trigger caps under the ICA would not be proscribed by the Council or NMFS regulations. The ICA would decide how to manage participating vessels to avoid reaching the trigger closures as long as possible during each season. However, NMFS regulations would specify that the ICA would be required to include a closure to the area(s) specified under Component 5 once the overall trigger cap selected under Component 1 is reached.

Vessels participating in the ICA would operate under the same fishery level caps for the A and B seasons as apply to any vessels not participating in the ICA. NMFS would continue to manage triggered area closures for vessels not participating in the ICA as described in Section 3.3.2 above. Vessels participating in the ICA would be exempt from NMFS's area closures, and would instead be subject to the ICA closures. If the Council does not select any sector allocation of the trigger caps under Component 3, the area closures that would result from NMFS management and ICA management would occur at the same time. NMFS's closure would apply to vessels not participating in the ICA and the ICA's closure would apply to vessels participating in the ICA.

Under Component 3, the NMFS-managed seasonal caps may be further subdivided among the inshore, catcher/processor, or mothership sectors. The ICA, however, would operate only under the fishery-level seasonal caps established under Component 1. If the Council does select sector allocations of the trigger caps under Component 3, then NMFS's closures of the area(s) by sector may occur at different times than the ICA's closures because the ICA would not be required to follow the sector allocations of trigger caps that would govern NMFS's area closures.

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.

3.3.3 Component 3: Sector Allocation

Sector allocations are equivalent to those under consideration for hard caps (Section 3.2.2, Options 1, 2a-2d).

When a sector reaches its salmon bycatch cap, NMFS would close the area(s) specified under Component 5 to directed fishing for pollock by that sector for the remainder of the season. The remaining sectors may continue to fish in the area(s) unless they reach their sector salmon bycatch cap. Pollock fishing could continue outside of the closure areas until either the pollock allocation to the sector is reached or the pollock fishery reaches a seasonal (June 10) or annual (November 1) closure date.

If the Council selected Option 1 for ICA management of the trigger cap, vessels participating in the ICA would not be subject to NMFS's sector-level closures.

If transferable sector trigger caps are selected under Component 4, then each sector would be prohibited from fishing inside the closure area(s) once the sector's trigger cap was reached. NMFS would not issue Federal Register notices closing directed fishing for pollock by a sector under transferable trigger cap allocations.

The CDQ allocations would continue to be managed as they are under status quo, with further allocation of the salmon bycatch cap among the six CDQ groups, transferable trigger cap allocations, and a prohibition against a CDQ group fishing inside the closure area(s) once the group's salmon bycatch cap is reached.

3.3.4 Component 4: Sector Transfer

Options under this component may be selected only if the Council recommends allocating the salmon bycatch trigger cap among the sectors, under Component 3.

Options 1 and 2 are mutually exclusive, which means that the Council may select Option 1 to allow transferable salmon bycatch trigger caps at the sector level or Option 2 to require NMFS to manage the reapportionment of salmon bycatch trigger from one sector to another. But, the Council could not select both Option 1 and Option 2.

3.3.4.1 Option 1: Transferable salmon bycatch caps

Option 1) Allocate salmon bycatch trigger caps to each sector and allow the entity representing each non-CDQ sector and the CDQ groups to transfer salmon bycatch trigger caps among the sectors and CDQ groups. (NMFS does not actively manage the salmon bycatch allocations).

Suboption: Limit salmon bycatch trigger cap transfers to the following percentage of salmon that is available to the transferring entity at the time of transfer:

a) 50%
b) 70%
c) 90%

Transfers are voluntary requests initiated by the entity receiving a salmon bycatch trigger cap for NMFS to move a specific amount of a salmon bycatch trigger cap from one entity to another entity.

Option 1 would require that each sector receiving a transferable salmon bycatch trigger cap be represented by a legal entity that could:

- represent all vessels eligible to participate in the particular AFA sector and receive an annual permit for a specific amount of salmon bycatch on behalf of all of those vessels,
- be authorized by all members of the sector to transfer all or a portion of the sector's salmon bycatch cap to another sector or to receive a salmon bycatch transfer from another sector on behalf of the members of the sector,
- be responsible for any penalties assessed for exceeding the sector's salmon bycatch cap (i.e., have an agent for service of process with respect to all owners and operators of vessels that are members of the legal entity).

Once transferable salmon bycatch trigger caps are allocated to a legal entity representing an AFA sector or to a CDQ group, NMFS does not actively manage these trigger cap allocations. Each entity receiving a transferable trigger cap would be prohibited from fishing within the closure area(s) once the trigger cap was reached.

If transferable trigger caps were recommended by the Council, transfers could be allowed between individual CDQ groups and any of the three non-CDQ sectors. A transferable salmon trigger cap would allow a sector or CDQ group to obtain additional salmon bycatch to allow that sector or CDQ group to continue to fish within the areas subject to closure for a longer period of time. It is also possible that a sector or CDQ group could be closed out of the area after reaching its salmon bycatch cap, transfer in more salmon bycatch, and allow the area to reopen again for that sector of CDQ group.

Transferable sector trigger caps likely would not be a viable option if the Council selected Component 2 Option 1 to allow ICA management of triggered closure areas. Transferable salmon bycatch caps at the sector level require a contractual arrangement among all participants in a sector to establish the legal entity required to receive and transfer salmon bycatch allocations. If even one vessel in a sector joined a salmon bycatch intercooperative, then it is unlikely that this vessel also would join with other members of a sector to create the legal entity necessary to manage transferable salmon bycatch caps outside of the ICA.

3.3.4.1.1 Salmon bycatch monitoring suboptions under Option 1

The monitoring suboptions are the same two suboptions as presented under Alternative 2, Component 3

Suboption 1: NMFS's recommendations

Suboption 2: Council's February 2008 motion

In order to allow for effective monitoring and management requirements, except for catcher vessels that deliver unsorted cod ends, participation in the pollock fishery for vessels would require a minimum of 100% observer coverage or video monitoring to ensure no at-sea discards.

3.3.4.2 Option 2: Rollover unused salmon bycatch

Option 2) NMFS actively manages the salmon bycatch trigger cap allocations to the sectors and would rollover unused salmon bycatch from the sector level trigger caps to other sectors still fishing based on the proportion of pollock remaining for harvest by each sector.

Option 2 could apply if the Council selected to allocate the non-CDQ trigger caps among the inshore, catcher/processor, and mothership sectors and the Council decided (1) not to recommend Component 2 Option 1 to allow ICA management of the trigger caps, (2) not to allow transferable trigger caps among the sectors (Component 4, Option 1), or (3) the non-CDQ AFA sectors could not form the legal entity necessary to receive transferable salmon bycatch caps. Under Option 2, NMFS would rollover or reapportion the salmon bycatch trigger caps among the sectors. A reapportionment of salmon bycatch would occur if a sector completed harvest of its pollock allocation and had some salmon bycatch trigger cap allocation remaining. That remaining salmon bycatch trigger cap could be reapportioned to other sectors still fishing based on the proportion of pollock remaining to be harvested.

3.3.5 Component 5: Area options

Chinook closure areas may be triggered for the A season and B season. The areas described in detail in Chapter 2 of the EIS and are designed to cover where 90% of Chinook bycatch has occurred from the years 2000-2007. In the A season, the designated area closes immediately when triggered and remains closed for the duration of the A season. In the B season, three areas close simultaneously when the trigger is reached and remain closed for the duration of the B season (until December 31st). If the trigger for the B season is reached prior to August 15, the areas would remain open and close on August 15 through December 31.

When trigger caps are reached (either by the fishery or, if the Council selects Component 3, by sector), the area closes for the remainder of the season (with the exception of timing constraints for the B season closure to not close prior to August 15).

4 ANALYSIS OF THE ALTERNATIVES

This analysis addresses the potential costs and benefit of each of the proposed alternatives on the BSAI trawl pollock fishery, as well as on potentially affected subsistence, commercial, personal use, and sport salmon fisheries, and on communities dependent on those fisheries. Section A.2 of this RIR provides a brief summary of relevant characteristics of these fisheries and dependent communities.

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., passive-use values, domestic and international seafood demand) are also unavailable, and time and resource constraints prevent their preparation for use in this analysis.

Nonetheless, the following regulatory impact review, initial regulatory flexibility analysis, and supporting text use 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.

For clarity of presentation, a simple analytical convention is adopted for the foregone gross revenue and gross revenue-at-risk assessment (presented below), in which the 2003-2007 fisheries are reexamined, in succession, as if each of the proposed Chinook salmon bycatch minimization alternatives 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 2003-2007 records are used because they represent the most recent complete data sets for the fisheries in question and cover the timeframe when Chinook salmon bycatch has been increasing to record levels.

Approach in this Analysis

The first section of the analysis of each alternative presents potential benefits attributable to, or deriving from, the alternative salmon bycatch minimization measures under consideration by NMFS and the Council. The second section of the analysis of each alternative presents the costs associated with the salmon bycatch minimization measures under consideration. These analyses are conducted from the point of view of all citizens of the United States; that is, they seek to address the question: "What is likely to be the net benefit to the nation?"

The salmon bycatch minimization alternatives discussed in this analysis address concerns that ongoing bycatch of Chinook salmon may be adversely affecting Western Alaska stocks of origin and the associated subsistence, commercial, personal use, and recreational fisheries that are dependent on those stocks. In economic parlance, one might say that ongoing salmon bycatch is 'consuming' fish that, a portion of which, can be expected to be utilized upon return to natal rivers. Thus, a key benefit of the proposed salmon bycatch minimization measures is the extent to which they prevent salmon from being bycaught so that they may return to their natal rivers and be utilized by those who have allocative rights to Chinook salmon.

The benefits associated with the salmon bycatch minimization measures are addressed under two major headings, as follows:

1. Passive-use (or non-use) benefits
2. Use benefits (including non-consumptive use benefits, consumptive use benefits, non-market benefits, and market benefits) and productivity benefits

The costs associated with the fishing impact minimization measures are addressed under six major headings:

1. Potentially Foregone Revenue and/or Revenue at risk
2. Fleet Operational effects
3. Management and Enforcement Implications
4. Product quality, Markets and Consumers
5. Impacts on related fisheries
6. Impacts on dependent communities

4.1 Costs and Benefits Overview

This section will, for the initial review draft, serve as an overall discussion of the potential range effects on costs and benefits of the proposed Chinook salmon bycatch minimization measures. Given the breadth of the alternative set, the analysis of direct effects discussed generally below and more specifically in the analysis of direct effects of the alternatives, has been reduced to a set of scenarios that still provide a large amount of tabular information on direct effects. As will be seen in that direct effects analysis, the impacts range from zero to virtual shutdown of the pollock fishery and includes a nearly continuous range of level of effect within those bounds. As such, it is difficult to present a discussion of the various impacts on costs and benefits that is directly associated to such a wide range of possible impacts. Thus, what is presented here, applies in general to the impacts of the alternatives proportional to the severity of the constraint imposed by the alternative in binding upon industry. It is envisioned that the public review draft of this RIR, will include discussions of these cost and benefit categories that are specific to the alternatives, and hopefully specific to a preliminary preferred alternative set that is analytically tractable.

4.1.1 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 and/or enhance the asset being assessed?). Because no market, in the traditional economic sense, exists within which protections or enhancement of environmental assets is 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 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 Endangered Species Act (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.

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 the public is consciously aware of risks posed to a unique asset (e.g., the Amazon rain forest), they 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 contributes 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 whales of various species), isolating a passive-use value unique to Chinook salmon in the EEZ off Alaska 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 BSAI, whether or not it is revealed in a market, has embedded in it the value of salmon and other species such as great whales. 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 BSAI Chinook salmon. 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.

4.1.2 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, within the context of its potential relationship to fishing impact minimization measures.

Non-market/non-consumptive uses are, in general, associated with private recreation or leisure activities. A typical example of such a use is 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 may represent an important aspect of the aggregate benefit attributable Chinook salmon bycatch minimization in the BSAI .

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 subsistence 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 salmon bycatch minimization measures designed to minimize adverse impacts from commercial fishing gear. 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. In the present context, guided sport fishing utilizing catch and release would 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, benefit of this type will necessarily be imbedded in the overall assessment of prevention of salmon bycatch and what that might mean for Western Alaska river systems.

An additional class of market/consumptive-use values may be identified in connection with salmon bycatch minimization measures in the BSAI. 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.

4.1.3 Industry Revenue and Cost Effects

Foregone Revenue and Revenue at Risk[2]

This section examines the expected potential impacts on industry gross revenues attributable to potential reductions in pollock products being delivered to market as a result of fishery closure (foregone revenue) and/or due to relocation of effort outside of a closure area (Revenue At Risk). Accurate estimates of the change in gross revenues from reduced production associated with the Chinook salmon bycatch minimization alternatives require information on (1) the volume of production coming from fishing areas that would be affected by each of the Chinook salmon bycatch minimization measures, for each of the fleet sectors; (2) the extent to which each fleet sector can and would re-deploy displaced fishing effort into other fishing areas in an attempt to mitigate the loss of production from the areas directly affected by the fishing impact minimization measures; and (3) the relative productivity of the fleet sectors in the new areas compared with the EFH-affected areas.

[2] "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 foregone 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.

Currently, it is possible to estimate only the first of these (i.e., the volumes of production coming from areas that would no longer be available to fishermen under each of the alternatives). However, estimates of the volumes of production coming from fishing areas restricted by the Chinook salmon bycatch minimization measures, combined with data on historical first wholesale prices, allows estimates of the gross revenues, for each fleet sector, potentially foregone or placed at risk under the different alternatives. 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 a crude 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 foregone and/or at-risk estimate becomes an approximation of the potential maximum foregone gross revenues directly attributable to the proposed action.

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 salmon bycatch minimization measures. This is done without specifying where else the fleet segment might have operated (or at what cost), except to assume that the effort would have been is 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 foregone under each.

To be precise, the gross revenues at risk were estimated using information about the following: (1) projected fleet segment harvests for the 2003-2007 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 2003–2007; (3) estimated product mix and first wholesale product values for all pollock products by sector and year from 2001–2007. The years 2003–2007 were chosen as the base years for the analysis because they represent a consistent data series (new catch accounting began in 2003) and also include the years when Chinook salmon bycatch began to rise to record levels. Harvest tonnages were valued using annual round weight equivalent first wholesale prices derived from the catch accounting system (Hyatt, 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 4-1 First Wholesale value of retained Pollock by sector, 2003-2006 ($ millions)

Sector	Season	2003		2004		2005		2006	
		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
	B	$55.4	$172.9	$46.0	$188.2	$62.3	$244.2	$60.5	$241.1
	Total	**$116.4**	**$373.6**	**$104.2**	**$442.0**	**$120.0**	**$526.3**	**$123.5**	**$499.8**
M	A	$6.0	$36.7	$6.7	$44.1	$6.9	$28.4	$6.2	$50.7
	B	$5.4	$32.4	$5.0	$33.2	$5.5	$24.1	$5.0	$43.9
	Total	**$11.3**	**$69.1**	**$11.8**	**$77.3**	**$12.4**	**$52.5**	**$11.1**	**$94.6**
S	A	$0.0	$206.3	$0.0	$220.9	$0.0	$262.4	$0.0	$249.2
	B	$0.0	$249.3	$0.0	$225.4	$0.0	$273.6	$0.0	$268.6
	Total	**$0.0**	**$455.6**	**$0.0**	**$446.3**	**$0.0**	**$535.9**	**$0.0**	**$340.5**
All	A	$66.9	$443.7	$64.9	$518.9	$64.6	$572.9	$69.2	$558.7
	B	$60.8	$454.6	$51.1	$446.7	$67.8	$541.9	$65.4	$553.6
	Total	**$127.7**	**$898.3**	**$116.0**	**$965.6**	**$132.4**	**$1,114.8**	**$134.6**	**$1,112.3**

Table 4-2 First Wholesale Value of Retained Pollock by Sector, CDQ and Non-CDQ Combined, 2003-2006

Sector	Season	2003 Total	2004 Total	2005 Total	2006 Total
CP	A	$261.7	$312.1	$339.7	$321.8
	B	$228.3	$234.2	$306.5	$301.5
	Total	**$490.0**	**$546.2**	**$646.3**	**$623.3**
M	A	$42.6	$50.8	$35.3	$56.9
	B	$37.8	$38.2	$29.6	$48.8
	Total	**$80.4**	**$89.0**	**$64.9**	**$105.8**
S	A	$206.3	$220.9	$262.4	$249.2
	B	$249.3	$225.4	$273.6	$268.6
	Total	**$455.6**	**$446.3**	**$535.9**	**$340.5**
All	A	$510.6	$583.8	$637.4	$627.9
	B	$515.4	$497.8	$609.7	$619.0
	Total	**$1,026.0**	**$1,081.6**	**$1,247.2**	**$1,246.9**

Table 4-3 Round weight Equivalent First Wholesale value of retained Pollock by sector, 2003-2006 ($/mt)

Sector	Season	2003		2004		2005		2006	
		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
	B	$712	$533	$591	$591	$766	$768	$748	$748
	Total	**$899**	**$689**	**$804**	**$818**	**$893**	**$979**	**$915**	**$920**
M	A	$716	$706	$806	$850	$1,101	$552	$963	$982
	B	$428	$412	$403	$429	$566	$304	$514	$550
	Total	**$543**	**$529**	**$564**	**$598**	**$777**	**$402**	**$693**	**$720**
S	A	$0	$797	$0	$849	$0	$1,018	$0	$947
	B	$0	$633	$0	$596	$0	$700	$0	$700
	Total	**$0**	**$698**	**$0**	**$699**	**$0**	**$827**	**$0**	**$526**
All	A	$1,116	$839	$1,081	$972	$1,090	$1,083	$1,144	$1,043
	B	$672	$570	$565	$577	$745	$688	$723	$704
	Total	**$849**	**$677**	**$771**	**$738**	**$881**	**$847**	**$892**	**$707**

Table 4-4 Round Weight Equivalent First Wholesale Value of Retained Pollock by Sector, CDQ and Non-CDQ Combined, 2003–2006

Sector	Season	**2003 Total**	**2004 Total**	**2005 Total**	**2006 Total**
CP	A	$971	$1,141	$1,246	$1,170
	B	$567	$591	$767	$748
	Total	**$729**	**$816**	**$962**	**$919**
M	A	$708	$844	$612	$980
	B	$414	$425	$333	$546
	Total	**$531**	**$593**	**$443**	**$717**
S	A	$797	$849	$1,018	$947
	B	$633	$596	$700	$700
	Total	**$698**	**$699**	**$827**	**$526**
All	A	$867	$983	$1,084	$1,053
	B	$581	$576	$694	$706
	Total	**$695**	**$742**	**$850**	**$726**

The analysis of revenue impacts of the alternatives was conducted in terms of two gross revenue categories.[5] The first is the potential forgone gross revenues that could have been generated under various Chinook salmon bycatch hard caps contained within Alternative 2. 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 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 an alternative could not have been made up elsewhere by that fleet sector would at-risk 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 by fishing in another require information on the following: (1) the volume of production affected by the various restrictions, (2) the extent to which each fleet sector would have redirected its operations into other fishing areas, and (3) the productivity of the fleet sectors in the new areas. Currently it is possible to estimate only the first of these, i.e., the volumes of production coming from areas that would no longer have been available to fishermen under each triggered closure scenario contained within Alternative 3.

As noted above, revenues at risk are foregone **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 revenues that might be lost for 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 foregone catch is straightforward. For example, if one assumes that a given sector is able to make up 10% of the harvest elsewhere, the estimated at risk gross revenue impact would be multiplied by 0.90; if the assumption is that, say, 20% 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 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 foregone. Most of the discussion relevant to this approach can be found in this section; Section 3.4, which summarizes the benefits and costs between alternatives; and Section 3.5, which deals with the distribution of impacts among areas, fisheries, fleet components, and dependent communities.

4.1.4 Fleet Operational Effects

Under the alternatives to the status quo, fishermen would be expected to attempt to minimize losses associated with foregone 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) 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 in an area unaffected by

[5] One would, as previously noted, prefer to base these economic impact evaluations on net, rather than gross, measures. However, insufficient data are available to make this conversion. While the analysts in no way wish to imply that gross and net values are proxies for one another, given the data limitations, gross figures are presented in the expectation that they can provide useful insights into the nature of the impacts which may be expected to accompany adoption of any one of the alternatives under consideration.

Chinook salmon bycatch minimization measures; (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 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 the 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 effect 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.

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 Chinook salmon bycatch minimization alternatives on operating 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]; 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 a maximum speed and capacity in order to harvest as much pollock as possible prior to a hard cap induced fishery closure.

Projecting 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 relative to the status quo under each of the proposed alternatives provided that a hard cap was reached and/or a trigger closure level of bycatch was 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.

What economists refer to as the ‘opportunity cost’ of labor is another variable cost that may be increased by triggered closure scenarios contained within Alterntative 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, fishing impact minimization measures may increase transit time to and from fishing grounds; they may force fishermen 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 or gear, 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, makes 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, under attainment of a hard cap, some portion of TAC would remain unharvested and represents foregone 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 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. 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 the 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, bait, 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 foregone 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 for the fish 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 gear
- Costs of bycatch avoidance measures, or (if these efforts are unsuccessful) premature closure due to excessive bycatch
- Reduced CPUE due to less concentrated target stocks;
- Potential gear conflicts
- Effects on processors built for higher throughput
- Safety impacts (addressed separately below in Section 3.1.2.4)

4.1.4.1 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, rates of success in locating fishable concentrations of the target species in remaining open areas or time periods, operational mode and capacity, the level of aggregate effort exerted by the fleet or sub-sector in the remaining open areas, etc. But clearly, if catch per unit effort declines, cost per unit of catch would increase. In the limit, 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.

4.1.4.2 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 under consideration by the Council, triggered closures would compel operators to alter the pattern of operations they would voluntarily choose to undertake as profit maximizing entities. 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 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 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 salmon and other prohibited species.

Even if the bycatch is composed of species for which there is 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.

4.1.4.3 Costs of Bycatch Avoidance Measures

While the selectivity of the gear fished for these target species varies, groundfish fishermen unavoidably take other species as incidental catch when they fish for most target species. In some instances (e.g., bycatches of halibut, salmon, herring, and some species of crabs), groundfish 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).

4.1.4.4 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.

4.1.4.5 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 and could force the bottom trawl effort onto fishing grounds typically used by longline fishermen targeting Pacific cod.

4.1.4.6 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 inducesd 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 Voluntary Rolling Hotspot Sytem is an industry conceived and implemented (before Amendment 84 regulations took effect) system designed for proactive bycatch avoidance it is not unreasonable to expect that the pollock industry may continue to operate the VRHS, 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 the triggered closure althernative (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.

4.1.5 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% per year; from 1995 to 1998 the rate averaged 7.25% 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 opilio 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:

1. Fishing farther offshore,
2. Reduced profitability, and
3. Changes in risk.

4.1.5.1 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 (SAR) case into an emergency or life threatening situation. Many SAR 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.

4.1.5.2 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.

4.1.5.3 Changes in Risk

Each of the factors described above increase 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.

4.1.6 Potential Minimization of Adverse Impact via Transfers, Rollovers and Cooperative Provisions.

As is discussed above, the proposed Chinook salmon bycatch minimization alternatives have potentially serious implications for fleet revenues and operating costs as well as on fleet operations. The potential direct effects of the alternatives in terms of foregone revenue (Alternative 2) and revenue at risk (Alternative 3) are discussed, along with tabular estimates of potential impacts for a subset of the large number of possible combinations of caps or triggers, seasonal splits, sector allocations, and allocation options.

That analysis identifies the potential for worst case scenario foregone revenue impacts under Alternative 2 of as much as 84% of A season total first wholesale revenue and, additionally, 30% of B season total first wholesale revenue. Further, the trigger closure analysis of revenue at risk identified potential worst case impact of 77% of A season, and 19% of B season total first wholesale revenue placed at risk. At the other end of the impacts spectrum, the largest cap and/or trigger levels and their various splits do not have any effects in all but the worse bycatch years.

Lying between these extreme values is a nearly continuous range of impact values that vary by cap/trigger, split, season, sector, option, and even year. Some consistent patters are observed; however, the breath of impact values calculated for even the subset chosen for analysis make a comprehensive (meaning scenario by scenario) evaluation of impact minimization options, such as transfers, rollovers, and cooperative management provisions problematic, if not intractable. What is developed here is hoped to provide a general, and simplistic, treatment of how these provisions might help minimize adverse effects on the pollock fleet within the general understanding that the greater the impact, in terms of foregone revenue and or revenue at risk, the more important these measures become; however, that is true only up to a point. If a Chinook salmon bycatch measure is so constraining that it result in near immediate, or even relatively early in season, shutdown of the fishery and/or closure of areas, there may be little time to put such measures into place and there may be little Chinook salmon bycatch available for transfers or rollovers. Still, under more moderate scenarios, these minimization measures deserve careful consideration.

4.1.6.1 Sector Transfers

As is discussed in the description of the alternatives, If the Council were to recommend salmon bycatch allocations to the sectors under Component 2, of either Alternative 2 or Alternative 3, but does not recommend a sector transfer option the salmon bycatch available to each sector could not change during the year. Thus, NMFS would close directed fishing for pollock (Alternative 2) and/or a triggered closure (Alternative 3) would occur once each sector reached its Chinook salmon bycatch allocation. This is the case that is documented in the analysis of direct effects on foregone revenue (Alternative 2) and revenue at risk (Alternative 3) below. The assumption of those analyses is that directed fishing would stop and/or a triggered closure would occur and would not be mitigated by any transfer, among sectors, of any Chinook bycatch allocation that might be available (i.e. not being used). As such, those analyses present what might be called the worst case scenario absent any potential mitigation of impacts via transfer of unused Chinook salmon Bycatch allocation.

In concept, once a preferred hard cap level is chosen, it may be considered acceptable for Chinook Salmon Bycatch to achieve that level. If so, then it may also be acceptable to allow sectors that do not use all of their Chinook salmon bycatch allocation to transfer it to other sectors in order to allow continued exploitation of the available pollock resource up to allowed pollock allocations. Doing so, would mitigate some portion of the foregone revenue and would be in keeping with the stated objectives of the proposed action, which are to minimize Chinook salmon bycatch, to the extent practicable, (MSA National Standard 9) while also promoting conservation and management measures that prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry (MSA National Standard 1). The language of Option 1 of Component 3 would promote that approach as it read to “Allocate salmon bycatch caps to each sector and allow the entity representing each non-CDQ sector and the CDQ groups to transfer salmon bycatch trigger caps among the sectors and CDQ groups. (NMFS does not actively manage the salmon bycatch allocations).”

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 within 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 for mitigation of impacts. The suboption to Option 1 of Component three provides an opportunity for such measures. The suboption would limit transfers to a) 50 %, b) 70% or c) 90% of the salmon that is available to the transferring entity at the time of transfer. Clearly, more Chinook salmon would be conserved with the 50% transferability than with 70% or 90%, and the reverse is true of mitigation of adverse impacts on fleet revenue.

Interestingly, if no transfer provision were recommended, the CDQ allocations would continue to be managed as they are under status quo, with further allocation of the salmon bycatch cap among the six CDQ groups, transferable allocations within the CDQ Program, and a prohibition against a CDQ group exceeding is 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.

While this discussion has used the terminology more appropriate to hard caps, it is applicable to the triggered closures of Alternative 3, but in a slightly different way. Under the triggered closure, NMFS would not actively manage the pollock fisheries by issuing 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 the area(s) selected under Component 5 after the sector’s trigger cap is reached.

4.1.6.2 Rollovers

Option 2 to Component 3, under each alternative, provides for an alternative means of sector re-allocation of unused Chinook salmon bycatch allocations. Under these “rollover” provisions, NMFS would manage the reapportionment of salmon bycatch from one sector to another; similar to the way that it presently reallocates unused TAC among sectors. A “rollover” is a management action taken by NMFS to “reapportion” or move salmon bycatch from one sector to another through a notice in the Federal Register. Rollovers are an alternative to allowing each sector to voluntarily transfer salmon bycatch to another sector. Any reapportionment of salmon bycatch by NMFS would be based on the proportion by sector of the total amount of pollock remaining for harvest by all sectors through the end of the year. Successive reapportionment actions would occur as each non-CDQ sector completes harvest of its pollock allocation.

The CDQ groups could receive rollovers of salmon bycatch from other sectors. However, because the CDQ groups will each receive a specific, transferable allocation of salmon bycatch (as occurs under status quo), unused salmon bycatch would not be reapportioned from an individual CDQ group to other CDQ groups or other AFA 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.

4.1.6.3 Cooperative Provisions (Alternative 2: Hard Caps)

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 open access fishery (if the inshore open access fishery existed in a particular year) would receive a salmon allocation managed at the cooperative level. If the cooperative or open access fishery salmon cap is reached, the cooperative or open access fishery must stop fishing for pollock. The initial allocation of salmon by cooperative within the shore-based CV fleet or to the open access fishery would be based upon the proportion of total sector pollock catch associated with the vessels in the cooperative or open access fishery. (see Chapter 2 of the EIS)

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 by cooperative 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, they have incentive to avoid bycatch to stay within their bycatch allocation. At the larger sector level, that incentive is somewhat reduced and higher capacity operators could attempt to catch their pollock allocation quickly with little regard for bycatch levels so long as the sector level bycatch allocation is not being approached. In such circumstances, the smallest or least capable catcher vessels may be adversely affected by the actions of the larger, more capable, vessels. 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.

4.1.6.4 Cooperative transfer options (Alternative 2: Hard Caps)

Also under consideration are options to allow transfers among inshore cooperatives, provided that sector allocations are made and further allocated among the inshore cooperatives and the inshore open access fishery (if the inshore open 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%, 70% and 90% 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.

4.1.6.5 Inter-Cooperative Agreement (ICA) Management of triggered closures

Under Option 1 of Component 2 (Management) of the triggered closure alternative a NMFS-approved salmon bycatch reduction intercooperative agreement (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 and how it would work in practice are discussed in the description of alternative section

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. Vessels participating in the ICA would be exempt from NMFS's area closures, and would instead be subject to the ICA closures. The ICA, however, 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 A2.1.4). 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 open access Olympic race for fish circumstances, 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 vessels operators to join the ICA and not engaging 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.

4.1.7 Management & Enforcement Costs

Management and enforcement considerations, as they pertain to groundfish fisheries in the EEZ off Alaska, are treated at length in sections specific to each alternative and options to the alternatives. he reader is referred to those sections for detailed discussions.

4.1.8 Product Quality, Markets, & Consumers

4.1.8.1 Product Quality & Revenue Impacts

The Chinook salmon bycatch minimization alternatives considered in lieu of the status quo may impose restrictions on 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 two reasons:

- If a triggered closure occurs, Fishermen may have to fish farther away from processors, requiring them to travel greater distances to deliver their catch.
- If forced out of the most productive grounds, 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.

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 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. 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.

Increased revenue accruing from such a per-unit price rise would be a benefit to primary producers (i.e., fishermen), offsetting an indeterminate amount of the increased operational costs they would be expected to incur through adoption of any one of the proposed alternatives to the status quo. However, to the extent that these fishery products are consumed in the United States, this producer benefit 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 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) they may. It is not possible, at this time, to estimate the likelihood or magnitude of these 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.

4.1.8.2 Longer Travel to Deliver Fish

The interval between catching and initiating processing groundfish 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 the larger, faster, more seaworthy elements of the fleet. In the long run, this may have the added (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.

4.1.8.3 Change in Average Size of Fish

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 (e.g., deep-skin fillets). 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.

4.1.8.4 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 externalities imposed by salmon bycatch), actions taken to reduce these externalities (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).

4.1.8.5 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. 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 LLP constraints seek to manage and control transference 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, imposing potentially significant costs on the operations that currently prosecute them.

Operations in any given fishery or sub-sector are not homogeneous in capacity and capability. Therefore, should Chinook salmon bycatch minimization measures induce movement of capacity and effort from one fishery to others, it is likely that the greatest economic and operational burden would fall upon the smallest, least operationally diversified, and least mobile elements of these fleets. Given these smaller operations' inherent physical limitations (e.g., operational range, catch holding capacity, speed and sea worthiness) it is likely that these would be the first casualties of any effort and capacity transference. Because these operations are most likely to shore based and the relative magnitude of such displacement on these local and regional economies would be disproportionately greater, as well.

Compression/Overlapping of Fishing Season: Many of the larger operations in the Bering Sea, and even Aleutians' and Gulf fishing fleets, 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 an 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 BSAI. 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. Should subsequent changes in fishing patterns occur that substantially reduced demand for transient stand-down moorage, some or all of these investments could be stranded (that is, they would become excess capacity).

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 fishing impact minimization alternatives) would increase the likelihood that some may not continue to operate.

4.1.8.6 Impacts on Dependent Communities

Many of the communities of coastal Alaska that are adjacent to the BSAI 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 BSAI community development quota (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.

Alternative 1 would not provide any additional measures to minimize Chinook salmon bycatch beyond those currently in place or planned as part of other fishery management actions. Therefore, there would be no direct short-term effect on groundfish fishery dependent communities. However, to the extent that bycaught Chinook salmon could represent an important element of both subsistence and commercial use in Western Alaska Communities, the status quo provides no specific limit on Chinook salmon bycatch and relies on the existing VRHS and/or savings areas to minimize Chinook salmon bycatch.

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 fishing and processing opportunities in communities that have historically depended on commercial Chinook salmon fishing.

From firms with direct and obvious linkages to the groundfish fisheries, 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 these communities, all would be affected by the structural changes in commercial fishing attributable to the Chinook salmon bycatch minimization measure actions. 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 exports) can do 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 foregone revenue and/or revenue at risk, especially adjacent 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 any selected EFH protection management regime. 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 would also be widespread.

Sixty-five communities in the BSAI region, organized into six non-profit groups, depend upon CDQs of groundfish and crab. These CDQs are either harvested directly by vessels belonging to the communities or contracted out to private companies. If, as expected, the fishing impact minimization alternatives being considered result in lower CPUEs and higher costs in fishing operations, the revenue from the CDQ harvests would be diminished, the value of the CDQ allocations to the member-communities would decrease, and secondary adverse impacts on community businesses would occur.

4.2 Alternative 1

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 BSAI 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 a the VRHS system described in section A.2.1.5 above.

4.2.1 Effects on Salmon Bycatch, Salmon Harvesters & Communities

In October 2005, to reduce the pollock fisheries' bycatch of Pacific salmon, the North Pacific Fisheries Management Council (Council) adopted Amendment 84 to the BSAI Fisheries Management Plan. Pacific salmon are caught incidentally in the BSAI pollock trawl fisheries, especially in the pollock fishery. Of the five species of Pacific salmon, Chinook salmon (*Onchorynchus tshawytscha*) and chum salmon (*O. keta*) are most often caught incidentally in the pollock fisheries.

The Council developed Amendment 84 to attempt to resolve the bycatch problem through the AFA pollock cooperatives. The amendment exempts pollock vessels from Chinook and Chum Salmon Savings Area closures if the vessels participate in an intercooperative agreement (ICA) to reduce salmon bycatch. Through the ICA, the cooperatives reduce salmon bycatch by a method called the ''voluntary rolling hotspot system'' (VRHS).

Regulatory management measures implemented prior to Amendment 84 to reduce salmon bycatch had not been effective. The Council developed Amendment 84 to attempt to resolve the bycatch problem through the AFA pollock cooperatives. The amendment exempts pollock vessels from Chinook and Chum Salmon Savings Area closures if the vessels participate in an intercooperative agreement (ICA) to reduce salmon bycatch. Through the ICA, the cooperatives reduce salmon bycatch by a method called the ''voluntary rolling hotspot system'' (VRHS).

Despite these efforts, salmon bycatch numbers have continued to increase substantially. In light of the high amount of Chinook salmon bycatch in recent years, the Council and NMFS are considering measures to effectively reduce bycatch to the extent practicable while achieving optimum yield from the pollock fishery.

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 122,000 Chinook salmon in 2007.

The description of potentially affected fisheries section (section A2) 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.

4.2.1.1 Norton Sound

The Alaska Board of Fisheries (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% of the overall value. Chinook value has fluctuated since the 1980s and rose to $225,136 in 1997 when it was nearly 62% 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 form 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.

4.2.1.2 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 is expected to have been achieved throughout the area.

The Alaska Board of Fisheries (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.

4.2.1.3 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 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.

Historic 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 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 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% 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.

4.2.1.4 Bristol Bay Region

In 2007, Chinook salmon escapement into the Nushagak River was 60,000, 80% 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.

4.2.2 VRHS Operational Effects

An extensive discussion of the VRHS as described in the EFP report on the VRHS system is presented in section A2. Additional analysis of the operational implications for the fleet are being developed but could not be included in this initial review draft.

4.2.3 Management and Enforcement

The purpose of this section is to provide information about current Chinook salmon bycatch control measures in the AFA pollock and CDQ pollock fisheries in the Bering Sea. Information is presented about:

- existing management measures
- monitoring requirements currently in effect for these fisheries
- methods currently used to estimate and account for salmon bycatch

4.2.3.1 Existing Salmon Bycatch Management Measures

Salmon incidentally caught by AFA trawl vessels targeting pollock in the Bering Sea is currently managed using a system of area closures. The area closures occur upon attainment of Chinook salmon catch limits, which are specified in federal regulation. 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 a salmon bycatch reduction inter-cooperative agreement (ICA). This industry-initiated agreement requires vessels to stop fishing in areas of high salmon bycatch and move to other areas. The groundfish harvest specifications process (which establishes salmon bycatch limits), Bering Sea salmon savings areas, and the ICA are further described below. Subsequent sections describe the monitoring and enforcement measures that are associated with salmon bycatch management measures.

4.2.3.2 Harvest Specification Process

The annual allocation of salmon PSC limits for the non-CDQ and CDQ Bering Sea trawl fisheries is specified in the annual groundfish harvest specifications and in federal regulation. Federal regulations specify 29,000 Chinook salmon annually as the 2008 and 2009 PSC limit[6] for the Bering Sea subarea pollock fishery. A portion of this (7.5%, or 2,175 Chinook salmon) is allocated to the CDQ Program as a prohibited species quota reserve[7], while the remaining 26,825 Chinook salmon are available to the non-CDQ fishery.

[6] See 50 CFR 679.21(e)(1)(vii).
[7] See 50 CFR 679.21(e)(3)(i)(A)(3)(i) .

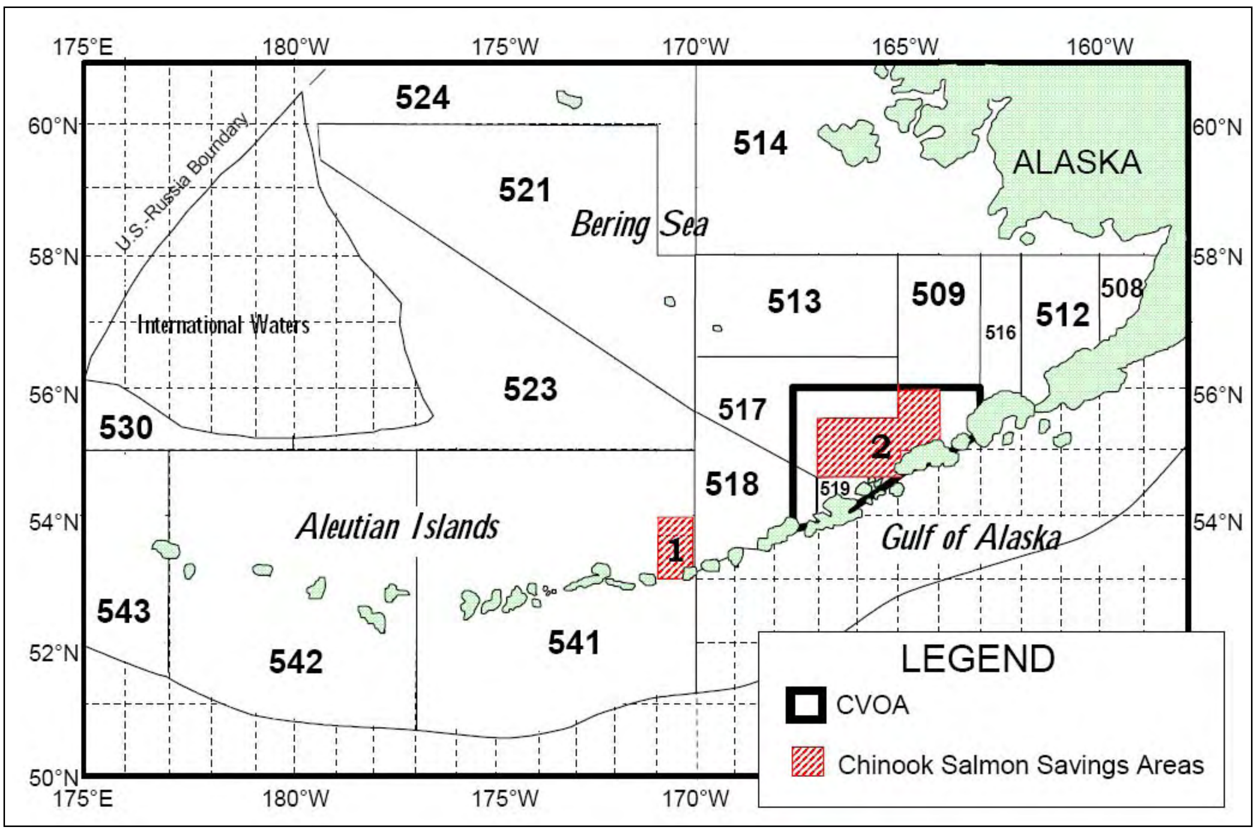
The groundfish harvest specifications establish specific catch limits on the commercial harvest of groundfish and are used to manage the groundfish fisheries. Harvest specifications include overfishing levels, acceptable biological catch levels, total allowable catch (TAC) limits, and prohibited species catch (PSC) limits. The harvest specifications are based on recommendations from the Council. The harvest specifications are effective for two calendar years. Catch limits that have been specified for the second year in each two year cycle are superseded when a new, two year set of harvest specifications is published.

The Council's recommendation for the BSAI groundfish harvest specifications are implemented through rulemaking. In December of the year preceding the beginning year of each two year specification period, NMFS publishes a proposed rule in the Federal Register that explains the upcoming year's harvest limits and solicits public comment. The comment period is generally open for 30 days. The final harvest specifications, generally published in late February, responds to public comment and establishes the final harvest limits for the current fishing year. The two year harvest specification cycle allows NMFS to meet Administrative Procedures Act requirements associated with public notice and comment. It also allows fishing to begin in the second year of each two year cycle without delay or disruption due to the pending effectiveness of a new set of harvest specifications.

4.2.3.3 Chinook Salmon Savings Areas

Alternative 1 (status quo) would keep the existing Chinook management system of closure areas in effect. NMFS would continue to monitor salmon bycatch based on existing practices and issue savings area closures when specified bycatch limits are reached. Federal regulations governing the closure areas are found at 50 CFR 679.21(e). These areas are depicted below.

Figure 4-1 Bering Sea and Aleutian Islands Chinook Salmon Savings Areas.



The two Chinook Salmon Savings Areas close to directed fishing for pollock if 29,000 Chinook salmon are caught by any vessels fishing for groundfish in the Bering Sea. The timing of the closure depends upon when the Chinook limit is reached:

1. If the limit is triggered before April 15, the areas close immediately through April 15. After April 15, the areas re-open, but are again closed from September 1-December 31.
2. If the limit is reached after April 15, but before September 1, the areas would close on September 1 through the end of the year.
3. If the limit is reached after September 1, the areas close immediately through the end of the year.

The Chinook salmon saving areas are closed to the non-CDQ pollock fishery by the NMFS through notice and comment rulemaking published in the Federal Register. When a savings area limit has been reached, NMFS prepares a rulemaking package to close the areas. Such packages includes a Federal Register notice and an information bulletin that is distributed to the public. These rulemakings are reviewed by staff at NMFS, Alaska Region, NMFS Headquarters, NOAA General Counsel, and the Office of the Federal Register. Rulemakings are only reviewed by the Office of the Federal Register during normal business hours. Thus, closure notices cannot be processed on Saturdays, Sundays, or Federal holidays. Thursday is the last day of the week that a closure can be submitted for an effective date of Friday, Saturday, Sunday, or Monday if it is a Federal holiday. If a closure is processed on Friday, the earliest effective date for the closure is Monday (or Tuesday, if Monday is a Federal holiday). These particular rules are known as “inseason actions.”

Enforcement of the salmon savings area uses information from vessel monitoring systems (VMS), logbook information, and observer information. VMS is used to determine the location of vessels. This monitoring system uses a global positioning system to record real-time vessel location and can be matched up with fishery data to determine vessel activity, including location, fishery target, and amounts of harvested and discarded species. The NOAA Fisheries Office for Law Enforcement (NMFS OLE) investigates alleged violations of salmon savings area closures. If a vessel is detected directed fishing for pollock in a closed salmon savings area, the incident is investigated. Depending on NMFS OLE’s findings, such cases may be forwarded to NOAA General Counsel for settlement or prosecution.

4.2.3.4 Voluntary Rolling Hot Spot Closure System

Amendment 84 to the BSAI groundfish FMP exempted vessels from closures of both the Chum and Chinook salmon savings areas if they participate in a salmon bycatch reduction ICA that is approved by NMFS. Subsequently, in 2007, NMFS amended regulations associated with the salmon savings areas to allow vessels in the Bering Sea pollock fishery to be exempt from salmon savings area closures. This bycatch reduction system is known as the vessel rolling hot spot (VRHS) system. Through 2007, all vessels participating in the pollock fishery belonged to a single salmon bycatch reduction ICA.

Parties to an ICA include operators of pollock fishing vessels, a third-party salmon bycatch data manager, and other entities with interests in Bering Sea salmon bycatch reduction. Federal regulations require the ICA to describe measures that parties to the agreement will take to monitor salmon bycatch and redirect fishing effort away from areas in which salmon bycatch rates are relatively high. It also must include intra-cooperative enforcement measures and various other regulatory conditions. Parties to salmon bycatch reduction ICAs are exempt from salmon savings area closures in the Bering Sea, should NMFS issue such closures. The ICA data manager monitors salmon bycatch in the pollock fisheries and announces area closures for areas with relatively high salmon bycatch rates. The efficacy of voluntary closures and bycatch reduction measures must be reported to the Council annually.

The pollock industry began operating an ICA through an exempted fishing permit (EFP) in 2006. An EFP was also used to continue the ICA through 2007. In 2008, NMFS approved an ICA governed by regulation, rather than an EFP. The 2008 ICA added a fixed Chinook closure area, adjustable bycatch base rate in the A season, and a larger Bering Sea closure area in the A season. Inshore cooperatives choose to participate in the ICA, rather than offering this election to individual vessels within a cooperative. Thus, a single vessel in an inshore cooperative cannot elect to opt out of the ICA. Doing so would mean that the cooperative to which they were affiliated would be charged with a contractual violation each time the single vessel fished in a closed area (Karl Haflinger, SeaState, personal communication, April 14, 2008).

4.2.3.5 Management of PSC limits under the CDQ Program

Under the status quo, the CDQ Program receives allocations of 7.5% of the BS and AI Chinook salmon PSC limits as "prohibited species quota reserves" or PSQ reserves. NMFS further allocates the PSQ reserves among the six CDQ groups based on percentage allocations approved by NMFS on August 8, 2005. A CDQ group is prohibited from harvesting pollock in the Chinook salmon savings areas when that group's Chinook salmon PSQ is reached. NMFS does not issue fishery closures through rulemaking for the CDQ groups. All CDQ groups are participating in the 2008 salmon bycatch ICA.

4.2.4 Current Monitoring Requirements

4.2.4.1 Catcher/processors & motherships

Catcher/processors and motherships are required to carry two NMFS-certified observers during each fishing day. These vessels must also have an observer sampling station and a motion-compensated flow scale, which is used to weigh all catch in each haul. The observer sampling station is required to include a table, motion compensated platform scale, and other monitoring tools to assist observers in sampling. Each observer covers a 12 hour shift and all hauls are observed unless an observer is unable to sample (*e.g.*, due to illness or injury).

Estimates of the weight of each species in the catch are derived from sampling. A sample is a specific portion of the haul that is removed and examined by the observer. Catch in the sample is sorted by species, identified, and weighed by the observer. Species counts also are obtained for non-predominant species. Observer samples are collected using random sampling techniques to the extent possible on commercial fishing vessels. Observer samples are extrapolated to the haul level under the assumption that sample composition represents the composition of an entire haul. The sample proportion of each haul in the pollock fishery is relatively high because catch is generally not diverse and excellent sampling tools, such as flow scales and observer sample stations, are available.

Sampling for salmon is conducted as part of the overall species composition sampling for each haul. The observer collects and records information about the number of salmon in each sample and the total weight of each haul. NMFS estimates the total number of salmon in each haul by extrapolating the number of salmon in the species composition samples to the total haul weight. In the rare case that an observer on an AFA catcher/processor or mothership is unable to sample a haul for species composition, NMFS applies species composition information from observed hauls to non-observed hauls.

Catcher vessels deliver unsorted catch to the three motherships that participate in the AFA pollock fisheries. NMFS does not require these catcher vessels to carry observers because catch is not removed from the trawl's codend (the detachable end of the trawl net where catch accumulates) prior to it being transferred to the mothership. Observer sampling occurs on the mothership following the same estimation processes and monitoring protocols that are described above for catcher/processors.

While regulations require vessel personnel to retain salmon until sampled by an observer, salmon that are retained by catcher/processor and mothership crew outside of the observer's sample are not included in the observer's samples and are not used to estimate the total number of salmon caught. However, observers examine these salmon for coded-wire tags and may collect biological samples.

4.2.4.2 Catcher vessels delivering to shoreside processors or stationary floating processors

Catcher vessels in the inshore sector are required to carry observers based on vessel length.

Catcher vessels 125 feet in length or greater are required to carry an observer during all of their fishing days (100% coverage).

Catcher vessels greater than 60 feet in length and up to 125 feet in length are required to carry an observer at least 30% of their fishing days in each calendar quarter, and during at least one fishing trip in each target fishery category (30% coverage).

Catcher vessels less than 60 feet in length are not required to carry an observer. However, no vessels in this length category participate in the Bering Sea pollock fisheries.

4.2.4.3 Sampling onboard catcher vessels

Observers sample hauls onboard the catcher vessels to collect species composition and biological information. Observers use a random sampling methodology that requires observers to take multiple, equal sized, samples from throughout the haul to obtain a sample size of approximately 300 kilograms. Catch from catcher vessels delivering to shoreside processing plants or floating processors generally is either dumped or mechanically pumped from a codend (i.e., the end of the trawl net where catch accumulates) directly into recirculating seawater (RSW) tanks. Observers attempt to obtain random, species composition samples by collecting small amounts of catch as it flows from the codend to the RSW tanks.

This particular collection method is difficult (and dangerous), as observers must obtain a relatively small amount of fish from the catch flowing out of the codend as it is emptied into the RSW tanks. A large codend may contain over 100 mt of fish. This sampling is typically done on-deck, where the observer is exposed to the elements and subject to the operational hazards associated with the vessel crew's hauling, lifting, and emptying of the codend into the large hatches leading to the tanks. In contrast, the sampling methods used on catcher/processors and motherships allow observers to collect larger samples under more controlled conditions. On these vessels, the observer is able to collect samples downstream of the fish holding tanks, just prior to the catch sorting area that precedes the fish processing equipment. Additionally, the observer is below decks and has access to catch weighing scales and an observer sampling station.

Because the composition of catch in the pollock fishery is almost 100% pollock, species composition sampling generally works well for common species. However, for uncommon species such as salmon, a larger sample size is desired; however, large sample sizes are generally not logistically possible on the catcher vessels. Instead, estimates of salmon bycatch by catcher vessels are based on a full count or census of the salmon bycatch at the shoreside processing plant or stationary floating processor.

Vessel operators are prohibited from discarding salmon at sea until the number of salmon has been determined by an observer, either on the vessel or at the processing plant, and the collection of any scientific data or biological samples from the salmon has been completed. Few salmon are reported discarded at sea by observed catcher vessels. However, any salmon reported as discarded at sea by the observer are added into the observer's count of salmon at the processing plant.

4.2.4.4 Sampling at inshore processors

AFA inshore processors are required to provide an observer for each 12 consecutive hour period of each calendar day during which the processor takes delivery of, or processes, groundfish harvested by a vessel directed fishing for pollock in the Bering Sea. NMFS regulates plant monitoring through a permitting process. Each plant that receives AFA pollock is required to develop and operate under a NMFS-approved catch monitoring and control plan (CMCP). Monitoring standards for CMCP are described in regulation at 50 CFR 679.28(g).

These monitoring standards detail the flow of fish from the vessel to the plant ensuring all groundfish delivered are sorted and weighed by species. CMCPs include descriptions and diagram of the flow of catch from the vessel to the plant, scales for weighing catch, and accommodations for observations. Depending on the plant, observers will physically remove all salmon from the flow of fish before the scale as it is conveyed into the plant, or supervise the removal of salmon by plant personnel. Observers assigned to the processing plant are responsible for reading the CMCPs and verifying the plant is following the plan laid out in the CMCP. Vessel observers complete the majority of a salmon census during an offload, with the plant observer providing breaks during long offloads.

One performance standard required in CMCPs is that all catch must be sorted and weighed by species. The CMCP must describe the order in which sorting and weighing processes take place. Processors meet this performance standard in different ways. Some processors choose to weigh all of the catch prior to sorting and then deduct the weight of non-pollock catch in order to obtain the weight of pollock. Other processors choose to sort the catch prior to weighing and obtain the weight of pollock directly. No matter how the weight of pollock is obtained, it will only be accurate if bycatch is effectively sorted, and methods must be in place to minimize the amount of bycatch that makes it past the sorters into the factory. CMCPs were not designed to track individual fish throughout the shoreside processor and the focus of the performance standards is on monitoring the large volumes of species such as pollock, not on monitoring small quantities of bycatch. Currently, processors have the incentive to report bycatch, including salmon, missed during the sorting process, and make sure it is subtracted from the total pollock catch weight. This is because these species are less valuable than salmon.

4.2.4.5 Salmon accounting at inshore processors

When a catcher vessel offloads at the dock, prohibited species such as crab, salmon, and halibut are identified and enumerated by the vessel observer during the offload. The observer monitors the offload and, with the assistance of the plant's processing crew, attempts to remove all salmon from the catch. Salmon that are missed during sorting will end up in the processing facility, which requires special treatment by the plant and the observers to ensure they are counted. These "after-scale" salmon (so called because they were initially weighed along with pollock) creates tracking difficulties for the plant and the observer.

While after scale salmon are required to be given to an observer, there is no direct observation of salmon once they are moved past the observer and into the plant. Although observers currently record after scale salmon as if they were collected independently, they can better be thought of as plant reported information. Further complications in plant based salmon accounting occur when multiple vessels are delivering sequentially, making it difficult or impossible to determine which vessel's trip these salmon should be assigned to. Currently, plant personnel are very cooperative with saving after-scale salmon for observers at this stage of sampling and after scale salmon numbers are relatively low. However, if management measures create incentives for not reporting salmon, this cooperation could be reduced.

For each haul brought onboard a catcher vessel, NMFS estimates the official total weight of that haul by proportioning the captain's estimated weight for each haul against the total weight of the delivery reported on the fish ticket. The total count of salmon for the delivery also is distributed among the hauls based on the proportion of groundfish each haul contributed to the total weight of the offload. The official total catch for each haul and the salmon attributed to each haul is then used by NMFS to calculate salmon bycatch rates in a process described in Section 1.1.3.

4.2.4.6 2007 Chinook salmon bycatch by vessel category

Vessel-specific salmon bycatch information currently exists for catcher/processors, motherships, and observed catcher vessels in the inshore sector. However, a significant component of the inshore sector are vessels in the 30% observer coverage category. When these vessels are not observed, salmon bycatch rates from other observed vessels are used to estimate the salmon bycatch associated with the pollock catch by the unobserved vessels. For example, Table 1-1 shows the estimated pollock catch and salmon bycatch in the AFA pollock fisheries in the Bering Sea in 2007, by fishery sector and vessel length class. Fifty-seven of the 83 vessels participating in the inshore sector in 2007 were in the 30% observer coverage category. These vessels caught approximately 20% of the pollock catch and 27% of the Chinook salmon bycatch.

Table 4-5 2007 Distribution of vessels categories, pollock catch, and Chinook salmon catch.

Vessel category	Number of Vessels	Pollock (mt)	Percent of Pollock Catch	Number of Chinook salmon	Percent of Chinook Salmon
Catcher/processor	16	488,528	41%	32,212	28%
Motherships	3	121,514	10%	6,663	6%
CV 60 ft.-125 ft.	57	240,546	20%	31,381	27%
CV ≥ 125 ft.	26	332,081	28%	45,937	40%
Total	102	1,182,669	100%	116,193	100%

4.2.4.7 Prohibited species donation program

Salmon caught incidentally in the pollock fishery may be donated to a prohibited species donation (PSD) program. This program is described in 50 CFR part 679.26. The program allows third parties, such as hunger relief organizations, to be authorized distributors of salmon and halibut. This entails meeting a range of application requirements and receiving a PSD permit. Vessel operators and shoreside processors voluntarily participate in this program, and are subject to additional federal recordkeeping and reporting requirements. Chapter 9 of the EIS contains more information on the PSD program.

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 NMFS 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.

4.2.5 NMFS Salmon Bycatch Accounting

NMFS's Catch Accounting System (CAS) was developed to receive catch reports from multiple sources, evaluate data for duplicate or errors, estimate the total catch by species or species category, and determine the appropriate "bin" or account to attribute the catch. Historically, these accounts have been established to mirror the myriad combinations of gear, area, sector, and season that are established in the annual groundfish harvest specifications. In general, the degree to which a seasonal or annual allocation requires active NMFS management is often inversely related to the size of the allocation. Typically, the smaller the catch limit, the more intensive management that is required to ensure that it is not exceeded.

The CAS account structure is also different for each major regulatory program such as the Amendment 80 Program, the Rockfish Pilot Program, the AFA pollock fishery, and the CDQ Program. For example, separate accounts are used to monitor Atka mackerel caught by Amendment 80 vessels and non-Amendment 80 vessels. To monitor this catch, accounts are created for all Atka mackerel caught, separate accounts if the vessel is in a cooperative or limited access sector, separate accounts for fish caught in or outside special harvest limit areas, and finally, seasonal accounts for all scenarios combined. This results in 10 separate accounts that had to be created by programmers for use by NMFS fisheries managers.

The AFSC'S Fisheries Monitoring and Analysis Division provides observer data about groundfish catch and salmon bycatch, including expanded information to the NMFS. NMFS estimates salmon bycatch for unobserved catcher vessels using algorithms implemented in its CAS. The haul-specific observer information is used by the CAS to create salmon bycatch rates from observed vessels that are applied to total groundfish catch in each delivery by an unobserved vessel. The rate is calculated using the observed salmon bycatch divided by the groundfish weight, which results in a measure of salmon per metric ton of groundfish caught. Salmon bycatch rates are calculated separately for Chinook salmon and non-Chinook salmon.

The CAS is programmed to extrapolate information from observed vessels to unobserved vessels by matching the type of information available from observed vessels with that of an unobserved vessel. In general, the more information there is about bycatch in the same fishery by sector, time, and place, the more accurate a calculated rate will be when used to estimate bycatch by unobserved vessels. Surrogate bycatch rates are applied using the most closely available data from an observed catcher vessel by:

- processing sector (in this case, inshore sector)
- week ending date,
- fishery (pollock),
- gear (pelagic trawl),
- trip target,
- special area (such as the catcher vessel operational area), and
- federal reporting area.

If no data are available for an observed vessel within the same sector, then rates will be applied based on observer data from vessels in all sectors in the target fishery. If observer data is not available from the same week, then a three-week moving average (if the reporting area or special area is the same) or three-month moving average (if data with the same reporting or special areas is not available) is applied. Similarly, if data from the same federal reporting area is not available, then observer data from the pollock fishery in the Bering Sea as a whole will be applied. However, this latter methodology is rarely used. NMFS generally receives adequate information to calculate bycatch rates for the inshore sector based on bycatch rates on observed catcher vessels that operate in a similar time and place as the unobserved catcher vessels.

In fisheries besides the inshore pollock fishery, estimates of salmon, crab, and halibut bycatch rely on at-sea sampling. To estimate the bycatch of these species, at-sea observers take several within haul samples that are extrapolate to obtain an estimate of specie-specific catch for a sampled haul. The haul-specific estimate is used by NMFS to calculate a bycatch rate that is applied to non-observed hauls. Thus, there are several levels of estimation: (1) from sample to haul, (2) sampled hauls to unsampled hauls within a trip, and potentially, (3) sampled hauls to unsampled hauls between trips and vessels.

The sampling and extrapolation method for prohibited species such as halibut, salmon, and crab are generally the same for observed vessels in the inshore pollock sector. Sampling of prohibited species for this sector is conducted by observers both at-sea and shoreside. The majority of catch is assessed by observers when a vessel offloads catch at a plant (shoreside). During an offload, observers count all prohibited species as they are removed from the vessel. Catch that is discarded at-sea is assessed by onboard observers. The total amount of at-sea discard is added to the shoreside census information to obtain a total amount of specie-specific discard for a trip. NMFS uses the total discard information (inshore plus at-sea discards) to create a bycatch rate that is applied to non-observed vessels. The catch accounting system uses the shoreside information for salmon bycatch only if the offloading vessel also had an observer onboard. As a result, only salmon bycatch data from observed trips is used when calculating a bycatch rate.

4.2.5.1 Approaches to enforcing bycatch limits

PSC monitoring requirements are dependent upon whether NMFS manages PSC limits or whether PSC limits are allocated to entities within a fishery. There are two general types of allocations:

- Fishery or sector-level PSC limits. Management of these allocations are done through directed fishing closure rulemakings. For example, closures to directed fishing are used to prohibit directed fishing for the deep water and shallow water flatfish complexes in the GOA once the amount of halibut PSC allocated to these fisheries has been reached.

- PSC allocations made to a specific entity. These allocations are enforced through regulatory provisions that prohibit exceeding an allocation. For example, halibut PSC is currently allocated to an Amendment 80 cooperative, six CDQ groups, and Rockfish Pilot Program cooperatives. These entities monitor their halibut bycatch relative to their allocation and are prohibited from exceeding their halibut PSC allocations.

Management programs that allocate PSC limits to entities give recipients more specific control over their fisheries. Therefore, the general management approach changes with such allocations. Entities that receive allocations generally are prohibited from exceeding their allocations. If they do exceed an allocation, NMFS may initiate enforcement action against the entity. This requires a more accurate catch monitoring and accounting system than is required when managing multiple entities at a fishery or sector level. This is particularly true when catch or bycatch data must be used as a basis for enforcement action should an entity exceed an allocation.

The catch of most allocated species is readily determined using observer and landings data. However, PSC catch generally is required to be discarded. This makes it more difficult to establish how much PSC has been caught. Therefore, NMFS must estimate the amount or numbers of PSC that occurs. Much of these estimates are based on observer data. Lacking observer data, NMFS calculates bycatch rates from observed vessels or fisheries to estimate the PSC catch by unobserved vessels. Without 100% observer coverage, the enforcement of PSC allocations becomes more problematic, as PSC estimates are not directly associated with a vessel's actual catch. There are two primary problems associated with the use of estimated bycatch rates when enforcing prohibition against exceeding PSC allocations.

- The CAS method of applying information from observed vessels to non-observed vessels assumes that the observed vessel fishes in a manner similar to the unobserved vessel. NMFS has not evaluated this assumption. From a legal perspective, an entity subject to an enforcement action for alleged overage could claim that the calculated bycatch rates (based on other entities fishing activities) does not represent its fishing behavior.

- As new observer information becomes available, the CAS continuously updates rates, which are applied to non-observed vessels. The CAS rate calculation would continuously change account balances (positive or negative) for PSC allocation holders. Thus, an entity may exceed a particular allocation due to the CAS analytical process. This complicates enforcement of an overage for all PSC accounting.

NMFS notes that catch monitoring issues were a large component of the implementation of Amendment 80 Program, which allows non-AFA catcher/processors to form cooperatives. Amendment 80 cooperatives receive allocations of BSAI flatfish and PSC. The analysis prepared to evaluate the monitoring requirements for the Amendment 80 Program concluded that additional monitoring measures were needed to account for both the target species and the PSC bycatch caught by this fleet.

The use of estimated bycatch rates was not deemed appropriate due to incentives for Amendment 80 cooperatives to misreport their PSC (which could result in not being able to catch all of their target species) and the problem associated with prosecuting allocation overages based on calculated rates, rather than actual bycatch. Furthermore, while the Amendment 80 limited access sector was not issued quota, it could be composed of participants that acted like a single entity. The ability for such vessels to collude could allow them to manipulate their bycatch rates to the degree that NMFS would be prevented from collecting and estimating accurate PSC information.

4.3 Alternative 2 (Hard Caps)

4.3.1 Effects on Salmon Bycatch, Salmon Harvesters & Communities

Table 4-6 provides an analysis of hypothetical reductions in Western Alaska specific adult equivalent Chinook salmon bycatch from the Yukon, 2003-2007. Values are based on median Adult Equivalency (AEQ) values and mean proportions regional assignments within strata (A-season, and NW and SE B seasons) genetics data collected from 2005-2007. The proportional breakout of Western Alaska Chinook is from Myers et al. 2004; median AEQ estimates are shown in the second row. This analysis is presented in more detail in Chapter 2 of the EIS. What is reproduces here is the estimation of adult equivalence by Western Alaska River System.

As expected, the potential benefit of Chinook salmon bycatch reduction, in terms of Yukon River salmon adult equivalency, increases as the cap decreases and the greatest adult equivalence benefits would have occurred in years when bycatch was highest (2007) due to the cap being a more binding constraint in high bycatch years. Also generally true is that in the highest bycatch years option 1 tends to result in the greatest number of estimated adult salmon returning to the Yukon river, followed by option 2d and then option 2a. The estimates by the differing splits vary by cap level and option. For the Yukon River maximum estimated adult equivalent salmon benefits, in numbers of fish are 13,300 fish under the most constraining hard cap of 29,300 Chinook in the 2007 year and under the 50/50 split with option 1.

As the hard cap is increased, the benefits in terms of AEQ estimates necessarily decrease as more Chinook are allowed to be bycaught. With a hard cap of 48,700 Chinook the maximum benefit of 10,027 fish is from the 2007 year with a 50/50 split and option 2a. The low end AEQ estimate of 738 fish occurs in the 2004 year under the 70/30 split with option 1. As the cap is further increased, the AEQ estimates decrease and with the highest cap of 87,500 Chinook maximum benefit of 5,499 fish is estimated for the 2007 year under the 50/50 split and option 1. The least benefit under this cap is actually negative. A thorough review of the table below shows a nearly continuous range of potential benefits, in numbers of adult Chinook from zero to 13,300.

Table 4-6 Hypothetical reductions in Western Alaska specific adult equivalent Chinook salmon bycatch from the **Yukon,** 2003-2007. Values are based on median AEQ values and mean proportions regional assignments within strata (A-season, and NW and SE B seasons) genetics data collected from 2005-2007. The proportional breakouts of Western Alaska Chinook is from Myers et al. 2004; median AEQ estimates are shown in the second row.

Yukon	**2003**	**2004**	**2005**	**2006**	**2007**
No Cap	**8,484**	**9,180**	**10,990**	**14,887**	**16,274**
Cap scenario					
87,500 70/30 opt2d	561	-2	1,267	2,107	1,267
87,500 70/30 opt2a	421	691	819	1,861	2,060
87,500 70/30 opt1	468	353	2,017	3,581	2,666
87,500 58/42 opt2d	106	182	448	3,524	2,764
87,500 58/42 opt2a	478	-29	-1	1,223	1,794
87,500 58/42 opt1	498	340	1,244	3,774	3,152
87,500 50/50 opt2d	409	574	373	2,597	3,335
87,500 50/50 opt2a	1,096	555	1,452	2,588	2,884
87,500 50/50 opt1	161	400	837	4,718	5,499
68,100 70/30 opt2d	254	787	1,704	4,388	4,555
68,100 70/30 opt2a	1,128	1,176	2,167	3,012	3,738
68,100 70/30 opt1	211	537	1,910	4,615	5,210
68,100 58/42 opt2d	501	242	1,588	4,454	5,892
68,100 58/42 opt2a	1,422	526	1,229	3,780	5,059
68,100 58/42 opt1	366	640	1,621	5,772	6,729
68,100 50/50 opt2d	1,118	723	1,475	5,415	7,060
68,100 50/50 opt2a	1,073	954	1,614	4,824	4,221
68,100 50/50 opt1	572	184	1,654	5,810	7,480
48,700 70/30 opt2d	1,390	1,032	2,833	7,070	9,122
48,700 70/30 opt2a	1,287	1,522	3,236	6,405	7,115
48,700 70/30 opt1	974	768	2,555	6,638	8,680
48,700 58/42 opt2d	1,466	1,093	2,307	7,247	8,403
48,700 58/42 opt2a	1,921	2,342	2,806	8,068	9,198
48,700 58/42 opt1	1,831	1,345	2,696	7,239	9,476
48,700 50/50 opt2d	1,445	1,489	2,675	7,682	8,791
48,700 50/50 opt2a	1,880	1,892	3,314	8,236	10,027
48,700 50/50 opt1	2,348	1,770	3,034	7,585	9,704
29,300 70/30 opt2d	3,690	3,469	4,989	9,786	12,906
29,300 70/30 opt2a	3,170	3,185	4,796	9,689	11,838
29,300 70/30 opt1	3,794	3,589	5,303	10,034	12,432
29,300 58/42 opt2d	4,046	3,789	5,316	9,782	12,654
29,300 58/42 opt2a	3,892	3,869	5,767	9,424	12,687
29,300 58/42 opt1	4,062	4,245	5,723	10,400	12,514
29,300 50/50 opt2d	4,027	3,989	5,871	10,264	13,181
29,300 50/50 opt2a	4,284	3,938	5,636	9,659	12,782
29,300 50/50 opt1	4,676	4,531	6,309	10,522	13,300

Table 4-7 provides a similar AEQ analysis specific to the Bristol Bay region. For the Bristol Bay Region, the maximum estimated adult equivalent salmon benefits, in numbers of fish are 11,305 fish under the most constraining hard cap of 29,300 Chinook in the 2007 year and under the 50/50 split with option 1. With a hard cap of 48,700 Chinook the maximum benefit of 8,523 fish is from the 2007 year with a 50/50 split and option 2a. The low end AEQ estimate, under a 48,700 cap, of 653 fish occurs in the 2004 year under the 70/30 split with option 1. As the cap is further increased, the AEQ estimates decrease and with the highest cap of 87,500 Chinook maximum benefit of 4,674 fish is estimated for the 2007 year under the 50/50 split and option 1. The least benefit under this cap is actually negative. A thorough review of the table below shows a nearly continuous range of potential benefits, in numbers of adult Chinook, from less than zero to 11,305.

Table 4-7 Hypothetical reductions in coastal-west Alaska specific adult equivalent Chinook salmon bycatch from the Bristol Bay, 2003-2007. Values are based on median AEQ values and mean proportions regional assignments within strata (A-season, and NW and SE B seasons) genetics data collected from 2005-2007. The proportional breakouts of Western Alaska Chinook is from Myers et al. 2004; median AEQ estimates are shown in the second row.

Bristol Bay	2003	2004	2005	2006	2007
No Cap	**7,211**	**7,803**	**9,342**	**12,654**	**13,833**
Cap scenario					
87,500 70/30 opt2d	477	-1	1,077	1,791	1,077
87,500 70/30 opt2a	358	587	696	1,582	1,751
87,500 70/30 opt1	398	300	1,714	3,044	2,266
87,500 58/42 opt2d	90	155	381	2,996	2,349
87,500 58/42 opt2a	406	-24	-1	1,039	1,525
87,500 58/42 opt1	424	289	1,057	3,207	2,679
87,500 50/50 opt2d	348	488	317	2,207	2,835
87,500 50/50 opt2a	932	472	1,235	2,200	2,451
87,500 50/50 opt1	136	340	712	4,011	4,674
68,100 70/30 opt2d	216	669	1,448	3,730	3,872
68,100 70/30 opt2a	959	999	1,842	2,561	3,177
68,100 70/30 opt1	180	456	1,624	3,923	4,429
68,100 58/42 opt2d	426	205	1,350	3,786	5,008
68,100 58/42 opt2a	1,209	447	1,045	3,213	4,300
68,100 58/42 opt1	311	544	1,378	4,906	5,720
68,100 50/50 opt2d	950	615	1,254	4,603	6,001
68,100 50/50 opt2a	912	811	1,372	4,101	3,588
68,100 50/50 opt1	487	156	1,406	4,938	6,358
48,700 70/30 opt2d	1,182	877	2,408	6,009	7,754
48,700 70/30 opt2a	1,094	1,294	2,750	5,444	6,047
48,700 70/30 opt1	828	653	2,172	5,642	7,378
48,700 58/42 opt2d	1,246	929	1,961	6,160	7,142
48,700 58/42 opt2a	1,633	1,991	2,385	6,858	7,818
48,700 58/42 opt1	1,557	1,144	2,292	6,153	8,055
48,700 50/50 opt2d	1,228	1,266	2,274	6,530	7,472
48,700 50/50 opt2a	1,598	1,608	2,817	7,000	8,523
48,700 50/50 opt1	1,996	1,504	2,579	6,447	8,249
29,300 70/30 opt2d	3,137	2,948	4,241	8,318	10,970
29,300 70/30 opt2a	2,695	2,708	4,077	8,235	10,063
29,300 70/30 opt1	3,225	3,051	4,507	8,529	10,567
29,300 58/42 opt2d	3,439	3,221	4,518	8,314	10,756
29,300 58/42 opt2a	3,308	3,289	4,902	8,010	10,784
29,300 58/42 opt1	3,452	3,608	4,865	8,840	10,637
29,300 50/50 opt2d	3,423	3,391	4,990	8,724	11,204
29,300 50/50 opt2a	3,641	3,347	4,791	8,210	10,865
29,300 50/50 opt1	3,975	3,851	5,363	8,944	11,305

Table 4-8 provides a similar AEQ analysis specific to the Kuskokwim region. For the Kuskokwim Region, the maximum estimated adult equivalent salmon benefit in numbers of fish is 8,645 fish under the most constraining hard cap of 29,300 Chinook in the 2007 year and under the 50/50 split with option 1. With a hard cap of 48,700 Chinook the maximum benefit of 6,517 fish is from the 2007 year with a 50/50 split and option 2a. The low end AEQ estimate, under a 48,700 cap, of 671 fish occurs in the 2004 year under the 70/30 split with option 1. As the cap is further increased, the AEQ estimates decrease and with the highest cap of 87,500 Chinook maximum benefit of 3,574 fish is estimated for the 2007 year under the 50/50 split and option 1. The least benefit under this cap is actually negative. A thorough review of the table below shows a nearly continuous range of potential benefits, in numbers of adult Chinook, from less than zero to 8,645.

Table 4-8 Hypothetical reductions in coastal-west Alaska specific adult equivalent Chinook salmon bycatch from the Kuskokwim, 2003-2007. Values are based on median AEQ values and mean proportions regional assignments within strata (A-season, and NW and SE B seasons) genetics data collected from 2005-2007. The proportional breakouts of Western Alaska Chinook is from Myers et al. 2004; median AEQ estimates are shown in the second row.

Kuskokwim	**2003**	**2004**	**2005**	**2006**	**2007**
No Cap	**5,514**	**5,967**	**7,144**	**9,677**	**10,578**
Cap scenario					
87,500 70/30 opt2d	365	-1	824	1,369	823
87,500 70/30 opt2a	274	449	532	1,210	1,339
87,500 70/30 opt1	304	229	1,311	2,328	1,733
87,500 58/42 opt2d	69	118	291	2,291	1,797
87,500 58/42 opt2a	310	-19	-1	795	1,166
87,500 58/42 opt1	324	221	808	2,453	2,049
87,500 50/50 opt2d	266	373	243	1,688	2,168
87,500 50/50 opt2a	712	361	944	1,682	1,874
87,500 50/50 opt1	104	260	544	3,067	3,574
68,100 70/30 opt2d	165	512	1,108	2,852	2,961
68,100 70/30 opt2a	733	764	1,409	1,958	2,430
68,100 70/30 opt1	137	349	1,242	3,000	3,387
68,100 58/42 opt2d	326	157	1,032	2,895	3,829
68,100 58/42 opt2a	925	342	799	2,457	3,288
68,100 58/42 opt1	238	416	1,054	3,751	4,374
68,100 50/50 opt2d	727	470	959	3,520	4,589
68,100 50/50 opt2a	698	620	1,049	3,136	2,744
68,100 50/50 opt1	372	119	1,075	3,776	4,862
48,700 70/30 opt2d	904	671	1,841	4,595	5,929
48,700 70/30 opt2a	837	989	2,103	4,163	4,624
48,700 70/30 opt1	633	499	1,661	4,314	5,642
48,700 58/42 opt2d	953	710	1,499	4,710	5,462
48,700 58/42 opt2a	1,249	1,522	1,824	5,244	5,979
48,700 58/42 opt1	1,190	875	1,753	4,705	6,160
48,700 50/50 opt2d	939	968	1,739	4,994	5,714
48,700 50/50 opt2a	1,222	1,230	2,154	5,353	6,517
48,700 50/50 opt1	1,526	1,150	1,972	4,930	6,308
29,300 70/30 opt2d	2,399	2,255	3,243	6,361	8,389
29,300 70/30 opt2a	2,061	2,071	3,117	6,298	7,695
29,300 70/30 opt1	2,466	2,333	3,447	6,522	8,080
29,300 58/42 opt2d	2,630	2,463	3,455	6,358	8,225
29,300 58/42 opt2a	2,530	2,515	3,749	6,126	8,246
29,300 58/42 opt1	2,640	2,759	3,720	6,760	8,134
29,300 50/50 opt2d	2,617	2,593	3,816	6,672	8,568
29,300 50/50 opt2a	2,784	2,560	3,664	6,279	8,308
29,300 50/50 opt1	3,040	2,945	4,101	6,839	8,645

Table 4-9 below provides a summary of the range of hypothetical reductions in coastal-west Alaska specific adult equivalent Chinook salmon bycatch as estimated by the AEQ analysis. These ranges have been discussed above with regard to the specific river systems. However, the table below also shows the ranges when all of Western Alaska as a whole. The data show that the maximum benefit to the region would be approximately 33,250 fish during the most severe bycatch year of 2007 and for the most restrictive cap and option as discussed previously. In the 2004 year, which had the lowest bycatch in the period, that maximum benefit is 11,328. The minimum benefit in the 2007 years would have been 3,167 fish, 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 splits and/or options are.

Table 4-9 Range of hypothetical reductions in coastal-west Alaska specific adult equivalent Chinook salmon bycatch. Values are based on median AEQ values and mean proportions regional assignments within strata (A-season, and NW and SE B seasons) genetics data collected from 2005-2007. The proportional breakouts of Western Alaska Chinook is from Myers et al. 2004 and is shown on the second row.

	Year	Coastal WAK	Yukon 40%	Bristol Bay 34%	Kuskokwim 26%
Min	2003	265	106	90	69
	2004	-72	-29	-24	-19
	2005	-3	-1	-1	-1
	2006	3,056	1,223	1,039	795
	2007	3,167	1,267	1,077	823
Max	2003	11,691	4,676	3,975	3,040
	2004	11,328	4,531	3,851	2,945
	2005	15,773	6,309	5,363	4,101
	2006	26,305	10,522	8,944	6,839
	2007	33,250	13,300	11,305	8,645

While the AEQ estimates presented above provide the estimated benefit of Chinook salmon bycatch reductions, in numbers of fish, for specific rivers and for Western Alaska, underlying that analysis is estimated Chinook salmon that would have been "saved" under the various scenarios under consideration. The term "saved" simply means not caught as bycatch in is used in the same sprit as it is used to define the term Chinook Salmon "Savings" Area, which is an element of the status quo. The following series of tables provide the underlying estimates of Chinook salmon saved by year from 2003-2007 and for the A and B season. This information is given more extensive treatment in the EIS (Chapter 2) and is only repeated here for information purposes

Table 4-10 Hypothetical Numbers of Chinook salmon that would have been saved under different options for sector and season specific caps 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	595	331	0	0	0	0
		M	0	0	0	0	0	0	0	0	0
		P	0	0	0	6,318	2,865	885	885	0	0
		S	0	0	0	0	0	0	0	0	0
	87500 Total		0	0	0	6,913	3,196	885	885	0	0
	68,100	CDQ	0	0	0	729	595	331	0	0	0
		M	0	0	0	602	403	0	201	0	0
		P	885	0	0	6,318	6,318	6,318	6,318	2,865	0
		S	1,502	0	0	0	0	0	0	0	0
	68100 Total		2,387	0	0	7,649	7,316	6,649	6,519	2,865	0
	48,700	CDQ	0	0	0	1,218	1,218	729	156	0	0
		M	403	201	0	1,167	1,167	602	841	509	201
		P	6,318	6,318	885	8,913	8,913	6,318	6,318	6,318	6,318
		S	6,535	3,819	1,502	0	0	0	2,914	1,502	0
	48700 Total		13,257	10,338	2,387	11,297	11,297	7,649	10,229	8,329	6,519
	29,300	CDQ	331	0	0	1,457	1,218	1,218	831	595	595
		M	1,610	1,167	841	1,912	1,610	1,610	1,610	1,610	1,167
		P	8,913	8,913	6,318	10,945	10,945	8,913	8,913	8,913	8,913
		S	11,404	9,184	9,184	6,535	5,290	2,914	9,184	9,184	5,290
	29300 Total		22,258	19,264	16,344	20,849	19,062	14,654	20,538	20,302	15,965
B	87,500	CDQ	0	0	0	0	0	95	0	0	0
		M	0	0	0	0	0	327	0	0	0
		P	0	0	0	0	0	0	0	0	0
		S	0	0	0	0	0	0	0	0	0
	87500 Total		0	0	0	0	0	422	0	0	0
	68,100	CDQ	0	0	0	0	57	378	0	0	0
		M	0	0	0	0	327	1,039	0	0	327
		P	0	0	0	0	0	0	0	0	0
		S	0	0	0	0	0	0	0	0	0
	68100 Total		0	0	0	0	384	1,417	0	0	327
	48,700	CDQ	0	0	0	187	378	795	0	0	0
		M	0	0	1,039	1,039	1,039	1,039	96	327	1,039
		P	0	0	0	0	0	447	0	0	0
		S	0	0	1,062	0	0	0	0	0	0
	48700 Total		0	0	2,101	1,226	1,417	2,281	96	327	1,039
	29,300	CDQ	0	0	0	795	795	795	0	95	378
		M	1,039	1,039	1,039	1,039	1,330	1,330	1,039	1,039	1,330
		P	0	0	447	447	897	1,474	0	0	897
		S	1,062	3,128	4,995	0	0	1,062	0	1,062	3,128
	29300 Total		2,101	4,167	6,481	2,281	3,022	4,661	1,039	2,196	5,733
Total	87,500	CDQ	0	0	0	595	331	95	0	0	0
		M	0	0	0	0	0	327	0	0	0
		P	0	0	0	6,318	2,865	885	885	0	0
		S	0	0	0	0	0	0	0	0	0
	87500 Total		0	0	0	6,913	3,196	1,307	885	0	0
	68,100	CDQ	0	0	0	729	652	709	0	0	0
		M	0	0	0	602	730	1,039	201	0	327
		P	885	0	0	6,318	6,318	6,318	6,318	2,865	0
		S	1,502	0	0	0	0	0	0	0	0
	68100 Total		2,387	0	0	7,649	7,700	8,066	6,519	2,865	327
	48,700	CDQ	0	0	0	1,405	1,596	1,524	156	0	0
		M	403	201	1,039	2,205	2,205	1,641	937	836	1,240
		P	6,318	6,318	885	8,913	8,913	6,765	6,318	6,318	6,318
		S	6,535	3,819	2,564	0	0	0	2,914	1,502	0
	48700 Total		13,257	10,338	4,488	12,523	12,714	9,930	10,325	8,656	7,558
	29,300	CDQ	331	0	0	2,252	2,013	2,013	831	690	973
		M	2,648	2,205	1,880	2,951	2,940	2,940	2,648	2,648	2,497
		P	8,913	8,913	6,765	11,392	11,842	10,387	8,913	8,913	9,810
		S	12,466	12,313	14,180	6,535	5,290	3,976	9,184	10,247	8,418
	29300 Total		24,359	23,431	22,825	23,129	22,084	19,315	21,577	22,498	21,698

Table 4-11 Hypothetical Numbers of Chinook salmon that would have been saved under different options for sector and season specific caps 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
	87500 Total		0	0	0	0	0	0	0	0	0
	68,100	CDQ	0	0	0	361	0	0	0	0	0
		M	0	0	0	0	0	0	0	0	0
		P	0	0	0	2,346	965	0	0	0	0
		S	0	0	0	0	0	0	0	0	0
	68100 Total		0	0	0	2,707	965	0	0	0	0
	48,700	CDQ	0	0	0	544	361	361	0	0	0
		M	0	0	0	497	197	0	24	0	0
		P	0	0	0	3,770	3,770	2,346	2,346	965	0
		S	2,691	0	0	0	0	0	0	0	0
	48700 Total		2,691	0	0	4,811	4,328	2,707	2,370	965	0
	29,300	CDQ	0	0	0	725	725	544	361	107	0
		M	651	497	9	1,331	898	651	898	651	497
		P	3,770	3,770	2,346	6,140	6,140	4,601	4,601	3,770	3,770
		S	6,160	5,359	3,719	2,691	711	0	5,359	2,691	711
	29300 Total		10,580	9,626	6,075	10,888	8,474	5,796	11,219	7,219	4,978
B	87,500	CDQ	0	0	0	532	785	1,105	0	0	532
		M	0	0	0	0	0	590	0	0	0
		P	0	0	0	0	0	0	0	0	0
		S	4,518	10,370	13,135	0	0	6,485	0	4,518	10,370
	87500 Total		4,518	10,370	13,135	532	785	8,180	0	4,518	10,902
	68,100	CDQ	0	0	0	1,105	1,105	1,434	0	0	532
		M	0	0	169	0	169	749	0	0	590
		P	0	0	0	0	0	0	0	0	0
		S	10,370	13,135	15,667	0	4,518	10,370	4,518	10,370	13,135
	68100 Total		10,370	13,135	15,836	1,105	5,792	12,553	4,518	10,370	14,257
	48,700	CDQ	0	0	532	1,105	1,434	1,434	532	532	1,105
		M	0	169	590	590	749	1,146	169	590	891
		P	0	0	0	0	0	0	0	0	0
		S	13,135	15,667	18,433	10,370	10,370	15,667	10,370	13,135	15,667
	48700 Total		13,135	15,836	19,555	12,065	12,553	18,247	11,071	14,257	17,663
	29,300	CDQ	532	785	1,105	1,434	1,675	1,675	1,105	1,105	1,434
		M	590	891	1,146	1,146	1,146	1,390	891	1,146	1,327
		P	0	0	0	0	155	1,045	0	0	575
		S	18,433	18,433	20,389	15,667	15,667	18,433	15,667	16,701	20,389
	29300 Total		19,555	20,109	22,640	18,247	18,643	22,543	17,663	18,952	23,725
Total	87,500	CDQ	0	0	0	532	785	1,105	0	0	532
		M	0	0	0	0	0	590	0	0	0
		P	0	0	0	0	0	0	0	0	0
		S	4,518	10,370	13,135	0	0	6,485	0	4,518	10,370
	87500 Total		4,518	10,370	13,135	532	785	8,180	0	4,518	10,902
	68,100	CDQ	0	0	0	1,466	1,105	1,434	0	0	532
		M	0	0	169	0	169	749	0	0	590
		P	0	0	0	2,346	965	0	0	0	0
		S	10,370	13,135	15,667	0	4,518	10,370	4,518	10,370	13,135
	68100 Total		10,370	13,135	15,836	3,812	6,757	12,553	4,518	10,370	14,257
	48,700	CDQ	0	0	532	1,649	1,795	1,795	532	532	1,105
		M	0	169	590	1,087	946	1,146	193	590	891
		P	0	0	0	3,770	3,770	2,346	2,346	965	0
		S	15,826	15,667	18,433	10,370	10,370	15,667	10,370	13,135	15,667
	48700 Total		15,826	15,836	19,555	16,876	16,881	20,954	13,442	15,222	17,663
	29,300	CDQ	532	785	1,105	2,159	2,400	2,219	1,466	1,212	1,434
		M	1,241	1,388	1,155	2,477	2,044	2,041	1,789	1,797	1,824
		P	3,770	3,770	2,346	6,140	6,295	5,646	4,601	3,770	4,345
		S	24,593	23,792	24,109	18,358	16,378	18,433	21,026	19,392	21,100
	29300 Total		30,135	29,735	28,715	29,135	27,117	28,339	28,882	26,171	28,703

Table 4-12 Hypothetical numbers of Chinook salmon that would have been saved under different options for sector and season specific caps 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
		M	0	0	0	0	0	0	0	0	0
		P	0	0	0	2,416	0	0	0	0	0
		S	0	0	0	0	0	0	0	0	0
	87500 Total		0	0	0	2,416	0	0	0	0	0
	68,100	CDQ	0	0	0	332	200	0	0	0	0
		M	0	0	0	0	0	0	0	0	0
		P	0	0	0	3,442	2,416	836	836	0	0
		S	0	0	0	0	0	0	0	0	0
	68100 Total		0	0	0	3,774	2,616	836	836	0	0
	48,700	CDQ	0	0	0	837	837	332	0	0	0
		M	0	0	0	507	332	0	110	0	0
		P	2,416	342	0	6,449	5,101	3,442	5,101	2,416	836
		S	4,209	1,551	0	0	0	0	404	0	0
	48700 Total		6,625	1,893	0	7,793	6,271	3,774	5,615	2,416	836
	29,300	CDQ	0	0	0	958	837	837	837	200	0
		M	741	507	110	1,392	917	741	917	741	332
		P	6,449	5,101	3,442	8,566	8,566	6,449	6,449	6,449	5,101
		S	9,851	6,879	6,879	4,209	2,949	0	6,879	6,879	2,949
	29300 Total		17,041	12,488	10,430	15,126	13,269	8,027	15,082	14,269	8,383
B	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	15,714	22,356	25,368	8,049	9,436	22,356	15,714	15,714	22,356
	87500 Total		15,714	22,356	25,368	8,049	9,436	22,356	15,714	15,714	22,356
	68,100	CDQ	0	0	0	0	0	117	0	0	0
		M	0	0	0	0	0	0	0	0	0
		P	0	0	0	0	0	0	0	0	0
		S	22,356	22,356	27,449	15,714	15,714	22,356	15,714	22,356	25,368
	68100 Total		22,356	22,356	27,449	15,714	15,714	22,473	15,714	22,356	25,368
	48,700	CDQ	0	0	0	0	117	218	0	0	0
		M	0	0	0	0	0	0	0	0	0
		P	0	0	0	0	0	1,161	0	0	0
		S	25,368	27,449	28,531	22,356	22,356	25,368	22,356	25,368	27,449
	48700 Total		25,368	27,449	28,531	22,356	22,473	26,748	22,356	25,368	27,449
	29,300	CDQ	0	0	0	218	313	377	0	0	117
		M	0	0	0	0	0	221	0	0	95
		P	0	0	1,161	1,161	1,996	2,271	0	522	1,996
		S	28,531	30,262	31,454	25,368	27,449	29,233	27,449	28,531	30,262
	29300 Total		28,531	30,262	32,616	26,748	29,758	32,102	27,449	29,053	32,471
Total	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	2,416	0	0	0	0	0
		S	15,714	22,356	25,368	8,049	9,436	22,356	15,714	15,714	22,356
	87500 Total		15,714	22,356	25,368	10,465	9,436	22,356	15,714	15,714	22,356
	68,100	CDQ	0	0	0	332	200	117	0	0	0
		M	0	0	0	0	0	0	0	0	0
		P	0	0	0	3,442	2,416	836	836	0	0
		S	22,356	22,356	27,449	15,714	15,714	22,356	15,714	22,356	25,368
	68100 Total		22,356	22,356	27,449	19,488	18,330	23,309	16,550	22,356	25,368
	48,700	CDQ	0	0	0	837	954	550	0	0	0
		M	0	0	0	507	332	0	110	0	0
		P	2,416	342	0	6,449	5,101	4,603	5,101	2,416	836
		S	29,578	29,000	28,531	22,356	22,356	25,368	22,759	25,368	27,449
	48700 Total		31,993	29,342	28,531	30,149	28,744	30,521	27,971	27,784	28,285
	29,300	CDQ	0	0	0	1,176	1,150	1,214	837	200	117
		M	741	507	110	1,392	917	962	917	741	427
		P	6,449	5,101	4,603	9,727	10,562	8,720	6,449	6,971	7,098
		S	38,382	37,141	38,333	29,578	30,398	29,233	34,328	35,410	33,211
	29300 Total		45,572	42,750	43,046	41,873	43,028	40,129	42,531	43,322	40,854

Table 4-13 Hypothetical Numbers of Chinook salmon that would have been saved under different options for sector and season specific caps 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	87,500	CDQ	0	0	0	451	240	0	0	0	0
		M	2,004	546	0	2,257	2,004	2,004	2,004	2,004	546
		P	976	0	0	8,317	6,591	4,035	4,035	4,035	0
		S	26,728	16,015	12,595	12,595	854	0	12,595	12,595	2,597
	87500 Total		29,708	16,561	12,595	23,620	9,690	6,039	18,633	18,633	3,143
	68,100	CDQ	0	0	0	927	451	240	0	0	0
		M	2,004	2,004	2,004	3,554	3,554	2,257	3,554	2,004	2,004
		P	4,035	4,035	0	9,910	8,317	6,591	6,591	6,591	4,035
		S	26,728	26,728	16,015	12,595	12,595	3,848	26,728	16,015	12,595
	68100 Total		32,767	32,767	18,019	26,985	24,917	12,936	36,873	24,610	18,633
	48,700	CDQ	0	0	0	927	927	927	0	0	0
		M	3,554	3,554	2,004	3,554	3,554	3,554	3,554	3,554	3,554
		P	8,317	6,591	4,035	12,742	12,742	9,910	9,910	8,317	6,591
		S	26,728	26,728	26,728	26,728	26,728	12,595	26,728	26,728	26,728
	48700 Total		38,599	36,873	32,767	43,951	43,951	26,985	40,192	38,599	36,873
	29,300	CDQ	240	0	0	1,180	1,180	1,180	927	927	451
		M	3,944	3,554	3,554	4,677	3,944	3,944	3,944	3,944	3,554
		P	12,742	12,742	9,910	13,397	12,742	12,742	12,742	12,742	12,742
		S	31,485	31,485	31,485	26,728	26,728	26,728	31,485	26,728	26,728
	29300 Total		48,411	47,781	44,949	45,982	44,594	44,594	49,098	44,341	43,475
B	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	3,578	7,155	12,561	0	0	7,155	0	3,578	10,357
	87500 Total		3,578	7,155	12,561	0	0	7,155	0	3,578	10,357
	68,100	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	10,357	10,357	14,145	0	3,578	10,357	3,578	7,155	12,561
	68100 Total		10,357	10,357	14,145	0	3,578	10,357	3,578	7,155	12,561
	48,700	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	12,561	14,145	16,434	7,155	10,357	12,561	10,357	12,561	16,434
	48700 Total		12,561	14,145	16,434	7,155	10,357	12,561	10,357	12,561	16,434
	29,300	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	16,434	18,629	18,986	12,561	14,145	18,629	16,434	16,434	18,629
	29300 Total		16,434	18,629	18,986	12,561	14,145	18,629	16,434	16,434	18,629
Total	87,500	CDQ	0	0	0	451	240	0	0	0	0
		M	2,004	546	0	2,257	2,004	2,004	2,004	2,004	546
		P	976	0	0	8,317	6,591	4,035	4,035	4,035	0
		S	30,306	23,170	25,156	12,595	854	7,155	12,595	16,172	12,954
	87500 Total		33,285	23,716	25,156	23,620	9,690	13,194	18,633	22,211	13,500
	68,100	CDQ	0	0	0	927	451	240	0	0	0
		M	2,004	2,004	2,004	3,554	3,554	2,257	3,554	2,004	2,004
		P	4,035	4,035	0	9,910	8,317	6,591	6,591	6,591	4,035
		S	37,085	37,085	30,160	12,595	16,172	14,205	30,306	23,170	25,156
	68100 Total		43,124	43,124	32,164	26,985	28,495	23,294	40,451	31,766	31,195
	48,700	CDQ	0	0	0	927	927	927	0	0	0
		M	3,554	3,554	2,004	3,554	3,554	3,554	3,554	3,554	3,554
		P	8,317	6,591	4,035	12,742	12,742	9,910	9,910	8,317	6,591
		S	39,289	40,873	43,162	33,883	37,085	25,156	37,085	39,289	43,162
	48700 Total		51,160	51,018	49,201	51,106	54,308	39,547	50,549	51,160	53,308
	29,300	CDQ	240	0	0	1,180	1,180	1,180	927	927	451
		M	3,944	3,554	3,554	4,677	3,944	3,944	3,944	3,944	3,554
		P	12,742	12,742	9,910	13,397	12,742	12,742	12,742	12,742	12,742
		S	47,919	50,114	50,471	39,289	40,873	45,357	47,919	43,162	45,357
	29300 Total		64,845	66,410	63,935	58,543	58,739	63,223	65,532	60,775	62,104

Table 4-14 Hypothetical Numbers of Chinook salmon that would have been saved under different options for sector and season specific caps 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	1,782	1,782	1,782	677	0	0
		M	1,270	400	0	2,832	2,832	1,270	1,645	1,270	400
		P	12,567	8,219	5,609	18,211	18,211	18,211	18,211	12,567	12,567
		S	22,631	14,957	11,434	6,282	1,512	0	11,434	11,434	1,512
	87500 Total		36,468	23,576	17,043	29,106	24,337	21,263	31,967	25,271	14,479
	68,100	CDQ	0	0	0	2,589	2,589	1,782	1,165	677	0
		M	2,832	1,270	788	2,832	2,832	2,832	2,832	2,832	1,270
		P	18,211	12,567	12,567	20,028	18,211	18,211	18,211	18,211	12,567
		S	22,631	22,631	14,957	14,957	11,434	2,686	22,631	14,957	11,434
	68100 Total		43,674	36,468	28,312	40,406	35,066	25,511	44,839	36,677	25,271
	48,700	CDQ	677	677	0	2,589	2,589	2,589	1,782	1,782	1,165
		M	2,832	2,832	2,832	4,758	4,758	2,832	4,758	2,832	2,832
		P	18,211	18,211	18,211	25,717	20,028	20,028	20,028	18,211	18,211
		S	34,463	34,463	22,631	22,631	22,631	14,957	22,631	22,631	22,631
	48700 Total		56,183	56,183	43,674	55,695	50,007	40,406	49,200	45,456	44,839
	29,300	CDQ	1,782	1,782	1,165	2,845	2,589	2,589	2,589	2,589	1,782
		M	4,758	4,758	4,758	4,758	4,758	4,758	4,758	4,758	4,758
		P	25,717	20,028	20,028	25,717	25,717	25,717	25,717	25,717	25,717
		S	34,463	34,463	34,463	34,463	34,463	22,631	34,463	34,463	34,463
	29300 Total		66,720	61,032	60,415	67,783	67,527	55,695	67,527	67,527	66,720
B	87,500	CDQ	0	0	0	1,294	1,752	1,752	0	323	1,294
		M	0	0	0	0	0	558	0	0	0
		P	0	0	0	0	0	1,791	0	0	0
		S	26,008	26,008	31,002	14,362	19,405	26,008	19,405	26,008	31,002
	87500 Total		26,008	26,008	31,002	15,656	21,157	30,109	19,405	26,331	32,296
	68,100	CDQ	0	0	1,294	1,752	1,752	2,002	323	1,294	1,294
		M	0	0	558	0	558	870	0	0	558
		P	0	0	0	0	338	2,209	0	0	1,791
		S	31,002	31,002	34,882	19,405	26,008	31,002	26,008	26,008	31,002
	68100 Total		31,002	31,002	36,734	21,157	28,656	36,083	26,331	27,302	34,645
	48,700	CDQ	323	1,294	1,294	2,002	2,002	2,175	1,294	1,294	1,752
		M	0	558	870	558	870	1,106	558	558	870
		P	0	0	1,791	1,791	2,209	3,559	0	1,791	2,209
		S	31,002	34,882	38,660	26,008	31,002	32,371	31,002	31,002	34,882
	48700 Total		31,325	36,734	42,615	30,359	36,083	39,211	32,854	34,645	39,713
	29,300	CDQ	1,294	1,752	1,752	2,175	2,175	2,351	1,752	1,752	2,002
		M	870	870	1,241	1,106	1,241	1,536	870	1,106	1,370
		P	1,791	2,209	3,559	3,559	3,895	4,554	2,209	2,813	3,895
		S	38,660	38,660	38,660	32,371	34,882	38,660	34,882	34,882	38,660
	29300 Total		42,615	43,491	45,212	39,211	42,193	47,101	39,713	40,553	45,927
Total	87,500	CDQ	0	0	0	3,076	3,534	3,534	677	323	1,294
		M	1,270	400	0	2,832	2,832	1,828	1,645	1,270	400
		P	12,567	8,219	5,609	18,211	18,211	20,002	18,211	12,567	12,567
		S	48,639	40,965	42,437	20,644	20,917	26,008	30,839	37,442	32,514
	87500 Total		62,476	49,584	48,046	44,762	45,494	51,372	51,372	51,602	46,776
	68,100	CDQ	0	0	1,294	4,341	4,341	3,784	1,488	1,971	1,294
		M	2,832	1,270	1,346	2,832	3,390	3,702	2,832	2,832	1,828
		P	18,211	12,567	12,567	20,028	18,549	20,420	18,211	18,211	14,358
		S	53,634	53,634	49,839	34,362	37,442	33,688	48,639	40,965	42,437
	68100 Total		74,676	67,471	65,046	61,563	63,722	61,594	71,170	63,979	59,917
	48,700	CDQ	1,000	1,971	1,294	4,591	4,591	4,764	3,076	3,076	2,917
		M	2,832	3,390	3,702	5,316	5,628	3,938	5,316	3,390	3,702
		P	18,211	18,211	20,002	27,508	22,237	23,587	20,028	20,002	20,420
		S	65,466	69,345	61,291	48,639	53,634	47,328	53,634	53,634	57,513
	48700 Total		87,509	92,917	86,289	86,054	86,090	79,618	82,054	80,101	84,552
	29,300	CDQ	3,076	3,534	2,917	5,020	4,764	4,940	4,341	4,341	3,784
		M	5,628	5,628	6,000	5,864	6,000	6,295	5,628	5,864	6,129
		P	27,508	22,237	23,587	29,276	29,612	30,271	27,926	28,530	29,612
		S	73,123	73,123	73,123	66,835	69,345	61,291	69,345	69,345	73,123
	29300 Total		109,335	104,523	105,627	106,995	109,721	102,796	107,241	108,080	112,647

4.3.2 Potentially Foregone Revenue

Under the Chinook salmon bycatch hard cap scenarios included in this alternative, the pollock trawl fishery, and/or specific sectors that participate in it (depending on allocations 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 in order to mitigate potential losses in revenue due to unharvested pollock TAC. Those specific provisions (components) will be discussed in turn in a separate section of this document. 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.

The terminology used herein to describe these impacts is “foregone revenue,” and simply means the amount of revenue that the fleet, or sectors within it, would not be allowed t earn under a binding hard cap. In other words, it is the answer to the question of how much revenue did they earn, in each of the years 2003-2007, from the projected date of the closure (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 costs and benefits analysis presented previously. What is presented here are the estimates of foregone 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 4-15 provides hypothetical estimates of foregone pollock first wholesale revenue by year and season under Chinook bycatch option for fleet wide caps, and for CDQ versus non-CDQ. As expected, the greatest impact would have occurred in the highest bycatch year (2007) and under the most restrictive bycatch cap of 29,300. In the A season, the greatest effect occurs under the 50/50 split because of the higher roe pollock price in the A season. The B season impact has the reverse situation with effects being greatest under the 70/30 split, which constrains B season revenue more. The maximum A season impact was $529.4 million in 2007 under the 50/50 split and the 29,300 cap. That value is composed of $482.7 million from non-CDQ and $46.7 million from CDQ fisheries. In the B season, the maximum impact is $179.9 million in 2007 with the 293,300 cap and the 70/30 split. In percentage terms (Table 4-16) the A season maximum impact represents 84% of total revenue and the B season total impact is 30% of total B season revenue.

As is expected, as the hard cap is increases the impacts decrease. However, in the 2007 year when bycatch was highest, even the 87,500 cap would have resulted in total foregone revenue of $322.6 million in the A season, with no CDQ impact. The impact would have been $72.9 million in the B season, with CDQ impact only under the 70/30 split. These values are 51% and 12% of total revenue for the A and B seasons respectively. Thus, in a high bycatch year, even the highest cap has significant potential impacts. Also evident is that as the cap increases, the effect of the split is increased. For example, the $322.6 million A season impact under the 50/50 split would have been $134.8 million under the 70/30 split. The reverse pattern is, of course, observed in the B season.

Table 4-15 Hypothetical Foregone Pollock Revenue by year and season under Chinook bycatch 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	$322.6	$253.3	$134.8
	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	$322.6	$253.3	$134.8
	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	$9.8	$1.0	$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	$393.4	$326.5	$256.0
	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	$403.1	$327.5	$256.0
	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	$35.3	$22.6	$9.7
		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	$401.3	$398.1	$393.4
	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	$436.6	$420.7	$403.1
	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	$46.7	$46.2	$36.2
		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	$482.7	$480.2	$476.4
	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	$529.4	$526.3	$512.6
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	$2.7
		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	$17.5	$20.6	$72.9
	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	$17.5	$20.6	$75.6
	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	$2.5	$3.2
		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	$46.7	$72.1	$96.8
	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	$46.7	$74.6	$100.0
	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	$2.9	$3.2	$6.0
		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	$73.6	$96.8	$117.3
	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	$76.4	$100.0	$123.3
	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	$6.0	$6.1	$8.4
		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	$117.3	$140.8	$171.5
	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	$123.3	$147.0	$179.9

Table 4-16 Hypothetical Foregone Pollock Revenue in Percent of Total Revenue by year and season under Chinook bycatch 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%	58%	45%	24%
	87,500 Total		0%	0%	0%	0%	0%	0%	0%	0%	0%	29%	19%	0%	51%	40%	21%
	68,100	CDQ	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	14%	1%	0%
		NonCDQ	1%	0%	0%	0%	0%	0%	0%	0%	0%	47%	34%	32%	70%	58%	46%
	68,100 Total		0%	0%	0%	0%	0%	0%	0%	0%	0%	42%	30%	29%	64%	52%	41%
	48,700	CDQ	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	51%	33%	14%
		NonCDQ	35%	25%	1%	0%	0%	0%	20%	0%	0%	61%	60%	47%	72%	71%	70%
	48,700 Total		30%	21%	0%	0%	0%	0%	18%	0%	0%	54%	53%	42%	70%	67%	64%
	29,300	CDQ	37%	34%	2%	1%	0%	0%	6%	0%	0%	32%	16%	2%	67%	67%	52%
		NonCDQ	59%	47%	46%	25%	24%	12%	58%	46%	34%	76%	62%	62%	86%	86%	85%
	29,300 Total		56%	45%	40%	22%	21%	11%	52%	41%	30%	71%	57%	55%	84%	84%	82%
B	87,500	CDQ	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	4%
		NonCDQ	0%	0%	0%	0%	0%	0%	0%	0%	3%	0%	0%	0%	3%	4%	13%
	87,500 Total		0%	0%	0%	0%	0%	0%	0%	0%	3%	0%	0%	0%	3%	3%	12%
	68,100	CDQ	0%	0%	0%	0%	0%	4%	0%	0%	0%	0%	0%	0%	0%	4%	5%
		NonCDQ	0%	0%	0%	0%	0%	2%	2%	3%	6%	0%	0%	3%	8%	13%	17%
	68,100 Total		0%	0%	0%	0%	0%	3%	1%	3%	5%	0%	0%	3%	8%	12%	16%
	48,700	CDQ	0%	0%	0%	0%	4%	17%	0%	0%	0%	0%	0%	0%	4%	5%	9%
		NonCDQ	0%	0%	0%	1%	2%	6%	5%	6%	13%	0%	3%	10%	13%	17%	21%
	48,700 Total		0%	0%	0%	1%	3%	7%	5%	5%	11%	0%	3%	9%	13%	16%	20%
	29,300	CDQ	0%	0%	26%	17%	31%	50%	0%	0%	0%	0%	0%	0%	9%	9%	13%
		NonCDQ	0%	0%	3%	6%	6%	13%	13%	18%	23%	10%	11%	21%	21%	25%	31%
	29,300 Total		0%	0%	5%	7%	9%	17%	11%	16%	21%	9%	10%	19%	20%	24%	30%

Impacts estimated for 2004, which is among the lowest bycatch year, are considerably smaller than those estimated for 2007 but are still significant in some cases. In the 2004 A season total impact under the 29,300 cap is estimated to have been $128 million under the 50/50 split, all coming from non-CDQ fishery participation. Under the 70/30 split that amount drops to $64.3 million. With the exception of $200.000 in estimated impact under the 50/50 split and a 48,700 cap, none of the other caps would have caused foregone revenue impacts in 2004. In the B season, 2004 foregone revenue estimates are greatest under the 29,300 cap and 70/30 split, where $82.7 million is the estimated impact.

Overall, the impacts 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 impact values. Even in the second highest bycatch year of 2006, A season impacts under even the largest cap of 87,500 Chinook are estimated have been $183.6 million, which is 29% of total first whole sale revenue in the pollock fishery. However, in lower bycatch years of 2003, 2004, and 2005, there was very little A season impact at the 68,100 cap level, and in percentage terms, this is also true of the B season.

The following tables break the fleet wide data, discussed above, down by sector (CDQ, CP, CV, and motherships), season, option, and year in order to show foregone revenue and percent of total revenue on a more refined scale. These tables show how the effect of the bycatch caps vary by season, sector, and year and with the various options. Unfortunately, there do not appear to be consistent pattern that rank the options as the comparative impact 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 revenue. Of course, once a preliminary preferred alternative is chosen by the Council these tables can be used to analyze, in detail, the implications of that preferred proposed action.

Table 4-17 Hypothetical forgone pollock revenue by season and sector under Chinook bycatch options 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 4-18 Hypothetical forgone pollock revenue in Percent of Total Revenue, by season and sector under Chinook bycatch options 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 4-19 Hypothetical forgone pollock revenue by season and sector under Chinook bycatch options 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 4-20 Hypothetical forgone pollock revenue in Percent of Total Revenue, by season and sector under Chinook bycatch options 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 4-21 Hypothetical forgone pollock revenue by season and sector under Chinook bycatch options 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
		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
	87,500	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
		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
	68,100	S	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
A	68,100 Total		$0.0	$0.0	$0.0	$103.9	$60.7	$22.8	$23.7	$0.0	$0.0
		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
	48,700	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
		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
	29,300	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
		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	$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
		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
	68,100	S	$26.0	$26.7	$49.4	$14.2	$15.2	$26.3	$15.3	$25.7	$37.1
B	68,100 Total		$26.0	$26.7	$49.4	$14.2	$15.2	$26.4	$15.3	$25.7	$37.1
		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
	48,700	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
		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
	29,300	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 4-22 Hypothetical forgone pollock revenue in Percent of Total Revenue, by season and sector under Chinook bycatch options 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%
		M	0%	0%	0%	0%	0%	0%	0%	0%	0%
		P	0%	0%	0%	19%	0%	0%	0%	0%	0%
		S	0%	0%	0%	0%	0%	0%	0%	0%	0%
	87,500 Total		0%	0%	0%	9%	0%	0%	0%	0%	0%
	68,100	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%
		S	0%	0%	0%	0%	0%	0%	0%	0%	0%
	68,100 Total		0%	0%	0%	16%	10%	4%	4%	0%	0%
	48,700	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%
		S	36%	13%	0%	0%	0%	0%	0%	0%	0%
	48,700 Total		24%	6%	0%	29%	23%	16%	19%	9%	4%
	29,300	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%
		S	62%	50%	50%	37%	23%	0%	50%	49%	24%
	29,300 Total		51%	41%	35%	55%	47%	31%	51%	47%	29%
B	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	6%	9%	14%	0%	3%	9%	5%	5%	10%
	87,500 Total		3%	4%	6%	0%	2%	4%	2%	2%	4%
	68,100	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	10%	10%	18%	5%	6%	10%	6%	9%	14%
	68,100 Total		4%	4%	8%	2%	2%	4%	3%	4%	6%
	48,700	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%
		S	14%	18%	23%	9%	10%	14%	10%	14%	18%
	48,700 Total		6%	8%	10%	4%	4%	10%	4%	6%	8%
	29,300	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%
		S	23%	32%	38%	14%	18%	27%	18%	23%	32%
	29,300 Total		10%	14%	21%	10%	15%	24%	8%	12%	21%

Table 4-23 Hypothetical forgone pollock revenue by season and sector under Chinook bycatch options 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	87,500	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
		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
	68,100	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
		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
	48,700	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
		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
	29,300	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
		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	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	$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
	68,100	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	$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
	48,700	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	$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
	29,300	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	$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 4-24 Hypothetical forgone pollock revenue in Percent of Total Revenue, by season and sector under Chinook bycatch options 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	87,500	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%
		S	62%	50%	35%	34%	0%	0%	36%	35%	4%
	87,500 Total		26%	20%	14%	32%	11%	3%	17%	16%	2%
	68,100	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%
		S	64%	63%	50%	37%	35%	14%	62%	50%	36%
	68,100 Total		28%	28%	21%	41%	34%	18%	39%	31%	17%
	48,700	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%
		S	66%	65%	64%	63%	62%	37%	64%	64%	62%
	48,700 Total		44%	40%	28%	58%	57%	41%	49%	44%	39%
	29,300	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%
		S	81%	81%	80%	66%	65%	64%	80%	66%	65%
	29,300 Total		63%	61%	55%	69%	63%	62%	66%	60%	56%
B	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	1%	4%	13%	0%	0%	4%	0%	0%	8%
	87,500 Total		0%	2%	6%	0%	0%	2%	0%	0%	4%
	68,100	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	8%	9%	20%	0%	1%	8%	1%	4%	13%
	68,100 Total		4%	4%	9%	0%	0%	4%	0%	2%	6%
	48,700	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	14%	20%	27%	4%	8%	14%	8%	13%	26%
	48,700 Total		6%	9%	12%	2%	4%	6%	4%	6%	11%
	29,300	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	27%	32%	36%	14%	20%	32%	26%	27%	32%
	29,300 Total		12%	14%	16%	6%	9%	14%	11%	12%	14%

Table 4-25 Hypothetical forgone pollock revenue by season and sector under Chinook bycatch options 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	$0.0	$0.0	$36.9	$36.3	$35.3	$8.8	$0.0	$0.0
		M	$20.1	$6.2	$0.0	$34.4	$33.8	$20.5	$27.4	$20.3	$6.2
		P	$105.8	$82.6	$61.3	$143.1	$141.2	$138.5	$138.9	$107.2	$104.1
		S	$185.6	$156.3	$124.6	$95.0	$1.9	$0.0	$126.5	$123.4	$2.1
	87,500 Total		$311.5	$245.2	$185.9	$309.3	$213.2	$194.3	$301.6	$250.9	$112.4
	68,100	CDQ	$0.0	$0.0	$0.0	$46.9	$46.4	$36.5	$22.2	$9.7	$0.0
		M	$33.7	$20.7	$11.8	$35.3	$34.8	$34.1	$34.5	$33.9	$20.7
		P	$139.2	$107.4	$104.4	$173.4	$144.2	$142.0	$142.4	$140.5	$108.1
		S	$188.6	$186.9	$157.4	$155.5	$124.6	$20.5	$185.6	$156.4	$124.7
	68,100 Total		$361.5	$315.0	$273.6	$411.2	$350.0	$233.1	$384.8	$340.5	$253.5
	48,700	CDQ	$10.2	$8.8	$0.0	$47.8	$47.4	$46.9	$36.1	$35.3	$22.2
		M	$35.1	$34.6	$33.7	$44.2	$43.8	$35.3	$43.6	$35.2	$34.5
		P	$143.6	$141.8	$139.2	$216.2	$174.7	$173.4	$173.6	$144.5	$142.4
		S	$217.6	$216.3	$188.6	$187.4	$185.5	$155.5	$189.5	$187.9	$185.6
	48,700 Total		$406.4	$401.5	$361.5	$495.6	$451.4	$411.1	$442.8	$403.0	$384.7
	29,300	CDQ	$36.4	$35.7	$22.9	$55.6	$48.4	$48.1	$47.1	$46.7	$36.8
		M	$44.5	$44.1	$43.6	$45.2	$45.0	$44.6	$44.9	$44.6	$44.1
		P	$215.9	$174.5	$173.2	$219.7	$218.8	$217.6	$217.8	$216.6	$214.9
		S	$220.8	$220.0	$218.9	$218.1	$216.9	$189.2	$219.5	$218.5	$217.0
	29,300 Total		$517.7	$474.4	$458.5	$538.6	$529.1	$499.5	$529.2	$526.3	$512.8
B	87,500	CDQ	$0.0	$0.0	$0.0	$2.2	$3.8	$3.9	$0.0	$0.8	$1.9
		M	$0.0	$0.0	$0.0	$0.0	$0.0	$1.4	$0.0	$0.0	$0.0
		P	$0.0	$0.0	$0.0	$0.0	$0.0	$3.9	$0.0	$0.0	$0.0
		S	$27.6	$28.1	$37.5	$6.6	$17.0	$27.8	$17.1	$27.3	$36.8
	87,500 Total		$27.6	$28.1	$37.5	$8.8	$20.8	$37.1	$17.1	$28.1	$38.7
	68,100	CDQ	$0.0	$0.0	$1.7	$3.8	$3.9	$5.3	$0.9	$1.8	$2.2
		M	$0.0	$0.0	$1.2	$0.0	$1.3	$3.0	$0.0	$0.0	$1.5
		P	$0.0	$0.0	$0.0	$0.0	$0.2	$11.2	$0.0	$0.0	$3.6
		S	$36.8	$37.3	$50.0	$17.5	$27.5	$37.0	$27.6	$28.2	$37.5
	68,100 Total		$36.8	$37.3	$52.9	$21.3	$32.9	$56.5	$28.5	$29.9	$44.7
	48,700	CDQ	$0.8	$1.7	$2.1	$5.3	$5.3	$7.2	$2.0	$2.2	$3.9
		M	$0.0	$1.2	$2.9	$1.5	$3.0	$5.2	$1.3	$1.5	$3.1
		P	$0.0	$0.0	$4.1	$4.3	$11.2	$22.4	$0.0	$3.6	$11.3
		S	$37.7	$50.0	$59.9	$28.0	$37.0	$42.9	$37.0	$37.5	$50.2
	48,700 Total		$38.5	$52.9	$69.1	$39.1	$56.5	$77.7	$40.3	$44.7	$68.4
	29,300	CDQ	$2.1	$3.7	$3.9	$7.2	$7.3	$9.9	$3.9	$3.9	$5.4
		M	$2.9	$3.1	$6.9	$5.2	$6.9	$12.1	$3.1	$5.2	$9.9
		P	$4.1	$11.0	$22.3	$22.4	$28.1	$44.0	$11.3	$17.1	$28.2
		S	$59.9	$60.2	$60.5	$42.8	$50.1	$60.0	$50.2	$50.4	$60.3
	29300 Total		$69.0	$78.0	$93.6	$77.7	$92.4	$126.0	$68.4	$76.7	$103.7

Table 4-26 Hypothetical forgone pollock revenue in Percent of Total Revenue, by season and sector under Chinook bycatch options 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%	53%	52%	51%	13%	0%	0%
		M	40%	12%	0%	68%	67%	40%	54%	40%	12%
		P	41%	32%	24%	55%	55%	54%	54%	41%	40%
		S	74%	63%	50%	38%	1%	0%	51%	50%	1%
	87,500 Total		50%	39%	30%	49%	34%	31%	48%	40%	18%
	68,100	CDQ	0%	0%	0%	68%	67%	53%	32%	14%	0%
		M	66%	41%	23%	70%	69%	67%	68%	67%	41%
		P	54%	42%	40%	67%	56%	55%	55%	54%	42%
		S	76%	75%	63%	62%	50%	8%	74%	63%	50%
	68,100 Total		58%	50%	44%	65%	56%	37%	61%	54%	40%
	48,700	CDQ	15%	13%	0%	69%	69%	68%	52%	51%	32%
		M	69%	68%	66%	87%	86%	70%	86%	69%	68%
		P	55%	55%	54%	84%	67%	67%	67%	56%	55%
		S	87%	87%	76%	75%	74%	62%	76%	75%	74%
	48,700 Total		65%	64%	58%	79%	72%	65%	71%	64%	61%
	29,300	CDQ	53%	52%	33%	80%	70%	70%	68%	67%	53%
		M	88%	87%	86%	89%	89%	88%	88%	88%	87%
		P	83%	67%	67%	85%	85%	84%	84%	84%	83%
		S	89%	88%	88%	88%	87%	76%	88%	88%	87%
	29,300 Total		82%	76%	73%	86%	84%	80%	84%	84%	82%
B	87,500	CDQ	0%	0%	0%	3%	6%	6%	0%	1%	3%
		M	0%	0%	0%	0%	0%	3%	0%	0%	0%
		P	0%	0%	0%	0%	0%	2%	0%	0%	0%
		S	10%	10%	14%	2%	6%	10%	6%	10%	14%
	87,500 Total		4%	5%	6%	1%	3%	6%	3%	5%	6%
	68,100	CDQ	0%	0%	3%	6%	6%	8%	1%	3%	3%
		M	0%	0%	3%	0%	3%	7%	0%	0%	3%
		P	0%	0%	0%	0%	0%	5%	0%	0%	1%
		S	14%	14%	19%	7%	10%	14%	10%	10%	14%
	68,100 Total		6%	6%	9%	3%	5%	9%	5%	5%	7%
	48,700	CDQ	1%	3%	3%	8%	8%	11%	3%	3%	6%
		M	0%	3%	7%	3%	7%	12%	3%	3%	7%
		P	0%	0%	2%	2%	5%	9%	0%	1%	5%
		S	14%	19%	22%	10%	14%	16%	14%	14%	19%
	48,700 Total		6%	9%	11%	6%	9%	13%	7%	7%	11%
	29,300	CDQ	3%	6%	6%	11%	11%	15%	6%	6%	8%
		M	7%	7%	16%	12%	16%	28%	7%	12%	23%
		P	2%	5%	9%	9%	12%	18%	5%	7%	12%
		S	22%	22%	23%	16%	19%	22%	19%	19%	22%
	29300 Total		11%	13%	15%	13%	15%	20%	11%	12%	17%

4.3.3 Management and Enforcement

Alternative 2 includes a range of hard caps that, depending on the component selected, apply to specific AFA sectors. These sectors consist of non-CDQ and CDQ pollock trawl vessels operating in the Bering Sea. The non-CDQ AFA sectors include the catcher/processor sector, the inshore cooperative sector, and the mothership sector. The CDQ sector consists of six CDQ groups. The inshore cooperative sector contains seven cooperatives, each composed of multiple fishing vessels associated with a specific inshore processor. There also is a possibility than an inshore open access sector could form if one or more catcher vessels does not join an inshore cooperative.

Under Alternative 2, the term “hard cap” refers to an amount of salmon that, once caught, would require entities regulated under the cap to stop directed fishing for pollock in the Bering Sea. The implementation of salmon bycatch hard caps in the Bering Sea pollock fishery would require various changes to federal regulations and NMFS management practices compared to the status quo. Depending on the components and options selected by the Council, these regulatory changes would include changes to monitoring requirements, inseason management, and enforcement responsibilities.

This action proposes several levels of salmon bycatch hard caps to different fishing industry sectors:

1. Component 1. Separate hard cap allocations could be made to the CDQ and the non-CDQ fisheries.
2. Component 2. The hard cap allocations to the non-CDQ sector could be further subdivided by sector into hard cap allocations for motherships, catcher/processors, and the inshore sector.
3. Component 4. Hard cap allocations to the inshore sector could further be subdivided among inshore cooperatives and, potentially, to an open access sector for catcher vessels not participating in a inshore cooperative.

4.3.4 Component 1: Hard Cap Formulation

4.3.4.1 Management Implications of Hard Caps

Management of hard caps would be the same for all proposed hard cap amounts. Salmon bycatch would be counted using the CAS, as described under Alternative 1. In general, once salmon bycatch approaches the cap established for a fishery, NMFS would close directed fishing for pollock for the applicable fishery.

Component 1 would allocate the salmon hard cap into two hard caps: one for the non-CDQ AFA sectors (catcher/processors, motherships, and inshore) and one for the CDQ Program. The annual CDQ salmon hard cap would be further subdivided to each of the six CDQ groups. In addition, under Component 1, salmon bycatch hard caps would be apportioned between the A and B seasons. This would result in 14 separate Chinook salmon bycatch hard caps: two caps in the non-CDQ AFA fisheries and 12 caps in the CDQ Program. This is portrayed in Table 4-27.

Table 4-27 Number of salmon caps, with seasonal splits.

Seasonal allowance	Number of hard caps, non-CDQ fishery	Number of hard caps, CDQ fishery	Total hard caps
A season	1	6	7
B season	1	6	7
Annual Total	2	12	14

Non-CDQ AFA sector salmon bycatch management under Component 1

The non-CDQ salmon bycatch hard cap would be managed seasonally. NMFS would issue a closure to directed fishing for pollock by all non-CDQ AFA sectors combined once their A season hard cap was reached. A second closure notice would be issued once the B season hard cap was reached.

Without seasonal rollover option: If the A season pollock cap was fully harvested by the non-CDQ AFA sectors before the A season salmon bycatch cap was reached, unused salmon bycatch would be not be available to supplement the B season limit.

With seasonal rollover option: If the A season pollock cap was fully harvested by the non-CDQ AFA sectors before the A season salmon bycatch cap was reached, unused salmon bycatch would be available to supplement the B season limit. If review of salmon bycatch data after the closure notice was issued determined that more Chinook salmon than were allocated to the A season were caught during the A season, then this amount of Chinook salmon would be subtracted from the B season allocation. This suboption does not have significant monitoring and enforcement issues beyond those considered for Component 1 as a whole.

CDQ Program salmon bycatch management under Component 1

Under the status quo, salmon bycatch allocations to the CDQ groups are made to specific entities (the CDQ groups) and are transferable within the CDQ Program. Allocations of hard caps of either target species or prohibited catch species are not managed by NMFS with directed fishing closures, primarily because most of these allocations are so small that NMFS could not obtain accurate catch data fast enough to have the appropriate lead time to issue closures notices in time for catch in the fisheries to stay within allocated amounts. Instead of using fishery closures initiated by NMFS, CDQ allocations are managed with a regulatory prohibition against the CDQ group catching in excess of the allocated amount. To avoid such an overage, the CDQ group would have to stop directed fishing for pollock unless they were certain that such fishing could continue to occur with no additional salmon bycatch.

To effectively enforce seasonal salmon bycatch allocations in the CDQ fisheries, each CDQ group would be prohibited from exceeding it's A season salmon bycatch allocation. If an overage of the A season salmon bycatch hard cap occurred, NMFS managers would provide this information to NOAA OLE as a potential regulatory violation subject to enforcement action. Any overage of the A season hard cap would not be subtracted from the B season hard cap because such an administrative adjustment would negate the enforcement action underway for the A season overage.

Without seasonal rollover option: If a CDQ group fully harvested its A season pollock allocation before it reached its A season salmon bycatch cap, the CDQ group could transfer its remaining A season salmon bycatch allocation to another CDQ group. This transfer provision follows current practices in the CDQ Program that allow transfers of target species and prohibited species allocations among the CDQ groups. However, if the seasonal rollover suboption was not selected by the Council, analysts interpret that the Council would intend that a CDQ group could not transfer its unused A season salmon bycatch cap to its own or any other CDQ group's B season salmon bycatch limit.

With seasonal rollover option: Unused salmon from the A season salmon cap could be transferred to another CDQ group during that same A season or it could be added to the CDQ group's B season salmon cap. This suboption does not have significant monitoring and enforcement issues beyond those for Component 1 as a whole.

Management effects of Component 1

Under the status quo, NMFS may have to issue one fishery closure associated with the Chinook salmon bycatch limit each year. If the Chinook salmon bycatch limit is reached, NMFS closes the Chinook salmon savings area to all non-CDQ AFA participants not participating in the ICA. Component 1 creates the potential for NMFS to have to issue two fishery closures each year for the non-CDQ AFA fisheries. The first closure would occur if the A season Chinook salmon bycatch cap was reached before all of the A season pollock allocation was harvested. The second closure would occur if the B season Chinook salmon bycatch cap was reached before all of the B season pollock allocation was harvested. This is not a significant increase in the number of fishery closures that NMFS would need to be issue.

Under Component 1, no changes to the observer requirements for the non-CDQ AFA participants are needed to monitor seasonal salmon bycatch hard caps allocated to the non-CDQ sectors as a whole. Some changes to NMFS's catch accounting system would be needed to track the additional seasonal salmon bycatch caps. The addition of salmon bycatch hard caps has the potential to add significant constraints to the pollock fisheries. However, as long as NMFS is managing a single hard cap for all of the non-CDQ AFA sectors combined, the current level of observer coverage and data available to estimate salmon bycatch by the fishery as a whole is adequate to support NMFS issuing fishery closures that apply to all of the non-CDQ AFA sectors at the same time.

Enforcement implications

Changing from a system of Chinook salmon savings area closures to pollock directed fishing closures by sector would require NMFS 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. NMFS OLE also would be responsible for enforcing any violations associated with exceeding CDQ seasonal salmon bycatch caps. The seasonal splits would add 12 additional CDQ salmon caps, in addition to the approximately 150 groundfish and prohibited species annual CDQ allocations. There have been approximately two dozen groundfish CDQ overages since 1999. The most recent CDQ overage was in 2006.[8]

4.3.4.2 Component 1, Suboption: Periodic adjustments to hard caps based on updated bycatch data

No specific monitoring or enforcement issues were identified for this suboption.

4.3.4.3 Component 1, Option 2: Index Cap

No specific monitoring or enforcement issues were identified for this option. However, it has the potential to significantly complicate the annual groundfish harvest specifications process. More information about how an index cap would be changed through that process is needed before the impact of this option can be fully evaluated.

4.3.5 Component 2: Sector Allocations

Under Alternative 2, Component 2, the non-CDQ salmon hard cap would be apportioned among the three non-CDQ AFA components. In combination with a seasonal allowance of each annual cap, this would result in 18 separate salmon caps for the catcher/processor, mothership, inshore, and CDQ sectors. This results in four more caps than considered under Component 1. NMFS would close directed fishing for pollock for each non-CDQ sector once it reached its seasonal salmon allowance. As with Component 1, unused salmon bycatch

[8] Patty Britza, NMFS, May 5, 2008.

from the A season could be available to supplement the non-CDQ and CDQ sectors' B season salmon bycatch limit through NMFS-initiated rollovers.

Table 4-28 Number of salmon caps under Component 2: Sector Allocations

Season split	Number of caps, non-CDQ fishery			Number of CDQ caps	Total number of caps
	Catcher/processor	Mothership	Inshore		
A season	1	1	1	6	9
B season	1	1	1	6	9
Annual total	2	2	2	12	18

The creation of sector-level salmon bycatch allocations would require the Council and NMFS to specify sector level salmon allocations through the annual harvest specifications. This would add an incremental degree of complexity to an already complicated process. Furthermore, increasing the number of annual and seasonal salmon hard caps would require additional agency resources to implement and manage.

Allocating salmon bycatch caps among different sectors increases the complexity of changes that would be required to be made to NMFS's CAS. NMFS probably would incur additional software design and development costs to accommodate allocating the non-CDQ salmon hard cap among three sectors. The additional sector allocations would require NMFS to design and test its CAS software to ensure sector-specific salmon harvest is correctly counted. These costs probably would be greater than those associated with the seasonal bycatch caps considered under Component 1.

The increase in the number of salmon hard caps under seasonal allowances would result in an increase in NMFS's management responsibilities. Multiple salmon bycatch caps for the three different non-CDQ AFA sectors would increase NMFS's involvement with allocating bycatch caps, monitoring salmon bycatch, closing directed fishing for pollock when a sector's salmon cap was reached, and implementing seasonal rollovers. Each CDQ group would continue to manage each of its seasonal and annual Chinook salmon caps. NMFS would not issue closures to directed fishing for pollock CDQ.

Enforcement implications

Component 2 would incrementally increase the number of fishery closures that NMFS OLE would monitor, compared to Component 1. 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. Logbook and observer information would be used by NOAA OLE to determine if a vessel was directed fishing for pollock. In addition, NMFS closely monitors observer information to manage groundfish and prohibited species catch limits. Thus, NMFS may refer some potential directed fishing violations to NOAA OLE as well.

4.3.6 Component 3: Sector Transfers

Component 3 includes options to allow sector salmon caps either to be transferred (Option 1) or rolled over (Option 2) from one sector to another by NMFS. Both of these options have associated management implications. Option 1 would put more of the burden of managing and accounting for salmon caps on the recipients of such caps. Option 2 would increase NMFS's monitoring and management role associated with salmon bycatch caps. Either the transfer and rollover options considered under Component 3 would require NMFS to administer the movement of salmon between sectors to some degree.

4.3.6.1 Component 3, Option 1. Inter-sector salmon transfers

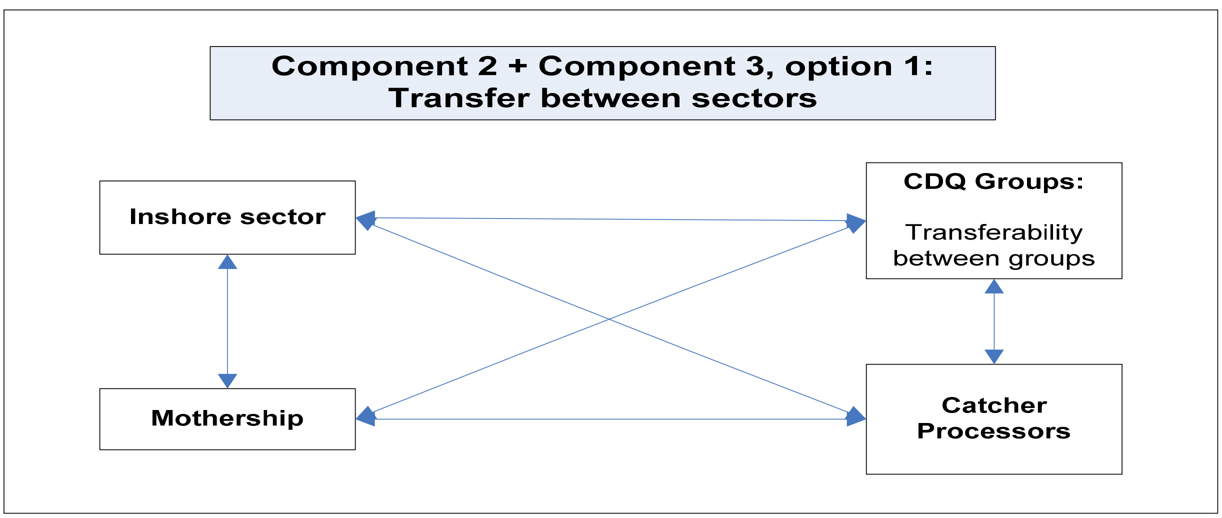
Under this option, transfers of salmon could occur between the catcher/processor, mothership, inshore, and CDQ sectors. Salmon could be transferred between any of these sectors. Participants would need to apply to NMFS to formally transfer salmon bycatch. Selection of this Option 1 would require NMFS to process and approve salmon cap transfer applications. The burden on the agency would increase proportionally with the number of inter-sector transfers that industry chose to request during a given season or year. Participants in the pollock fishery would face additional costs associated with preparing and submitting salmon cap transfer applications to NMFS, but the costs cannot be quantified at this time.

Salmon hard cap transfers would have to occur between two legal entities. Currently, the only entities in the pollock fishery that can receive or transfer allocations are the inshore cooperatives and CDQ groups.

Inshore cooperatives are themselves entities that could receive or transfer salmon, but salmon would not be allocated to this level under Component 3. Thus, inshore cooperatives and any vessels not in a cooperative would have to create an umbrella entity that represented all participants in the inshore cooperative. Similarly, a legal entity would have to be created in order for the mothership and catcher/processor sectors to transfer their salmon bycatch caps. The legal entity would have to represent all vessels eligible to participate in each applicable AFA sector, be authorized by all members of the sector to transfer or receive salmon caps from another sector, and be responsible for any penalties associated with exceeding a sector's catch limit or transfer violation (i.e., have an agent for service of process with respect to all owners and operators of vessels that are members of the legal entity).

Figure 4-2 depicts the four different Bering Sea pollock sectors. The arrows on the diagram represent the direction salmon could be transferred between each entity. The CDQ groups are currently individual entities that can receive or transfer salmon from one another. They also would be able to receive or transfer salmon to other sectors, although such transfers may have to occur at the CDQ sector level. Once the CDQ sector received a salmon transfer, the quantity of salmon cap being transferred would be apportioned among CDQ groups based on existing percentage allocations.

Figure 4-2 The transferability of salmon between sectors under Component 2 (sector allocation) and Component 3, option 1 (transferability).



The creation of sector-level legal entities would likely require federal regulations similar to those at 50 CFR 679.61(e). Those regulations address the formation and operation of fishery cooperative under the AFA. In general, these regulations require, on an annual basis, the name of the designated cooperative representative that is responsible for filing all reports on their behalf, an agent that is the primary NMFS contact person for the cooperative, the list of parties to the contract, the list of vessels that harvest the cooperative's allocation, and a requirement of for the cooperative to provide certain types of data on a annual basis. Formation of sector level-cooperatives would require affected parties to develop and maintain a cooperative structure. Sectors that were not able to form a legal entity, could not transfer or receive transfers of salmon bycatch. Each of the three sectors in the non-CDQ pollock fishery would incur some costs associated with establishing and maintaining the legal entity necessary for the sector as a whole to conduct salmon transfers, although this cost cannot be estimated at this time.

A salmon cap transfer between different entities in the pollock fishery would require NMFS approval before the transaction could be completed. Per existing agency practice with other fishery programs with transferrable allocations, NMFS would review the transferor's catch record to ensure sufficient salmon was available to transfer. The time required to complete a salmon transfer would depend on a variety of factors, including staff workload, the number of transfers being requested, and the accounting system developed to oversee the transfer process (i.e., electronic and/or paper).

NMFS is developing the internal processes that will allow the quota and allocation holders in various Alaska fisheries to conduct transfers through the internet. Such process probably would be extended to salmon hard cap allocations. The transfer process could be automated through an online system that allows entities to log onto a secure NMFS website and make a salmon cap transfer. Online transfers probably would reduce the amount of oversight required by NMFS. The costs for an online system would depend on the system developed, but could be shared with other fishery management programs. Another advantage to the online system is that transfers are almost instantaneous. By contrast, paper-based transfers take up to 3 business days to process.

The Chinook salmon cap that is allocated to the CDQ sector would continue to be subdivided into CDQ group allocations. Each CDQ group allocation may be transferred between CDQ groups. Regulations at 50 CFR 679.30(e) describe the process to transfer allocations between CDQ groups. This process requires each group involved in the transfer to complete a transfer request and submit it to NMFS for review. If the remaining salmon cap is sufficient, NMFS debits the transferring CDQ group's salmon account and credits the receiving group's salmon account per the amount requested.

Option 1 increases the complexity of the changes that would be required to be made to NMFS's CAS since it involves both sector allocations and transfers. 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.

Transfer provisions would require accounts to be established for entities that receive salmon allocations, including designing accounts that enable NMFS to track and archive transfers and changes in cooperative structure. 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, potentially, 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 (GOA) Rockfish Pilot 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[9]. 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 Rockfish Pilot Program.

Enforcement implications

NMFS would monitor the catch of each sector's salmon allocation. Each sector would be prohibited from exceeding its salmon bycatch allocation or be subject to a pollock fishery closure. NMFS OLE would enforce prohibitions against exceeding salmon hard caps and NOAA GC would have to prosecute such violations. Enforcement of penalties will require enforcement staff to investigate the overage, issue a citation, and prosecute a violation. Prosecution of a salmon cap overage would require additional enforcement and legal resources. This would increase the management burden on these two agency components.

4.3.6.2 Component 3, Option 1. Transfer limit suboption

This option contains a suboption to limit a salmon cap transfer to either 50%, 70%, or 90% of the amount of salmon available to a sector at the time of transfer. If such a level were adopted, NMFS would implement it by incorporating the appropriate limit into the business rules that would developed to modify the CAS changes and business rules discussed above.

4.3.6.3 Effects of Sector Transfers on Monitoring Requirements

If salmon bycatch is managed under a hard cap that requires NMFS to close directed fishing for pollock once a cap is reached, then salmon bycatch could become very valuable to each pollock fishery sector. Salmon bycatch caps could determine whether a sector's pollock is completely caught or not, as salmon bycatch would become a limiting factor. The pollock fishing industry could place considerable value on transferrable salmon bycatch caps. Bycatch caps also could provide an incentive for the industry to bias salmon bycatch accounting or attempt to under-report salmon bycatch.

Implementing a hard cap Chinook salmon bycatch management system that specifies allocations of salmon would increase the complexity of both monitoring and managing of the Bering Sea pollock fishery. Salmon hard cap management with transfers would increase the need for accurate salmon bycatch monitoring. NMFS believes that the mothership and catcher/processor sectors already have adequate observer coverage to use for salmon bycatch estimation.

However, transferable hard caps would require a better system of estimating salmon bycatch for the inshore catcher vessel fleet, which is not subject to 100% observer coverage. The current system of applying data collected from observed vessels to unobserved vessels uses the best information available under current observer coverage levels. Alternative 1 describes the methodology used by NMFS to extrapolate bycatch from observed vessels to non-observed vessels. However, there is uncertainty associated with extrapolating bycatch from observed vessels to non-observed vessels.

As a result, NMFS's existing use of bycatch rates to estimate salmon bycatch by unobserved catcher vessels could be problematic. This is because it could be difficult to enforce penalties that are imposed on an entity for exceeding a salmon bycatch cap. Enforcement of salmon caps would require entity-specific bycatch

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

accounting. Thus, without vessel and trip-based specific bycatch accounting, the agency would likely not be able to enforce salmon cap overages because bycatch rates from observed vessel would be applied to unobserved vessels. Establishing a legal case using data that may not represent a vessel's actual salmon bycatch is problematic, since such data does not necessarily reflect how much salmon the vessel actually caught.

Suboption 1: NMFS's recommendations

To ensure effective monitoring and enforcement of transferable salmon bycatch, NMFS recommends the following additional monitoring requirements be implemented for the inshore sector and the CDQ sector (if catcher vessels delivering to shoreside processors harvest pollock on behalf of CDQ groups in the future):

- Each catcher vessel, regardless of size, must have 100% observer coverage.
- Chinook salmon could be discarded at-sea only if first reported to, and recorded by, the vessel observer.
- Shoreside processor monitoring requirements may have to be adjusted to incorporate a higher standard for salmon bycatch accounting. This could include such changes as modifying observer sampling protocols or reducing the flow of pollock into the factory to ensure that salmon do not pass the observer's sampling area without being counted.
- Electronic (video) monitoring in lieu of observers on catcher vessels would only be allowed after a comprehensive assessment of the effectiveness of electronic monitoring to verify that salmon are not discarded.

Existing monitoring requirements in place for catcher/processors and motherships participating in the AFA pollock fisheries, including the directed fisheries for pollock CDQ, are adequate to obtain the salmon bycatch information needed to account for and transfer Chinook salmon among industry sectors. NMFS recommendations are further described below, following the Council's motion about monitoring requirements (Suboption 2).

Suboption 2: Council's February 2008 motion

In order to allow for effective monitoring and management requirements, except for catcher vessels that deliver unsorted cod ends, participation in the pollock fishery for vessels would require a minimum of 100% observer coverage or video monitoring to ensure no at-sea discards.

4.3.6.3.1 Costs associated with increased observer coverage on catcher vessels

This section summarizes the costs associated with the monitoring components for catcher vessels that would be subject to the increased observer coverage under Component 3. This discussion also is applicable to transferrable salmon caps at the cooperative level, as described in under Component 4.

Component 3 would establish transferable hard caps would increase the need for accurate salmon bycatch accounting, particularly for the inshore sector. This is because salmon bycatch for the inshore sector is based on NMFS calculated rates, as described under Section 1.1.3. More accurate salmon bycatch estimates would also assist NMFS in enforcing any prohibitions against exceeding salmon caps, since the calculation of overages must be based on more accurate estimates of total salmon bycatch by a particular sector. NMFS considers catch composition data collected by an observer onboard a vessel as the best source of information for prohibited species catch accounting for catcher/processors, motherships, and catcher vessels. However, recall that a portion of the inshore catcher vessel fleet is not subject to 100% observer coverage. Therefore, NMFS recommends that increased observer coverage be required for the inshore catcher vessel fleet under Component 3, if Option 1 (sector transfers) is selected. The objective of recommending increased observer coverage requirements is to have bycatch data collected by a trained, independent third party who does not face economic consequences associated with the catch data.

Participants in the pollock fishery would likely incur additional costs associated with increased monitoring requirements. Costs associated with increased observer coverage are difficult to predict. Based on NMFS's experience with the AFA catcher/processor fleet, some data is available about requiring observers on the catcher vessels potentially regulated by this action. A requirement that all catcher vessels be subject to 100% observer coverage would result in increased observer coverage for each of the 57 inshore catcher vessels which currently are required to carry an observer at least 30% of the time that they are fishing. This discussion is centered on the incremental changes in costs that would result from requiring that catcher vessels that are equal to or greater than 60 feet LOA but less than 125 feet LOA carry observers 100% of the time that they are directed fishing for pollock.

Observation of every trip would require the deployment of one observer aboard each inshore catcher vessel while engaged in directed fishing for pollock. Current regulations require trawl vessels 125 feet LOA or larger to carry one NMFS-certified observer at all times while fishing for groundfish. Therefore, this action would not require an increase in observer coverage on such vessels.

NMFS's estimate of observer costs is that a certified observer costs a vessel or processor approximately $355 per day. This is the best amount currently available to project future costs associated with increasing or changing observer coverage levels, although it may not be representative of the actual costs for current observer costs to industry. Future NMFS actions are being considered that may require the fishing industry to provide the agency with the cost data needed to estimate a more a representative average observer cost.

In 2007, 57 vessels between 60 feet and 124 feet LOA carried an observer about 1,590 days while AFA pollock fishing. These same catcher vessels fished a total of approximately 3,364 days in 2007. NMFS estimates that observer coverage costs for this level of coverage was approximately $564,450 (1,590 days * $355). If all of the 2007 fishing days were observed, this estimated total cost for 100% observer coverage would be $1,194,220 (3,364 days * $355). Increasing observer coverage requirements to 100% would have cost an additional $629,770.

During 2007, the 57 AFA catcher vessels between 60 feet and 124 feet LOA had observer coverage an average of 48% of their pollock fishing days. Individual vessels in this fleet averaged about 32 days of observer coverage, out of an average total of 67 fishing days per vessel. If these vessels continued to fish the same number of days in future years, the total cost for observer coverage per vessel would be approximately $23,785 annually, using existing observer cost estimates. The increased costs per vessel would be approximately $12,425 from the current coverage level. 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.

Table 4-29 Costs associated with increasing observer coverage to 100% for inshore catcher vessels that currently are subject to 30% observer coverage requirements.

	(A) Estimated Cost per Day of Observer Coverage	(B) Average number of fishing days 2007	(C) Average number of observer coverage days 2007	(D) Current Cost of Observer Coverage ***[A*C]***	(E) Cost of Proposed Increase to Observer Coverage ***[A*B]***	Annual Cost Increase ***[E-D]***
Per Vessel	$355	67	32	$11,360	$23,785	$12,425
Fleet wide	$355	3,364	1,590	$564,450	$1,194,220	$629,770

When considering potential observer cost increases, it is also important to consider that costs will vary with the amount of the pollock each vessel catches, and that some participants' pollock allocations could diverge 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. Some cost savings may be achieved if inshore sector catcher vessel operators "stack" their pollock history on a single, or fewer, vessels 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 in 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.

The costs 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 fisheries. In addition to increased management and 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 processes, additional training classes to accommodate the increase in observers, additional observer sampling equipment, 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 full time equivalent staff positions and approximately $325,000 annually (personal communication, J. Ferdinand, AFSC, March 2008).

4.3.6.3.2 Effects of changes to shoreside monitoring requirements

As described previously each shoreside pollock processors must annually submit a catch monitoring and control plan (CMCP) to NMFS. Regulations regarding CMCPs requirements are at 50 CFR 679.28(g). These plans are designed to ensure that processing facilities are laid out in a manner that allows for accurate catch accounting. The plans ensure that observers have adequate facilities to conduct their sampling duties efficiently, and obtain adequate estimates of the weight and species composition in each offload. Because plant layouts and operations vary widely between processors, 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. Therefore, additional measures would need to be implemented in addition 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 factory after a vessel has departed (with its observer) are brought to the plant observer.

Sector-level salmon bycatch caps could result in individual salmon significantly limiting pollock fishing. Since each salmon counted against a hard cap could ultimately constrain the full harvest of a sector's pollock allocation, Chinook salmon hard caps may create incentives to misreport salmon bycatch. This is particularly applicable to inshore processors. The factory areas of processing plants are large and complex. Preventing observers from seeing Chinook salmon that enter the factory would be simple. Thus, under transferable hard cap, there is a potential that the pollock industry could use methods to cause salmon to not be counted by the observer. In order for hard caps to be effective, NMFS needs to ensure that there is a credible salmon bycatch monitoring system in place at inshore processing plants. This would ensure that observers have access to all salmon prior to the fish being conveyed into the factory.

NMFS proposes that additional measures may need to be implemented to ensure that no salmon make it into the factory when the vessel observer is monitoring a catcher vessel's offload. For example, shoreside processors could be prohibited from allowing salmon to pass from the sorting area and into the factory. Because it is difficult to differentiate between different salmon species on a sorting belt, no salmon would be allowed past the observer's sampling area. To ensure that an observer may completely sort and count all salmon, the following constraints on processors could be required:

- The depth of fish flowing past the observer on the belt may be no more than one fish deep;
- Belt widths may need to be narrowed to allow observers to access all fish, and;
- Multiple belts in the sorting area would be prohibited in order to ensure that all of the fish in an offload passed a single observation point.

NMFS considered whether the use of video surveillance inside the factory could ensure that salmon did not enter the factory, or could ensure that any salmon that did enter the factory were detected and counted. However, this does not appear to be a reasonable option. This approach was rejected because factories are so complex that it would be logistically impossible to cover all areas where a salmon could appear in the factory. Also considered, but rejected, was the requiring of additional observers, enforcement personnel, or staff at the plant to monitor salmon inside the factory. This approach was also deemed to be too staff intensive because of the complexity and variety of plant layouts.

The reduction in the flow of fish through the initial catch sorting area could slow pollock processing, since fish would enter the factory at a slower rate. The degree to which processing speed would be reduced is highly variable among the processors, as the infrastructure changes necessary to allow observers access to all salmon depends on the plant's current layout. Further, the sampling methods used by observers would influence sorting requirements and the flow of fish into a plant.

Proposed changes to inshore monitoring requirements could increase processing costs, because processors may have to expend additional time to process the same relative volume of pollock. 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. A reduction in the flow of fish or change in the plant configuration would likely impose some additional costs. These costs would be associated 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. The magnitude of these costs would likely be plant-specific. They also would depend on the type of sampling required by the Observer Program.

Under existing protocols, observers have the option to either count all of the salmon in a given delivery (census) or to count the salmon in a portion (sample) of the delivery and extrapolate this number to estimate the number of salmon in the entire delivery. Currently, observers complete a census and only sample the delivery at specific plants or if they become ill during the offload.

If new monitoring requirements were implemented, the time needed for processors to sort bycatch out of a delivery could increase, due to the reduction in the flow of fish past the plant personnel who sort bycatch from pollock. The extent to which processing time could increase (due to a decrease in the flow of fish entering the factory) also depends on how the shoreside processors modified their factories to allow observers access to all salmon in a delivery. Pollock processing time may not be affected if processors modify the factories in a manner that allows observers to access all salmon in a delivery and continue to allow fish to move into the processing area at the current rate.

NMFS notes that existing observer sampling protocols allow observers to sample for prohibited species only in specific circumstances (i.e., illness, or at certain plants due to their configuration), rather than completing a complete census of all prohibited species in a delivery. Revising inshore catch monitoring requirements could result in a higher percentage of deliveries being sampled to for prohibited species composition. This would allow an observer to make more efficient use of their time than completing a full census. Furthermore, if observers collected samples instead of a census, inshore processors could be able to speed up the flow of fish into the factory once the observer had completed obtaining their sample from the delivery. Conversely, observers may choose to sample such a large fraction of the delivery that only minimal time savings could be realized relative to conducting a census.

The tradeoff between slowing down the flow of fish to allow for a complete census versus allowing salmon bycatch to be extrapolated from samples must be considered when selecting a monitoring protocol. Whenever possible, NMFS programs its CAS for fisheries managed with allocations or quotas so that catch accounting is based on a complete accounting of allocated species, rather than an estimate derived from sampling. NMFS has found that catch estimates may be questioned by allocation holders who do not believe that such estimates are accurate. To the extent that an estimate of Chinook salmon bycatch is critical to the point that it may determine whether a directed fishing for pollock may continue or not, plant personnel may place additional pressure on the observer to take larger samples, complete a census, or to modify their initial estimate of Chinook salmon bycatch.

4.3.6.3.3 Electronic monitoring background

In order to ensure adequate monitoring of salmon bycatch by shoreside catcher vessels, NMFS recommends that all catcher vessels be required to have 100% 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)[10] prepared for EM in the hake fishery, future regulations would include:

- an EM service provider permitting process;
- EM service provider responsibilities;

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

- EM service provider data confidentiality standards;
- EM coverage requirements for vessels;
- 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 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% and 100% 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. A final report for this project will be presented at the June 2008 Council meeting, but the preliminary results indicate that video is able to estimate the quantity of halibut discard successfully. This work will continue in 2008 with a larger group of vessels and is designed to investigate the logistical, cost, and infrastructural issues associated with full scale regulatory implementation of such a EM program.

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 the majority 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 to 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.

4.3.6.3.4 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 shoreside catcher vessels 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 do develop EFPs to test EM as a salmon bycatch monitoring tool in the Bering Sea pollock fisheries.

An Electronic Monitoring workshop is being sponsored by the AFSC's Fisheries Monitoring and Analysis Division, the NMFS Alaska Regional Office, North Pacific Research Board, and the Council. It will be held at the Alaska Fisheries Science Center in Seattle, Washington on July 29th and 30th, 2008.[11] The goal of the workshop is to assess the current state of video monitoring technology in fisheries, the applicability EM to research and management of North Pacific fisheries, the future potential of EM, and research and development needs. An outcome of the workshop may be a coalescence of current information about the paradigms of implementing effective EM systems.

4.3.6.4 Component 3, Option 2. NMFS rollovers of salmon bycatch caps

Option 2 would require NMFS to reallocate (rollover) salmon bycatch allocations between pollock sectors based on sector-specific and date-specific pollock harvest. This option would require that NMFS would rollover any remaining salmon bycatch from a sector that has completed pollock fishing to other sectors that

[11] Registration and other information is located at: http://efmworkshop.nprb.org/start.jsf.

are still pollock fishing. Rollovers are an option if the Council elects to allocate a hard cap or a trigger cap for salmon bycatch among the AFA sectors, but either:

1. decides not to allow salmon bycatch caps to be transferable among the sectors but wants to provide a mechanism to maximize the harvest of pollock for a given salmon cap, or
2. the non-CDQ sectors cannot form the legal entity necessary to allow transferability of salmon bycatch among the sectors.

Rollovers refer to an action that NMFS would take to reallocate, once a sector had reached its pollock allocation, that sector's remaining salmon bycatch hard cap to another AFA sector, the CDQ Program, or the inshore sector open access fishery. For example, if the catcher/processor sector harvested its entire pollock allocation, but still had some remaining salmon bycatch, and if the mothership sector, inshore sector, and CDQ sector had remaining pollock, NMFS would rollover the catcher/processor sector's remaining salmon bycatch to the other pollock sectors. This is portrayed in the following table, in which there are 1,000 salmon remaining in the catcher/processor salmon bycatch cap.

Table 4-30 Example of a salmon bycatch cap rollover to remaining sectors from catcher/processor cap.

Sector	Pollock remaining	Percent of total pollock remaining	Reallocation of 1,000 salmon
Inshore	20,000 mt	77	770
Mothership	5,000 mt	20	200
CDQ Program	1,000 mt	3	30
Total	26,000 mt	100	1,000

Rollovers of salmon caps among AFA sectors could include the CDQ sector as a recipient of rollovers. Any salmon bycatch reallocated to the CDQ sector during a year would be further allocated among the CDQ groups, based on each group's percentage allocation of salmon bycatch. However, rollovers from the CDQ sector to other AFA sectors are not practicable under the current allocative structure of CDQ Program. A percentage of the current salmon PSC limits currently are allocated to the CDQ Program. These PSC allocations are then further allocated among the six CDQ groups as transferable salmon PSQ. Therefore, once allocated among the CDQ groups, NMFS could not reallocate salmon bycatch away from one or more CDQ groups through a rollover.

Regulatory guidelines would be needed to allow NMFS to conduct salmon bycatch rollovers. For example, the following process could be used for guiding the rollover process:

If, during a fishing year, the Regional Administrator determines that a non-CDQ AFA sector has completed harvest of its pollock allocation without using all of its salmon bycatch allocation and sufficient salmon bycatch remains to be reapportioned, the Regional Administrator would reapportion the projected unused amount of salmon bycatch to other AFA sectors (including CDQ), through notification in the Federal Register. Any reapportionment of salmon bycatch by the Regional Administrator would be based on the proportion each sector represents of the total amount of pollock remaining for harvest by all sectors through the end of the year. Successive reapportionments actions would occur as each sector completes harvest of its pollock allocation.

Regulations could specify that any remaining sector-specific salmon in the A season would be moved to the same sector's B season salmon bycatch cap. Recall that, as previously discussed under Section 1.2.2

(Component 1, seasonal rollovers), salmon may be allowed to rollover from the A to the B season. NMFS would make inter-sector salmon rollovers through the inseason action process.

Seasonal salmon bycatch rollovers could complicate the sector rollover considered under this option. A given sector might prefer that its residual A season salmon bycatch not be redistributed to other sectors during the A season, since that would decrease the amount that could be rolled over to the B season. If NMFS did reapportion salmon bycatch between sectors in the A season, it would be difficult to establish how much salmon could be rolled from the A season to the B season on a sector by sector basis, as the sectors' original salmon allocations would have been co-mingled. The combination of A season inter-sector salmon rollovers and seasonal rollovers could lead to inequitable seasonal rollovers, since a sector could lose access to some portion of its original annual salmon allocation.

Thus, NMFS recommends that inter-sector salmon reapportionments only be allowed in the B season. If a sector still had a portion of its salmon bycatch cap remaining after it harvested all its pollock allocation in the B season, NMFS could then reapportion that sector's remaining B season salmon bycatch to other sectors. The reapportionment would be based on the amount of pollock remaining in each sector, as previously described.

Sector rollovers would require additional agency resources to monitor and carry out. These would require NMFS to assess the amount of salmon a sector needs to complete its harvest of pollock and rollover any salmon from a sector that likely has "excess" salmon. The process would require considerable effort to determine 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, the ability for NMFS to project the amount of salmon to reapportion and a given sector's need for additional salmon would based on the amount of pollock remaining in that sector. There probably would be some delay between when salmon become available for transfer and the most current pollock catch figures. For this reason, NMFS would need to forecast pollock catch using observer information and reallocate salmon appropriately. Thus, the amount of salmon bycatch that NMFS estimated was needed for a rollover would be less accurate than the transfer option considered under Option 1, which would allow different pollock sectors to move salmon bycatch based on their estimates of salmon needs.

Effects of Not Allowing Rollovers or Transfers

The burden on NMFS to monitor additional salmon caps would depend on whether sector-specific salmon 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 have to be spent processing inter-sector salmon allocation transfers. 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.

If neither Option 1 or Option 2 were selected, *i.e.*, if Component 3 was not selected, each sector would have to stop directed fishing for pollock once its seasonal salmon bycatch cap was reached. There could be no movement of salmon bycatch between the catcher/processor, mothership, inshore sector, or the CDQ sectors. This option would impose a sector-specific hard cap that, prior to it being reached, would result in an inseason closure notice. The delay in effectiveness associated with inseason closures would require NMFS to closely monitor pollock catch and salmon bycatch in order to project when a sector might reach its salmon hard cap. NMFS would rely on existing observer coverage levels and monitoring requirements to determine the amount of salmon bycatch made by each sector. Thus, as with Component 1, bycatch information from observed fishing days would be applied to non-observed fishing days for catcher vessels that are not subject to 100% observer coverage.

Enforcement Implications

Component 3 contains different components and options to allow transfers of salmon allocations, which 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. The transfer process considered under Option 1 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. NMFS 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 additional enforcement considerations associated with NMFS's recommendation that all inshore catcher vessels be required to have 100% observer coverage and that shoreside monitoring improvements be required. NMFS OLE enforcement personnel potentially would be required to oversee additional activities associated with salmon bycatch monitoring. This would involve Enforcement personnel determining whether shoreside catcher vessels had sufficient observer coverage, if such catcher vessels were complying with "no discard" requirements, and if shoreside processors were complying with additional monitoring and operational requirements intended to facilitate salmon bycatch monitoring. Thus, enforcement costs would be greater for Component 3 than those that would expected for Component 1, since Component 3 requires a higher level of salmon bycatch accountability in order to carry out inter-sector transfers or rollovers.

4.3.7 Component 4: Cooperative Provisions

This component contains additional options to management measures that could apply to inshore cooperatives. It would only apply if Component 3, sector allocations, also was selected. This component includes two transfer options (1) pollock could be transferred between cooperatives, or (2) salmon bycatch could be transferred between cooperatives. These types of transfers differ from Component 3, which does not allocate salmon bycatch to cooperatives within the inshore sector. That component only allows salmon bycatch to be transferred between AFA sectors; it also not have any options that would allow pollock to be transferred between sectors.

4.3.7.1 Additional caps created under Component 4

Component 4 would allow NMFS to subdivide the allocation of salmon to the inshore sector (made under Component 3) to the seven inshore cooperatives, and potentially to an open access sector. The latter allocation would be required under circumstances in which one or more catcher vessels in the inshore sector did not join a cooperative, although in recent years, all AFA eligible catcher vessels have joined a cooperative. If a vessel or vessels decided not a join an inshore cooperative, they would become part of an inshore open access sector (this has not happened since 2005). The creation of an open access sector would result in the inshore sector allocation of salmon being divided between the cooperatives and, potentially, the inshore open access fishery. The amount of salmon allocated to the open access sector would be based on the pollock catch history by vessels within that sector. This allocation of salmon would not be transferable and could not rolled over to other sectors.

Allocating salmon to the cooperatives and the open access sector would result in a potential maximum of 16 seasonal allocations and 32 annual salmon allocations, as depicted in the Table 4-31. Compared with Component 3, which does not include cooperative allocations, selection of Component 4 increases the number of seasonal salmon allocations from nine to 16 and the annual allocations from 18 to 32.

Table 4-31 Potential number of seasonal salmon bycatch caps under Component 4.

Season	Number of caps, non-CDQ sector				Number of caps, CDQ sector	Total salmon caps
	Catcher/processor	Mothership	Cooperatives	Open Access		
A season	1	1	7	1	6	16
B season	1	1	7	1	6	16
Annual total	2	2	14	2	12	32

Inshore cooperatives are affiliations of catcher vessels and specific inshore processors. Cooperatives must adhere to regulatory requirements at 50 CFR 679.61 and 679.62. NMFS approves contracts for inshore cooperatives annually. These contracts contain information about the cooperative structure, including the vessels that are parties in the contract and the primary processor that will receive pollock deliveries. Each catcher vessel in a cooperative must have an AFA permit with an inshore endorsement, LLP permit authorizing the vessel to engage in trawl fishing for pollock in the Bering Sea or Aleutian Islands, and no sanctions on the AFA or LLP permits. Any contractual provisions under the AFA are enforced by the industry, rather than NMFS.

Once a cooperative's contract is approved by NMFS, the cooperative receives an annual pollock allocation based on the catch history of vessels listed in a cooperative contract. The allocation of pollock to each inshore cooperative does not changed within a year, unless NMFS reallocates pollock from the Bering Sea pollock incidental catch allowance or from the Aleutian Islands subarea TAC into the Bering Sea pollock TAC. Such reallocations are apportioned among the AFA sectors, including the inshore sector and its associated cooperatives.

The AFA require an inshore cooperative to deliver at least 90% of its annual pollock allocation to the AFA inshore processor designated in the cooperative's contract. These regulations also allow the remaining 10% of pollock to be delivered to any AFA inshore cooperative. Within a fishing season, inshore catcher vessels may move between cooperatives through contractual arrangements. Only vessels that are part of an inshore cooperative may contract with other cooperatives. These contracts allow vessels to harvest another cooperative's allocation of pollock, but do not allow the transfer of pollock between cooperatives. For example, a vessel that is a member of cooperative A could harvest pollock allocated to cooperative B, resulting in the vessel becoming a temporary member of cooperative B. However, the catch history of the vessel remains with cooperative A.

Cooperatives wanting to contract with a vessel must submit an application and a copy of the contract to NMFS. The type of information required in the application is described in 50 CFR 679.62. The application process alerts NMFS that some vessels might be reporting pollock catch under an alternate AFA inshore cooperative identification number. The cooperative identification is a unique number that allows pollock catch to be attributed to the proper cooperative account in NMFS's CAS.

4.3.7.2 General monitoring effects of Component 4

Cooperative-level salmon allocations could be very complicated for NMFS to monitor and manage, due to the large number of seasonal and sector salmon bycatch allocations that would be created. The selection of Component 3, Option 1 (sector transfers) and Component 4 (cooperative transfers) would yield the greatest range of possibilities to move salmon bycatch between sectors as well as between cooperatives. The combination of sector and cooperative-level salmon bycatch allocations and transfers could require intensive NMFS management of the salmon bycatch in the Bering Sea pollock fisheries.

Vessel operators within a cooperative determine who is allowed to catch the cooperative's annual allocation of salmon. These arrangements specify the penalties that members are subject to if they exceed their contracted allowable catch amount. NMFS is not responsible for monitoring fisheries allocations made to AFA cooperatives. Cooperative members or the co-op's manager are responsible for tracking a cooperative's catch, and may trade or lease the rights to fish within a cooperative without notifying NMFS. The distribution of fishing privileges within a cooperative is enforced through contractual agreements between cooperative members. Contract violations are settled by the parties in conflict through civil procedures. NMFS is not responsible for resolving disputes.

Federal regulations at 50 CFR 679.61(e) that govern AFA contracts require contract information to be provided to NMFS on an annual basis. In general, these regulations require the name of the designated cooperative representative that is responsible for filing all reports on their behalf, recognition of a primary NMFS contact person for the cooperative, the list of parties to the cooperative contract, and submission of certain types of data on an annual basis. These regulations currently require cooperatives to report on the effectiveness of the salmon VRHS.

NMFS would incur increased administrative costs associated with conducting transfers, issuing salmon allocations on an annual basis, and (for NMFS OLE) enforcing quota overages. Pollock cooperatives also would have an increased administrative burden associated with managing their annual salmon allocations and conducting transfers.

If Component 4 were selected, NMFS recommends that 100% observer coverage be extended to all shoreside catcher vessels. As discussed in Section 1.2.4, catcher/processors and motherships have the observer coverage levels and sampling protocols that provide NMFS (and industry, under its ICA) with a reasonably sufficient estimate of the salmon bycatch incurred by these two sectors. However, salmon bycatch data for the inshore sector is affected by existing observer coverage levels (30% or 100% of fishing days) on catcher vessels and the use of estimated bycatch rates that are used to calculate the amount of salmon caught by unobserved vessels. Furthermore, shoreside monitoring of salmon bycatch would have to be enhanced, as described under Component 3, Option 1.

Allocating salmon bycatch to the cooperative level would increase the need for more reliable estimates of salmon bycatch by this component of the pollock fishery. The use of bycatch rates to estimate the salmon bycatch by vessels without observers is not accurate or legally sufficient to manage allocations, transfers, or overages.

4.3.7.3 Component 4, Option 1, pollock transfers between cooperatives

This option would allow inshore pollock cooperatives to transfer pollock to other inshore cooperatives after the former's salmon cap is reached. Federal regulations currently prohibit pollock transfers between inshore cooperatives. These regulations could be amended, under the authority of the AFA, to allow pollock transfers among inshore cooperatives.

Component 4, Option 1 would require NMFS to monitor the pollock harvest for each cooperative and track amounts of transferred pollock among cooperatives. By way of example, NMFS has implemented management programs that allow the transfer of fish among entities in various BSAI and GOA fisheries. These programs use a combination of electronic reporting done by the processing plant, online account access for cooperatives, and NMFS approval and tracking of transfers. Component 4 would be similar to other programs in that annual allocations of pollock would be tracked for each cooperative using the existing

NMFS's CAS and electronic reporting system (eLandings). The CAS is configured to track cooperative-specific amounts of pollock, but in its current configuration does not accommodate pollock transfers. Thus, adjustment to the CAS would be needed to accommodate programming complexities associated with transfers, business rules, and CAS account structure.

Pollock transfers would require NMFS approval before the transaction could be completed. Upon receipt of a transfer application, NMFS would review a cooperative's catch to ensure its salmon cap was reached and that an adequate amount of pollock was available. The transfer process could be through eLandings or using a paper application process. NMFS prefers online transfers because paper-based transfers increase staff burden, the time required to complete a transfer, and may only be completed during business hours.

Online accounting of pollock is dependent on the CAS structure, which is the primary repository for catch data. The online interface would need to allow harvesters and NMFS to check account balances, make and accept transfers of pollock, and allow account balances to be updated based on transferred pollock and inseason rollovers of pollock from the ICA and Aleutian Islands, should such rollovers occur. Business rules also would be established as part of the account system to provide a framework for software development. For example, these rules will prohibit cooperatives from transferring pollock if they don't have any remaining salmon allocation. Thus, pollock allocation amounts and associated CAS account structure is dependent on whether salmon bycatch is allocated to the cooperative level and transferability of salmon is allowed. Any changes to the CAS required for salmon allocation transfers (Option 2) would need to interface with pollock transfer accounting.

Increased administrative costs would be associated with managing the online account system or conducting paper transfers. These costs will be greatest for paper transfers because NMFS staff will need to process and approve each transfer, rather than use automated accounting. Processing of paper transfers requires staff to check applications for completeness, notifying the applicants, and updating account status. Compared with paper transactions, administrative costs for online transfers are reduced because NMFS does not need to physically process applications and update account balances. 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 on the complexity of the salmon bycatch transfer options selected. However, unlike paper transfers, the time required to administer an online service would likely lessen after initial implementation.

4.3.7.4 Component 4, Option 2. Salmon transfers between cooperatives

The second option proposed under Component 4 would allow inshore cooperatives to transfer salmon bycatch to or from other inshore cooperatives. This would allow the inshore sector to match its salmon bycatch allocations, actual salmon bycatch, and pollock catch based on actual performance on each member cooperative.

If inshore cooperatives are allowed to transfer salmon, then NMFS would monitor salmon at the cooperative level for the inshore sector and the sector level for the mothership and catcher/processor sectors. Each sector would be required to maintain its salmon bycatch below specified seasonal and annual limits. NMFS would impose penalties on the applicable entity responsible for a particular allocation overage.

The salmon bycatch monitoring requirements for the shoreside sector that NMFS recommends in conjunction with Component 3 (Sector transfers) are equally applicable to inter-cooperative salmon bycatch transfers. They may be even more important because of the small amounts of salmon that ultimately be allocated to the cooperative level. Increased monitoring requirement for catcher vessels and shoreside processors would provide more accurate salmon bycatch accounting for the inshore sector.

The cost associated with changing the CAS will likely be greater than costs associated with pollock transfers. The greater cost is due to the programming time required to implement the more complex business rules associated with salmon bycatch caps. Some costs would be reduced if less complicated seasonal options are selected for salmon and the same online platform is used for pollock and salmon transfers. However, because of the interaction between components, the amount of programming time and associated costs is not known. Programming time and associated costs are increased for combinations of components/options that increase the number of salmon bycatch caps and transfer options. 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.

Salmon bycatch transfers would require a similar process as that described above for inter-cooperative pollock transfers. Salmon bycatch transfers between inshore cooperatives would require NMFS approval before the transaction could be completed. Approval by NMFS requires cooperative parties to notify the agency prior to a transfer so it may review catch records to ensure catch limits are not exceeded. The time necessary to complete a transfer would depend on a variety of factors, including agency staff workload, the number of transfers being requested, and the tracking system developed to oversee the transfer process (i.e., electronic versus paper). The salmon bycatch transfer process could be similar to the process used for the Amendment 80 groundfish fishery, which is a combination of an electronic database for tracking transfers and paper transfer applications.

The time required to complete a transfer depends on a variety of factors, including staff workload in Alaska Region, the number of transfers being requested, and the system developed to oversee the transfer process (i.e., electronic and/or paper). Under most circumstances, paper-based salmon allocation transfers could be completed within five business days. Electronic transfers could be conducted in real-time and much more quickly, as described under Option 1, pollock transfers.

Enforcement Implications

Salmon allocated to a cooperative would require the NMFS OLE to monitor and detect 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 exceeding a cooperatives salmon allocation.

4.3.8 Summary of Direct Effects of Alternative 2

Salmon Saved

This RIR draws heavily on an analysis of hypothetical reductions in coastal-west Alaska specific adult equivalent Chinook salmon bycatch areas that is contained within the EIS. The values are based on median Adult Equivalency (AEQ) values and mean proportions regional assignments within strata (A-season, and NW and SE B seasons) genetics data collected from 2005-2007. The proportional breakouts of Western Alaska Chinook are from Myers et al. 2004. The RIR reproduces output from the AEQ analysis for Western Alaska River System, specifically the Yukon, Bristol Bay, and Kuskokwim areas.

The potential benefit of Chinook salmon bycatch reduction, in terms of Yukon River salmon adult equivalency, increases as the cap decreases and bycatch increases the greatest adult equivalence benefits would have occurred in years when bycatch was highest (i.e. 2007). For the Yukon River, maximum estimated adult equivalent salmon benefits, in numbers of fish, are 13,300 fish under the most constraining hard cap of 29,300 Chinook in the 2007 year. As the hard cap is increased, the benefits in terms of AEQ estimates necessarily decrease as more Chinook are allowed to be bycaught. With a hard cap of 48,700 Chinook the maximum benefit of 10,027 fish is from the 2007 year. The low end AEQ estimate of 738 fish occurs in the 2004 year. As the cap is further increased, the AEQ estimates decrease and with the highest cap of 87,500 Chinook maximum benefit of 5,499 fish is estimated for the 2007 year. The least benefit under this cap is actually negative. A thorough review of the tabular data shows a nearly continuous range of potential benefits, in numbers of adult Chinook, from less than zero to 13,300.

For the Bristol Bay Region, the maximum estimated AEQ salmon benefits, in numbers of fish, are 11,305 fish under the most constraining hard cap of 29,300 Chinook in 2007. With a hard cap of 48,700 Chinook the maximum benefit of 8,523 fish is from the 2007 year. The low end AEQ estimate, under a 48,700 cap, of 653 fish occurs in the 2004 year. As the cap is further increased, the AEQ estimates decrease and with the highest cap of 87,500 Chinook maximum benefit of 4,674 fish is estimated for the 2007 year. The least benefit under this cap is actually negative. A thorough review of the tabular data shows a nearly continuous range of potential benefits, in numbers of adult Chinook, from less than zero to 11,305, depending on cap, split, option, and year.

For the Kuskokwim Region, the maximum estimated adult equivalent salmon benefit in numbers of fish is 8,645 fish under the most constraining hard cap of 29,300 Chinook in the 2007 year. With a hard cap of 48,700 Chinook the maximum benefit of 6,517 fish is from the 2007 year. The low end AEQ estimate, under a 48,700 cap, of 671 fish occurs in the 2004 year. As the cap is further increased, the AEQ estimates decrease and with the highest cap of 87,500 Chinook maximum benefit of 3,574 fish is estimated for the 2007 year. The least benefit under this cap is negative. A thorough review of the tabular data shows a nearly continuous range of potential benefits, in numbers of adult Chinook, from less than zero to 8,645 depending on cap, split, option, and year.

The maximum benefit to the Western Alaska region would be approximately 33,250 fish during the most severe bycatch year of 2007, and for the most restrictive cap and option as discussed previously. In the 2004 year, the lowest bycatch year in the period, that maximum benefit is 11,328. The minimum benefit in the 2007 year would have been 3,167 fish, 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 splits and/or options are. Further, not all scenarios provide salmon savings benefit.

Potentially Foregone Revenue

Under the Chinook salmon bycatch hard cap scenarios included in this alternative, the pollock trawl fishery, and/or specific sectors that participate in it (depending on allocations 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 in order to mitigate potential losses in revenue due to unharvested pollock TAC.

The RIR provides hypothetical estimates of foregone pollock first wholesale revenue by year and season under Chinook bycatch option for fleet wide caps, and for CDQ versus non-CDQ. As expected, the greatest impact would have occurred in the highest bycatch year (2007) and under the most restrictive bycatch cap of 29,300. In the A season, the greatest effect occurs under the 50/50 seasonal split because of the higher roe pollock price in the A season. The B season impact has the reverse situation with effects being greatest under the 70/30 split, which constrains B season revenue more. The maximum A season impact was $529.4 million in

2007 under the 50/50 split and the 29,300 cap. That value is composed of $482.7 million from non-CDQ and $46.7 million from CDQ fisheries. In the B season, the maximum impact is $179.9 million in 2007 with the 293,300 cap and the 70/30 split. In percentage terms the A season maximum impact represents 84% of total revenue and the B season total impact is 30% of total B season revenue.

As is expected, as the hard cap is increases the impacts decrease. However, in the 2007 year when bycatch was highest, even the 87,500 cap would have resulted in total foregone revenue of $322.6 million in the A season, with no CDQ impact. The impact would have been $72.9 million in the B season, with CDQ impact only under the 70/30 split. These values are 51% and 12% of total revenue for the A and B seasons respectively. Thus, in a high bycatch year, even the highest cap has significant potential impacts. Also evident is that as the cap increases, the effect of the split is increased. For example, the $322.6 million A season impact under the 50/50 split would have been $134.8 million under the 70/30 split. The reverse pattern is, of course, observed in the B season.

Impacts estimated for 2004, which is among the lowest bycatch year, are considerably smaller than those estimated for 2007 but are still significant in some cases. In the 2004 A season total impact under the 29,300 cap is estimated to have been $128 million under the 50/50 split, all coming from non-CDQ fishery participation. Under the 70/30 split that amount drops to $64.3 million. With the exception of $200.000 in estimated impact under the 50/50 split and a 48,700 cap, none of the other caps would have caused foregone revenue impacts in 2004. In the B season, 2004 foregone revenue estimates are greatest under the 29,300 cap and 70/30 split, where $82.7 million is the estimated impact.

Overall, the impacts 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 impact values. Even in the second highest bycatch year of 2006, A season impacts under even the largest cap of 87,500 Chinook are estimated have been $183.6 million, which is 29% of total first whole sale revenue in the pollock fishery. However, in lower bycatch years of 2003, 2004, and 2005, there was very little A season impact at the 68,100 cap level, and in percentage terms, this is also true of the B season. The RIR also provides these effects broken out by sector and by year in a series of lookup tables.

4.4 Alternative 3 (Triggered Closures)

4.4.1 Effects on Salmon Bycatch, Salmon Harvesters and Communities

The triggered Closures analyzed here are based on hard caps that are formulated in the same manner as those formulated 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 the EIS) for the A and B seasons. The difference here is that the triggered closure does not cap salmon bycatch but rather used 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, the EIS 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, taken from the EIS, document those numbers as potential benefits in terms of the number of Chinook potentially saved under each trigger, option, an 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 4-32 provides estimates of the Expected Chinook saved by all vessels if A-season trigger-closure was invoked on the dates provided in the analysis of triggered-closure as discussed in the EIS (Chapter 2).

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 5050 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 respectively.

Table 4-32 Expected Chinook *saved* by all vessels if A-season trigger-closure was invoked on the dates provided in The analysis of triggered-closure dates (see EIS Chapter 2).

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 4-33 Expected Chinook *saved* by at-sea processors if A-season trigger-closure was invoked on the dates provided in the analysis of triggered-closure dates (see EIS Chapter 2).

Chinook Salmon saved					**Sector P, 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 4-33 through Table 4-35 provide a breakout of these data specific to at sea processors (CPs), shore based CVs and motherships in the A season, those table show consistent patterns and that the greatest number of salmon saved generally come from the shore based CV sector, and the least from the Mothership sector.

Table 4-34 Expected Chinook *saved* by shore-based catcher vessels if A-season trigger-closure was invoked on the dates provided in the analysis of trigger-closure dates (see EIS Chapter 2).

Chinook Salmon saved					**Sector S, 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 4-35 Expected Chinook *saved* by mothership operations if A-season trigger-closure was invoked on the dates provided in the analysis of trigger-closure dates (see EIS Chapter 2)).

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

The B season expected Chinook saved by all vessels is presented in Table 4-36 below. 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 92007), and from the 70/30 split. However, even the 87,500 trigger with the 70/30 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 200r 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 4-37 through Table 4-39 provide the breakdown of these results for at sea processors (CPs) CV, 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 4-36 Expected Chinook *saved* by all vessels if B-season trigger-closure was invoked on the dates provided in the analysis of trigger-closure dates (see EIS Chapter 2))

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 4-37 Expected Chinook *saved* by **a**t-sea processors if B-season trigger-closure was invoked on the dates provided in the analysis of trigger-closure dates (see EIS Chapter 2)).

Chinook saved			**Sector P, 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 4-38 Expected Chinook *saved* by shorebased catcher vessels if B-season trigger-closure was invoked on the dates provided in the analysis of trigger-closure dates (see EIS Chapter 2))

Chinook saved					**Sector S, 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 4-39 Expected Chinook *saved* by mothership operations **i**f B-season trigger-closure was invoked on the dates provided in the analysis of trigger-closure dates (see EIS Chapter 2).

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

4.4.2 Revenue at Risk

While the hard caps of Alternative 2 have the potential effect of fishery closure and resulting foregone pollock fishery revenue, the triggered closures don't directly create foregone revenue, but rather, they place revenue at risk of being foregone. 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 foregone revenue, the revenue at risk estimate is the answer to the question of how much revenue did they earn, in each of the years 2003-2007, from the projected date of the triggered closure (see 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 triggered closure date forward. Presented here are the estimates of revenue at risk and the percent of total revenue that these estimates comprise.

Table 4-40 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 $485 million in the A season for all vessels combined. That represents 77% 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 $125.2 million in revenue at risk, or a bout 21% 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 $33.2 million (70/30) to $97.4 million (50/50) at risk. These values are 11% and 31% of total revenue respectively.

Table 4-40 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			Sector (All), 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	$125.2
	1-2: 58/42	50,750	$0.0	$0.0	$0.0	$77.5	$263.2
	1-3: 55/45	48,125	$0.0	$0.0	$0.0	$157.0	$269.9
	1-4: 50/50	43,750	$0.0	$0.0	$0.0	$234.9	$280.5
68,100	1-1: 70/30	47,670	$0.0	$0.0	$0.0	$168.1	$269.9
	1-2: 58/42	39,498	$0.0	$0.0	$0.0	$265.8	$314.4
	1-3: 55/45	37,455	$0.0	$0.0	$0.0	$276.1	$326.4
	1-4: 50/50	34,050	$0.0	$0.0	$0.0	$300.1	$344.6
48,700	1-1: 70/30	34,090	$0.0	$0.0	$0.0	$300.1	$344.6
	1-2: 58/42	28,246	$92.3	$0.0	$0.0	$376.9	$385.6
	1-3: 55/45	26,785	$108.3	$0.0	$40.6	$376.9	$394.7
	1-4: 50/50	24,350	$141.0	$0.0	$151.5	$399.8	$412.6
29,300	1-1: 70/30	20,510	$241.5	$65.4	$232.1	$432.8	$453.0
	1-2: 58/42	16,994	$266.0	$129.3	$320.5	$442.6	$484.7
	1-3: 55/45	16,115	$272.1	$137.9	$338.7	$442.6	$484.7
	1-4: 50/50	14,650	$285.2	$179.2	$350.5	$442.6	$484.7

Pollock			Sector (All), A season				
Cap scenario	**Option**	**CAP**	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	61,250	0%	0%	0%	0%	20%
	1-2: 58/42	50,750	0%	0%	0%	12%	42%
	1-3: 55/45	48,125	0%	0%	0%	25%	43%
	1-4: 50/50	43,750	0%	0%	0%	37%	45%
68,100	1-1: 70/30	47,670	0%	0%	0%	27%	43%
	1-2: 58/42	39,498	0%	0%	0%	42%	50%
	1-3: 55/45	37,455	0%	0%	0%	44%	52%
	1-4: 50/50	34,050	0%	0%	0%	48%	55%
48,700	1-1: 70/30	34,090	0%	0%	0%	48%	55%
	1-2: 58/42	28,246	18%	0%	0%	60%	61%
	1-3: 55/45	26,785	21%	0%	6%	60%	63%
	1-4: 50/50	24,350	28%	0%	24%	64%	66%
29,300	1-1: 70/30	20,510	47%	11%	36%	69%	72%
	1-2: 58/42	16,994	52%	22%	50%	70%	77%
	1-3: 55/45	16,115	53%	24%	53%	70%	77%
	1-4: 50/50	14,650	56%	31%	55%	70%	77%

Table 4-41 through Table 4-43 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 at sea processors bear the greatest amount of revenue at risk, their percentages of total revenue are slightly lower than shore based CVs.

Table 4-41 Hypothetical Revenue At Risk based on Retained tons of pollock caught by At-sea processors after A-season closures would have been triggered (millions of dollars (upper) percent of total revenue (lower)).

Pollock			At-sea processors, 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	$67.2
	1-2: 58/42	50,750	$0.0	$0.0	$0.0	$38.0	$134.4
	1-3: 55/45	48,125	$0.0	$0.0	$0.0	$86.8	$137.9
	1-4: 50/50	43,750	$0.0	$0.0	$0.0	$119.9	$142.1
68,100	1-1: 70/30	47,670	$0.0	$0.0	$0.0	$91.5	$137.9
	1-2: 58/42	39,498	$0.0	$0.0	$0.0	$134.1	$155.8
	1-3: 55/45	37,455	$0.0	$0.0	$0.0	$139.5	$161.3
	1-4: 50/50	34,050	$0.0	$0.0	$0.0	$148.7	$170.9
48,700	1-1: 70/30	34,090	$0.0	$0.0	$0.0	$148.7	$170.9
	1-2: 58/42	28,246	$59.8	$0.0	$0.0	$187.9	$191.7
	1-3: 55/45	26,785	$67.7	$0.0	$15.2	$187.9	$199.0
	1-4: 50/50	24,350	$84.3	$0.0	$78.9	$196.7	$210.5
29,300	1-1: 70/30	20,510	$138.3	$33.2	$119.3	$213.2	$225.5
	1-2: 58/42	16,994	$149.0	$71.1	$167.3	$219.2	$240.4
	1-3: 55/45	16,115	$152.1	$74.6	$177.6	$219.2	$240.4
	1-4: 50/50	14,650	$157.7	$97.3	$183.7	$219.2	$240.4
Pollock			**At-sea processors, A season**				
Cap scenario	**Option**	**CAP**	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	61,250	0%	0%	0%	0%	21%
	1-2: 58/42	50,750	0%	0%	0%	12%	42%
	1-3: 55/45	48,125	0%	0%	0%	27%	43%
	1-4: 50/50	43,750	0%	0%	0%	37%	44%
68,100	1-1: 70/30	47,670	0%	0%	0%	28%	43%
	1-2: 58/42	39,498	0%	0%	0%	42%	48%
	1-3: 55/45	37,455	0%	0%	0%	43%	50%
	1-4: 50/50	34,050	0%	0%	0%	46%	53%
48,700	1-1: 70/30	34,090	0%	0%	0%	46%	53%
	1-2: 58/42	28,246	23%	0%	0%	58%	60%
	1-3: 55/45	26,785	26%	0%	4%	58%	62%
	1-4: 50/50	24,350	32%	0%	23%	61%	65%
29,300	1-1: 70/30	20,510	53%	11%	35%	66%	70%
	1-2: 58/42	16,994	57%	23%	49%	68%	75%
	1-3: 55/45	16,115	58%	24%	52%	68%	75%
	1-4: 50/50	14,650	60%	31%	54%	68%	75%

Table 4-42 Hypothetical Revenue At Risk based on Retained tons of pollock caught by Shore Based Catcher Vessels after A-season closures would have been triggered (millions of dollars (upper) percent of total revenue (lower)).

Pollock			Shore-based 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	$50.1
	1-2: 58/42	50,750	$0.0	$0.0	$0.0	$34.7	$107.2
	1-3: 55/45	48,125	$0.0	$0.0	$0.0	$63.2	$109.0
	1-4: 50/50	43,750	$0.0	$0.0	$0.0	$100.0	$113.8
68,100	1-1: 70/30	47,670	$0.0	$0.0	$0.0	$68.7	$109.0
	1-2: 58/42	39,498	$0.0	$0.0	$0.0	$112.4	$128.9
	1-3: 55/45	37,455	$0.0	$0.0	$0.0	$116.0	$134.6
	1-4: 50/50	34,050	$0.0	$0.0	$0.0	$127.3	$142.2
48,700	1-1: 70/30	34,090	$0.0	$0.0	$0.0	$127.3	$142.2
	1-2: 58/42	28,246	$29.8	$0.0	$0.0	$158.7	$159.5
	1-3: 55/45	26,785	$37.4	$0.0	$24.9	$158.7	$160.9
	1-4: 50/50	24,350	$51.5	$0.0	$68.3	$169.5	$166.0
29,300	1-1: 70/30	20,510	$91.5	$28.9	$104.7	$182.2	$186.0
	1-2: 58/42	16,994	$103.5	$52.3	$139.2	$186.1	$199.4
	1-3: 55/45	16,115	$106.1	$56.4	$145.8	$186.1	$199.4
	1-4: 50/50	14,650	$113.2	$71.6	$151.0	$186.1	$199.4

Pollock			Shore-based 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%	20%
	1-2: 58/42	50,750	0%	0%	0%	14%	43%
	1-3: 55/45	48,125	0%	0%	0%	25%	44%
	1-4: 50/50	43,750	0%	0%	0%	40%	46%
68,100	1-1: 70/30	47,670	0%	0%	0%	28%	44%
	1-2: 58/42	39,498	0%	0%	0%	45%	52%
	1-3: 55/45	37,455	0%	0%	0%	47%	54%
	1-4: 50/50	34,050	0%	0%	0%	51%	57%
48,700	1-1: 70/30	34,090	0%	0%	0%	51%	57%
	1-2: 58/42	28,246	14%	0%	0%	64%	64%
	1-3: 55/45	26,785	18%	0%	10%	64%	65%
	1-4: 50/50	24,350	25%	0%	26%	68%	67%
29,300	1-1: 70/30	20,510	44%	13%	40%	73%	75%
	1-2: 58/42	16,994	50%	24%	53%	75%	80%
	1-3: 55/45	16,115	51%	26%	56%	75%	80%
	1-4: 50/50	14,650	55%	32%	58%	75%	80%

Table 4-43 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	$8.4
	1-2: 58/42	50,750	$0.0	$0.0	$0.0	$4.3	$21.4
	1-3: 55/45	48,125	$0.0	$0.0	$0.0	$8.0	$22.8
	1-4: 50/50	43,750	$0.0	$0.0	$0.0	$14.8	$24.2
68,100	1-1: 70/30	47,670	$0.0	$0.0	$0.0	$8.7	$22.8
	1-2: 58/42	39,498	$0.0	$0.0	$0.0	$18.7	$28.6
	1-3: 55/45	37,455	$0.0	$0.0	$0.0	$20.1	$29.4
	1-4: 50/50	34,050	$0.0	$0.0	$0.0	$23.0	$30.4
48,700	1-1: 70/30	34,090	$0.0	$0.0	$0.0	$23.0	$30.4
	1-2: 58/42	28,246	$5.2	$0.0	$0.0	$29.1	$33.2
	1-3: 55/45	26,785	$5.8	$0.0	$0.5	$29.1	$34.1
	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	$40.1
	1-2: 58/42	16,994	$16.5	$6.5	$15.1	$35.7	$43.3
	1-3: 55/45	16,115	$16.9	$7.2	$16.3	$35.7	$43.3
	1-4: 50/50	14,650	$17.2	$10.8	$16.9	$35.7	$43.3

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%	38%
	1-3: 55/45	48,125	0%	0%	0%	14%	40%
	1-4: 50/50	43,750	0%	0%	0%	26%	43%
68,100	1-1: 70/30	47,670	0%	0%	0%	15%	40%
	1-2: 58/42	39,498	0%	0%	0%	33%	50%
	1-3: 55/45	37,455	0%	0%	0%	35%	52%
	1-4: 50/50	34,050	0%	0%	0%	40%	53%
48,700	1-1: 70/30	34,090	0%	0%	0%	40%	53%
	1-2: 58/42	28,246	12%	0%	0%	51%	58%
	1-3: 55/45	26,785	14%	0%	1%	51%	60%
	1-4: 50/50	24,350	19%	0%	16%	56%	63%
29,300	1-1: 70/30	20,510	35%	6%	27%	63%	71%
	1-2: 58/42	16,994	39%	13%	43%	63%	76%
	1-3: 55/45	16,115	40%	14%	46%	63%	76%
	1-4: 50/50	14,650	40%	21%	48%	63%	76%

Table 4-44 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 17% of total B season revenue. At the 29,300 trigger, and 70/30 split, the B season revenue at risk remains above 15% in all years except 2003. Even under the 87,500 trigger with a 70/30 split, more than $50 million, or 8% 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% of total first wholesale value.

Table 4-44 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			Sector (All), B season				
Cap scenario	Option	CAP	2003	2004	2005	2006	2007
87,500	1-1: 70/30	26,250	$0.0	$3.1	$15.8	$0.0	$50.2
	1-2: 58/42	36,750	$0.0	$0.0	$0.4	$0.0	$15.1
	1-3: 55/45	39,375	$0.0	$0.0	$0.0	$0.0	$10.6
	1-4: 50/50	43,750	$0.0	$0.0	$0.0	$0.0	$1.9
68,100	1-1: 70/30	20,430	$0.0	$11.7	$24.2	$14.4	$59.6
	1-2: 58/42	28,602	$0.0	$1.2	$9.9	$0.0	$42.4
	1-3: 55/45	30,645	$0.0	$0.0	$6.7	$0.0	$37.6
	1-4: 50/50	34,050	$0.0	$0.0	$1.5	$0.0	$22.0
48,700	1-1: 70/30	14,610	$0.0	$22.7	$35.2	$40.6	$79.0
	1-2: 58/42	20,454	$0.0	$11.7	$24.2	$14.4	$59.6
	1-3: 55/45	21,915	$0.0	$9.1	$22.6	$7.2	$57.0
	1-4: 50/50	24,350	$0.0	$4.8	$19.2	$0.0	$54.5
29,300	1-1: 70/30	8,790	$16.1	$79.8	$104.9	$117.3	$108.0
	1-2: 58/42	12,306	$7.1	$34.5	$54.4	$68.0	$91.6
	1-3: 55/45	13,185	$0.0	$23.7	$48.2	$61.7	$83.1
	1-4: 50/50	14,650	$0.0	$22.7	$35.2	$40.6	$79.0

Pollock			Sector (All), B season				
Cap scenario	Option	CAP	2003	2004	2005	2006	2007
87,500	1-1: 70/30	26,250	0%	1%	3%	0%	8%
	1-2: 58/42	36,750	0%	0%	0%	0%	2%
	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%	10%
	1-2: 58/42	28,602	0%	0%	2%	0%	7%
	1-3: 55/45	30,645	0%	0%	1%	0%	6%
	1-4: 50/50	34,050	0%	0%	0%	0%	4%
48,700	1-1: 70/30	14,610	0%	5%	6%	7%	13%
	1-2: 58/42	20,454	0%	2%	4%	2%	10%
	1-3: 55/45	21,915	0%	2%	4%	1%	9%
	1-4: 50/50	24,350	0%	1%	3%	0%	9%
29,300	1-1: 70/30	8,790	3%	16%	17%	19%	17%
	1-2: 58/42	12,306	1%	7%	9%	11%	15%
	1-3: 55/45	13,185	0%	5%	8%	10%	13%
	1-4: 50/50	14,650	0%	5%	6%	7%	13%

Table 4-45 through Table 4-47 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 at-sea processors (CPs).

Table 4-45 Hypothetical Revenue At Risk based on Retained tons of pollock caught by At-sea processors after B-season closures would have been triggered (millions of dollars (upper) percent of total revenue (lower)).

Pollock			At-sea processors, B season				
Cap scenario	Option	CAP	2003	2004	2005	2006	2007
87,500	1-1: 70/30	26,250	$0.0	$0.0	$0.0	$0.0	$17.0
	1-2: 58/42	36,750	$0.0	$0.0	$0.0	$0.0	$5.1
	1-3: 55/45	39,375	$0.0	$0.0	$0.0	$0.0	$3.1
	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	$19.8
	1-2: 58/42	28,602	$0.0	$0.0	$0.0	$0.0	$14.7
	1-3: 55/45	30,645	$0.0	$0.0	$0.0	$0.0	$13.3
	1-4: 50/50	34,050	$0.0	$0.0	$0.0	$0.0	$7.6
48,700	1-1: 70/30	14,610	$0.0	$1.6	$2.4	$9.6	$28.1
	1-2: 58/42	20,454	$0.0	$0.0	$0.0	$0.7	$19.8
	1-3: 55/45	21,915	$0.0	$0.0	$0.0	$0.0	$18.9
	1-4: 50/50	24,350	$0.0	$0.0	$0.0	$0.0	$18.2
29,300	1-1: 70/30	8,790	$1.0	$25.4	$37.5	$41.6	$40.5
	1-2: 58/42	12,306	$0.0	$6.8	$11.0	$22.4	$33.5
	1-3: 55/45	13,185	$0.0	$1.9	$9.1	$19.0	$29.8
	1-4: 50/50	14,650	$0.0	$1.6	$2.4	$9.6	$28.1
Pollock			**At-sea processors, B season**				
Cap scenario	**Option**	**CAP**	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	26,250	0%	0%	0%	0%	6%
	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%	7%
	1-2: 58/42	28,602	0%	0%	0%	0%	5%
	1-3: 55/45	30,645	0%	0%	0%	0%	4%
	1-4: 50/50	34,050	0%	0%	0%	0%	3%
48,700	1-1: 70/30	14,610	0%	1%	1%	3%	9%
	1-2: 58/42	20,454	0%	0%	0%	0%	7%
	1-3: 55/45	21,915	0%	0%	0%	0%	6%
	1-4: 50/50	24,350	0%	0%	0%	0%	6%
29,300	1-1: 70/30	8,790	0%	11%	12%	14%	13%
	1-2: 58/42	12,306	0%	3%	4%	7%	11%
	1-3: 55/45	13,185	0%	1%	3%	6%	10%
	1-4: 50/50	14,650	0%	1%	1%	3%	9%

Table 4-46 Hypothetical Revenue At Risk based on Retained tons of pollock caught by Shore Based Catcher Vessels after B-season closures would have been triggered (millions of dollars (upper) percent of total revenue (lower)).

Pollock			Shore-based catcher vessels, B season				
Cap scenario	Option	CAP	2003	2004	2005	2006	2007
87,500	1-1: 70/30	26,250	$0.0	$1.9	$13.5	$0.0	$26.3
	1-2: 58/42	36,750	$0.0	$0.0	$0.5	$0.0	$7.2
	1-3: 55/45	39,375	$0.0	$0.0	$0.0	$0.0	$5.3
	1-4: 50/50	43,750	$0.0	$0.0	$0.0	$0.0	$0.8
68,100	1-1: 70/30	20,430	$0.0	$10.1	$20.2	$10.6	$31.9
	1-2: 58/42	28,602	$0.0	$0.6	$9.1	$0.0	$21.3
	1-3: 55/45	30,645	$0.0	$0.0	$6.8	$0.0	$18.6
	1-4: 50/50	34,050	$0.0	$0.0	$1.5	$0.0	$11.0
48,700	1-1: 70/30	14,610	$0.0	$19.3	$29.0	$26.0	$40.4
	1-2: 58/42	20,454	$0.0	$10.1	$20.2	$10.6	$31.9
	1-3: 55/45	21,915	$0.0	$7.5	$19.1	$5.4	$30.7
	1-4: 50/50	24,350	$0.0	$3.2	$16.3	$0.0	$29.3
29,300	1-1: 70/30	8,790	$14.1	$41.5	$60.3	$64.7	$52.6
	1-2: 58/42	12,306	$6.4	$21.6	$39.3	$38.6	$44.9
	1-3: 55/45	13,185	$0.0	$19.5	$35.3	$36.0	$42.3
	1-4: 50/50	14,650	$0.0	$19.3	$29.0	$26.0	$40.4

Pollock			Shore-based catcher vessels, B season				
Cap scenario	Option	CAP	2003	2004	2005	2006	2007
87,500	1-1: 70/30	26,250	0%	1%	5%	0%	10%
	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%	12%
	1-2: 58/42	28,602	0%	0%	3%	0%	8%
	1-3: 55/45	30,645	0%	0%	2%	0%	7%
	1-4: 50/50	34,050	0%	0%	1%	0%	4%
48,700	1-1: 70/30	14,610	0%	9%	11%	10%	15%
	1-2: 58/42	20,454	0%	4%	7%	4%	12%
	1-3: 55/45	21,915	0%	3%	7%	2%	11%
	1-4: 50/50	24,350	0%	1%	6%	0%	11%
29,300	1-1: 70/30	8,790	6%	18%	22%	24%	20%
	1-2: 58/42	12,306	3%	10%	14%	14%	17%
	1-3: 55/45	13,185	0%	9%	13%	13%	16%
	1-4: 50/50	14,650	0%	9%	11%	10%	15%

Table 4-47 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			Mothership operations, B season				
Cap scenario	Option	CAP	2003	2004	2005	2006	2007
87,500	1-1: 70/30	26,250	$0.0	$1.0	$1.2	$0.0	$5.8
	1-2: 58/42	36,750	$0.0	$0.0	$0.0	$0.0	$4.3
	1-3: 55/45	39,375	$0.0	$0.0	$0.0	$0.0	$3.3
	1-4: 50/50	43,750	$0.0	$0.0	$0.0	$0.0	$1.0
68,100	1-1: 70/30	20,430	$0.0	$2.8	$3.7	$4.1	$12.1
	1-2: 58/42	28,602	$0.0	$1.0	$0.8	$0.0	$9.8
	1-3: 55/45	30,645	$0.0	$0.0	$0.0	$0.0	$8.8
	1-4: 50/50	34,050	$0.0	$0.0	$0.0	$0.0	$5.3
48,700	1-1: 70/30	14,610	$0.0	$3.7	$3.7	$7.5	$16.1
	1-2: 58/42	20,454	$0.0	$2.8	$3.7	$4.1	$12.1
	1-3: 55/45	21,915	$0.0	$2.7	$3.3	$2.3	$11.3
	1-4: 50/50	24,350	$0.0	$2.4	$2.7	$0.0	$10.9
29,300	1-1: 70/30	8,790	$2.6	$21.9	$9.9	$17.5	$23.2
	1-2: 58/42	12,306	$1.5	$10.2	$4.9	$11.1	$20.4
	1-3: 55/45	13,185	$0.0	$4.5	$4.5	$10.3	$17.1
	1-4: 50/50	14,650	$0.0	$3.7	$3.7	$7.5	$16.1

Pollock			Mothership operations, B season				
Cap scenario	Option	CAP	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%

4.4.3 Management and Enforcement

The implementation of a triggered salmon cap on the Bering Sea pollock fishery would require various changes to federal regulations and to NMFS management practices compared to the status quo. These regulatory changes would have to address all facets of a revised trigger cap salmon bycatch management system, including salmon bycatch allocations to different industry sectors, increased monitoring measures, reporting requirements, inseason management functions, and enforcement measures. Whereas Alternative 2 is centered on fishery closures, Alternative 3 focuses on closing specific areas to directed fishing for pollock once a salmon bycatch allocation is reached. This is similar to how the existing salmon savings area system functions, although the components and options associated with triggered closures are much more complicated than the status quo. Alternative 3 embodies many similar implementation requirements as Alternative 2, such as the establishment of caps and subsequent sector splits. Thus, the management and monitoring issues noted in Section 1.2 are applicable to this alternative as well.

4.4.3.1 Component 1: Trigger Cap Formulation

The trigger caps used to determine area closures would established within the range of hard caps that are considered under Alternative 2, Component 1. Under Alternative 2, Component 1, the hard caps are automatically divided seasonally. Under Alternative 3, there is a suboption to divide the hard caps seasonally. If so, NMFS would have to modify its catch accounting systems and management practices to accommodate those seasonal allocations, similar to what is described under the management effects described under Alternative 2, Component 1.

4.4.3.2 Component 2: Management Options

4.4.3.2.1 NMFS management of triggered area closures

Trigger closures would require a sector to stop pollock fishing in certain closure areas when its allocation of salmon is reached. Different closure areas would be specified for the A season (three separate areas that would be closed simultaneously) and the B season (one closure area). Potential area closures are described under Component 5. Depending on the selection of subsequent components in this alternative, salmon may be allocated at the fishery level (CDQ and non-CDQ) or to each sector (inshore, mothership, catcher/processor, and CDQ).

As described in Section 1.1.1, NMFS would issue pollock fishery closures once either the non-CDQ fishery or a non-CDQ sector reached its salmon bycatch limit. Vessel operators would be prohibited from directed fishing for pollock in a Chinook salmon savings area once NMFS closed the area to a fishery or sector. The CDQ sector would not be subject to pollock fishery closures; instead, CDQ groups would have to stop fishing for pollock once they had reached their Chinook bycatch allocation.

Enforcement of the area closures would be similar to the process currently used to monitor salmon bycatch and issue salmon savings area closures. NMFS would have to determine whether a vessel was directed fishing for pollock and then match that vessel with its fishery component or sector. This would require NMFS to use several different data sources including VMS, catch and effort information from a vessel's catch reports, and observer information.

NMFS currently uses a combination of VMS, industry reported catch information, and observer data to monitor vessel activities in special management areas, such as habitat conservation areas and species-specific savings areas (e.g., salmon savings area). These data sources are used by NMFS on a daily basis to monitor fishery limits. Information from VMS is useful for determining vessel location in relation to closure areas, but it does not indicate whether a vessel is fishing, transiting through a closed area, or targeting a particular species. Existing salmon savings area management measures are described in Section 1.1.1. One primary difference between the status quo and triggered area closures is that NMFS would be closing different savings areas, on a seasonally-specific basis, than is current practice under the status quo.

Enforcement Implications

NMFS monitors numerous annual catch limits, seasonal limits, sector allocations, and quotas for many different BSAI groundfish fisheries. As part of this monitoring effort, NMFS may detect what appear to be regulatory violations, such as quota overages or closed area incursions. Such incidents are forwarded to NMFS OLE for subsequent investigation. Depending on its findings for each particular case, NOAA OLE may forward cases to NOAA GC for settlement or prosecution. The investigation and disposition of regulatory infractions requires considerable staff time from NOAA GC and NMFS OLE.

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. In general, the more the salmon allocation is divided among entities and seasons, the more difficult it becomes for NMFS to detect a violation, particularly if salmon is allowed to be transferred between sectors. This also may have a bearing on how effectively and successfully alleged violations may be investigated and prosecuted.

4.4.3.2.2 Suboption 1. Allow ICA management of triggered closures

Under Option 1, a NMFS-approved salmon bycatch reduction intercooperative agreement (ICA) would manage any subdivision of the seasonal trigger caps at the sector level, inshore cooperative, or individual vessel level. The ICA specifies contractual obligations associated with enforcing the area closures to the designated group or entity when subdivided caps established by the ICA are reached. The subdivision of the trigger caps under the ICA would not be proscribed by the Council or NMFS regulations. The ICA would decide how to manage participating vessels to avoid reaching the trigger closures as long as possible during each season. However, NMFS regulations would specify that the ICA would be required to include a closure to the area(s) specified under Component 5 once the overall trigger cap selected under Component 1 is reached.

This suboption would exempt vessels that are members of a salmon bycatch ICA from NMFS-issued Chinook salmon savings area closures. Otherwise, vessels would be prohibited from directed fishing for pollock in the seasonal closure area or areas (described below under Component 5) if a seasonal, non-CDQ salmon bycatch cap were reached. NMFS would issue a sector-specific area closures once either the non-CDQ AFA fishery or sectors reached applicable salmon bycatch caps.

NMFS would have to revise the salmon bycatch ICA regulations at 50 CFR 679.21 to incorporate any changes made to the Chinook salmon savings areas proposed under this alternative. As with the status quo, NMFS would bear the costs of annually reviewing and approving ICAs, should the pollock industry use salmon bycatch ICAs. NMFS would approve an ICA if it met applicable regulatory requirements, but would not enforce the contractual conditions of an ICA. Each CDQ groups could opt to participate in an ICA. Vessel operators fishing for pollock CDQ would be then be exempt from salmon savings area closures. If a CDQ group was not part of a salmon bycatch ICA, vessel operators would be prohibited from fishing within a closed Chinook salmon savings area once that group's seasonal or annual Chinook salmon allocation had been caught.

Enforcement of area closures for ICA member vessels would be similar to non-ICA vessels. As previously described for non-ICA vessels, enforcement of area closures would require NMFS to use VMS data, vessel observers, and vessel logbooks. The ICA exemption would complicate NMFS's monitoring of the pollock fisheries because it would require the agency to delineate between those vessels in an ICA and those that are not. Once a salmon cap was reached and an area closed, the prohibition against directed fishing for pollock in a closure area only would apply to those vessels not party to an ICA. This currently is true under the status quo, however, all vessels in the pollock fishery have participated in a salmon bycatch ICA for the past three years (2006-2008). Thus, the parallel monitoring of ICA-associated vessels and non-ICA vessels has not been a monitoring or management issue.

4.4.3.3 Component 3: Sector Allocation

The management effects of sector allocations would be similar to those discussed under Alternative 2. Allocating salmon caps to individual sectors would increase the complexity of NMFS's salmon bycatch monitoring efforts, as it would increase the number of salmon bycatch caps that NMFS would have to monitor.

4.4.3.4 Component 4: Sector Transfers

The management effects of sector transfers would be similar to those discussed under Alternative 2, Component 3. Allowing sector transfers would have a bearing on whether an entity or vessel operator could continue to fish in, or re-enter, a salmon savings area, once it was closed. This transfer option would only apply to those sectors or vessels that did not join a salmon bycatch ICA, if any. This could decrease the number potential number transfers, since there would be fewer entities available to conduct transfers.

Transfers would be a complicating factor for NMFS's management of salmon savings areas that had been closed due to a sector's salmon cap being reached. Allowing salmon transfers would allow entities to increase (or decrease) their salmon allocations within a season, which means an entity's status in relation to a prohibited area could change multiple times throughout a season. For example, Components 2 through 4 would increase the complexity of the area closures from two fishery level allocation (CDQ and non-CDQ) to sector and season-specific closure options. Additionally, allowing transfers between sectors, as well as having parallel but different regulations applicable to vessels in an ICA would increasingly complicate NMFS's management of the Bering Sea pollock fishery.

Furthermore, as with Alternative 2, sector transfers would require an increase to the catch monitoring requirements for the inshore sector. These are described in Section 1.2.4. This includes increased observer coverage for those vessels that currently are subject to 30% observer coverage, as well as revisions to shoreside monitoring requirements.

The method used to close an area to directed pollock fishing would depend on whether Component 4, transfers among sector entities, is selected. If Component 4 is not selected, then NMFS would close savings areas through closure notices because an allocation of salmon is made to a sector, rather than an entity. Selection of Component 4 would require sectors to form an entity that would be authorized to make transfers. The entity would be allocated a specific amount of salmon that could be adjusted through transfers from other entities. Vessels in a given sector would be prohibited from directed fishing in a closed area once they had reached their salmon bycatch allocation.

Enforcement Issues

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. VMS requirements already are in place for vessels in the pollock fishery. Enforcing new, different Chinook salmon area closures could be incrementally more complex than existing practice, particularly if the closure areas are large or more complex than existing salmon saving areas. The enforcement implications of this component are similar to those discussed under Alternative 2, Component 3. NMFS 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 an inter-sector salmon transfer.

4.4.3.5 Component 5: Area Options

This component describes the closure areas associated with this alternative. These areas would affect management practices to some degree, since NMFS would have to transition from managing two Chinook salmon savings areas to four closure areas (three in the A season and one in the B season). These effects are described in more detail in association with in the discussion of the preceding components.

4.4.4 Summary of Direct Effects of Alternative 3

Salmon Savings:
The triggered Closures analyzed here are based on hard caps that are formulated in the same manner as those formulated 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 the EIS) for the A and B seasons. The difference here is that the triggered closure does not cap salmon bycatch but rather used 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, the EIS 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, taken from the EIS, 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.

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.

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 split. However, even the 87,500 trigger with the 70/30 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 2005 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.

Revenue at Risk

While the hard caps of Alternative 2 have the potential effect of fishery closure and resulting foregone pollock fishery revenue, the triggered closures don't directly create foregone revenue, but rather, they place revenue at risk of being foregone. 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 data show that in the highest bycatch years and under the most restrictive trigger levels, revenue at risk would be about $485 million in the A season for all vessels combined. That represents 77% 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 $125.2 million in revenue at risk, or a bout 21% 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 $33.2 million (70/30 split) to $97.4 million (50/50s split) at risk. These values are 11% and 31% of total revenue respectively.

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 17% of total B season revenue. At the 29,300 trigger, and 70/30 split, the B season revenue at risk remains above 15% in all years except 2003. Even under the 87,500 trigger with a 70/30 split, more than $50 million, or 8% 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% of total first wholesale value.

Concluding Thoughts

This RIR represents an initial review draft analysis of potential effects of a wide range of Chinook salmon bycatch alternatives on the BSAI pollock trawl fleet and attempts to demonstrate benefits in terms of the numbers of Chinook salmon that would be saved by the alternatives. This analysis has demonstrated that potential impacts range from zero to more than half a billion dollars under the most restrictive scenario and in the highest bycatch year, and that even the least restrictive measures may have large consequences in terms of foregone revenue and/or revenue at risk in high bycatch years. What has also been shown is that in those cases of greatest impact, there is also the potential for the greatest benefit in terms of Chinook salmon saved, with as many as 32,250 fish estimated to return to Western Alaska Rivers as adults. It is hoped that this initial analysis of this very complex alternative set will provide sufficient information for selection of a preliminary preferred alternative that can be analyzed with greater specificity regarding both direct and indirect effects.

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