An Analysis of Options to Restructure the Bristol Bay Salmon Fishery

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Bristol Bay
SALMON FISHERY
Restructuring Study

A Study Commissioned by the Bristol Bay Economic Development Corporation

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Executive Summary

A substantial increase in the world's supply of farmed salmon over the last decade and a decline in the productivity of Bristol Bay sockeye salmon stocks threaten the economic viability of one of the world's great salmon fisheries and the region that depends on it. These conditions, combined with others, have placed the fishery and many communities within the Bristol Bay region on the verge of financial insolvency. The business-as-usual option, in the eyes of many participants in the fishery, will induce more economic hardship than changing the structure of the fishery. As a result, there has been a ground swell of support for changing the way the fishery operates.

The purpose of this study was to identify and examine options to restructure the Bristol Bay salmon fishery and compare them, in terms of anticipated effects, to the option of not making changes to the fishery. If nothing is done to the structure of the fishery, the net income from the fishery will remain low and the economic hardship in the region will continue to expand. Our analysis identified several sources of wealth that are foregone under the current structure of the fishery and three restructuring options would allow participants to capture this wealth.

Furthermore, the study team concluded:

- The fishery is nearly financially insolvent. In 2001, permit holders on average earned $4,000 after operating costs, but before deducting for debt service on vessels and permits.
- There isn't enough wealth available in the fishery to support the number of participants and the average annual incomes that it once did. The outlook for future prices and harvest levels suggests this condition will likely not improve over the next 5 to 10 years.
- The *status quo* option (no active restructuring) will result in continued change and restructuring of the fishery by high-cost harvesters and processors selling out to lower cost participants. However, there is little new wealth to be captured through this process and significant long-term improvements to incomes are not likely.
- Sources of new wealth from the Bristol Bay salmon fishery include:
    - Reducing fishing capacity
    - Spreading harvesting across time
    - Exploring alternative harvesting methods
    - Improving product quality
    - Marketing the harvest better
    - Eliminating the race for fish by assigning shares of the harvest to participants
- These sources of wealth could potentially add $3 to $42 million annually to the net income from the fishery compared to the estimated $3.8 million in net income derived from the fishery in 2001. On a harvest of 14 million fish, these improvements in net income from restructuring would be on the scale of about 3.5 to 47 cents per pound.

Estimated New Wealth Available Annually from Different Sources in the Bristol Bay Salmon Fishery.

Restructuring Action	Expected Increase in Wealth (Millions $)
Reduce Excess Capacity (1,000 Drift permits remaining)	
Buyback funded by Government	6.0
Buyback 50:50 funding, Government: Fishers	4.3
Fisher financed buyback	2.6
Spread Harvesting Across Time	4.0
Alternative Harvesting with 33% reduction in costs	7.0
Alternative Harvesting with 50% reduction in costs	10.6
Improve Product Quality	4.1
Market the Harvest Better	4.1
Eliminate the Race for Fish	17 to 42

- Some or all these sources of wealth are accessible through three restructuring options:
    1. Reduce fishing capacity by permit reduction and consolidation.
    2. Increase the objectives for managers in the fishery to include cost reduction and improved quality.
    3. Assign harvest shares to participants.

Source of Wealth	Restructuring Option	
Reduce excess capacity	Permit reduction/consolidation	Assign Harvest Shares
Spread out harvesting	Permit reduction/consolidation	Assign Harvest Shares
Alternative fishing methods	Permit reduction/consolidation	Assign Harvest Shares
Improve quality	Increase Role of Management	Assign Harvest Shares
Market better	Increase Role of Management	Assign Harvest Shares
Eliminate the race for fish	Increase Role of Management	Assign Harvest Shares

- Significantly reducing the fishing capacity below the current levels through permit buyback and/or stacking options (e.g., 900 to 1,100 driftnet permits) would capture new wealth and raise net incomes for those remaining in the fishery. However, wealth created by consolidating the fleet will largely disappear over time unless the action is soon paired with actions to reduce or eliminate the race for fish. Investments in fleet reduction by fishers and governments will not be secure if the perverse incentive to further capitalize the fleet is not removed or further constrained.
- Adding to the objectives of managers to take economic and market factors into account when setting fishing periods could reduce harvesting and processing costs and improve revenues by improving quality and associated benefits from marketing programs.
- Assigning shares of the harvest to participants may reduce or eliminate the race for fish and permit access to the greatest potential wealth in the fishery of all options considered.
- Alaska case law generally supports the application of these restructuring options if they are crafted in a reasoned way and are supported by compelling justifications.

- Investments in improving regional infrastructure have the potential to significantly improve benefits and wealth generation from the salmon fisheries in Bristol Bay. However, the costs of the proposed developments exceed the benefits that would accrue to the fishery alone. However, such infrastructure improvements will generate significant benefits outside of the fishing industry and therefore they merit further study.
- Several factors may preclude progress toward improving the fishery through restructuring, including getting bogged down in the analysis of the many details of the infinite number of variations of different restructuring options. To avoid or overcome these impediments to change, participants must first develop consensus on a long-term vision of how they want the fishery to look.

In light of this analysis, we recommend fishery participants engage in a discussion and debate over what, if any, restructuring should be done. If restructuring actions are chosen, we further recommend:

- The task of designing restructuring options should be done by those most familiar with the fishery.
- One or more organizations take the lead in bringing together representatives of all groups in the fishery to design a restructuring action that all parties can support.

Funding for this study was provided by the Bristol Bay Economic Development Corporation (BBEDC) and the Joint Legislative Salmon Industry Task Force. The project was initiated in February 2002 and the final report was completed in March 2003. BBEDC took a lead role in this study because no single issue is more critical to the future of the region's economy. The intended audience for this report is fishery participants, local residents, and decision makers from government agencies. We assumed that the reader is familiar with the Bristol Bay salmon fishery and how it is currently operated. The report is intended to raise the level of discourse on this issue, spur informed discussion, and focus debate on policy choices before the industry. Hopefully, the results from the analysis will shape and provide guidance for future decisions regarding the fishery. The goal of this work was not to design in detail and recommend a single restructuring option.

An interdisciplinary research team made up of academic and consulting economists, fisheries experts, and an historian conducted the research over 12 months with the input from industry, the public, and an 11-member Advisory Panel. The Advisory Panel was comprised of the following:

- Seven fishers, from the set and driftnet fleets, each from a different regional community.
- A manager of a salmon processing facility.
- A fishery manager.
- An academic economist.
- The Chairman of the State's Commercial Fisheries Entry Commission.

The project study team sought and obtained input from a multitude of stakeholders in the fishery. Four thousand brochures explaining the study and soliciting input were distributed to fishery participants, regional organizations, and residents. Almost 3,000 brochures were mailed directly to permit holders (fishers). Public meetings were held in three Bristol Bay communities. A project website was established that provided materials describing the study and its progress, an email address to send comments directly to the entire study team, and a bulletin board where people could post comments for the public to read. Numerous on-on-one meetings were held between study team members and stakeholders in the fishery.

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1 Introduction

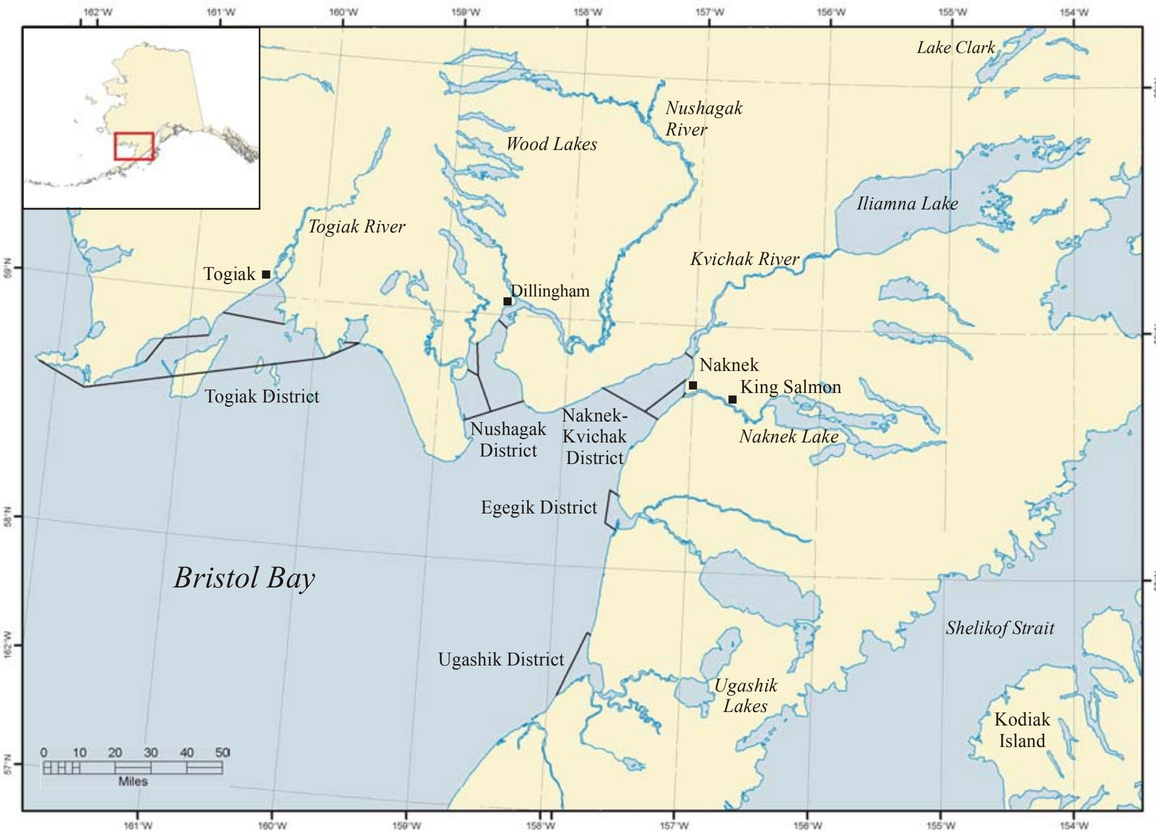
The Bristol Bay sockeye salmon fishery is one of the world's great salmon fisheries. For thousands of years, the Bay area was a crossroads to three native cultures – Yup'ik from the northwest, Aleut from the south, and Athabascan from the interior. These groups subsisted on the abundant salmon and other natural resources of the region for millennia. Each year for over a century now, thousands of native and non-native people have gathered at the river mouths of eight river systems that flow into Bristol Bay to capture and process millions of sockeye salmon returning to natal spawning lakes and streams. The way of life for the region's inhabitants has transitioned over the last 50 years from one dependent on a subsistence-based lifestyle to one dependent on both subsistence and commercial fishing.

The fishery has been the single largest source of private sector income for the 5,275 residents in the Dillingham Census Area, the Bristol Bay Borough and the Lake and Peninsula Borough, which together comprise the Bristol Bay region. In 2002 a total of 2,925 permit holders (1,884 driftnet and 1,041 setnet fishers) are allowed, through a limited entry license program, to fish for salmon with gillnets in the five fishing districts of Bristol Bay (Figure 1). Including crewmembers, an average of over 7,000 people are estimated to have been directly involved in fish harvesting over the last 15 years. Annual processing capacity in the Bay has ranged from 60 to 400 million pounds of fish and processors employ over 2,000 people during peak seasons.

Once worth as much as $350 million (adjusted for inflation), the value to fishers of the annual Bristol Bay harvest has recently declined to less than 10 percent of its historic highs and only 20 percent of its average value from 1980-2000. It is unlikely that in the future the Bristol Bay salmon fishery, in whatever forms it may take will be able to support the number of people it did during the recent two-decade period of high prices and large runs. Over the last two decades there has been an unprecedented alignment of the highest prices and highest catches to create the highest income from the fishery in its entire 120-year history. A major cause of the loss of these near-ideal conditions has been a fundamental change in the salmon market created by a 700% increase in world farmed salmon and trout production. Predicting future market conditions and prices is difficult, but indications strongly suggest that for the next 5 or more years prices for Bristol Bay sockeye salmon will be similar to the last 2 years.

The dismal outlook for the future of the Bay's salmon fishery has prompted many in the industry to question the old ways of doing things and search for new ways of doing business. People are looking for ways to increase net incomes from the fishery and see restructuring as one way to do so. The wealth in the fishery over the last two decades has promoted, or at least tolerated, less-than-efficient methods of prosecuting the fishery, often creating higher harvesting and processing costs and lower product quality than might otherwise be possible. For example, some fishers and processors have for many years called for a permit buyback program in Bristol Bay to reduce the number of fishing vessels operating in the fishery in order to reduce costs and increase revenues for those remaining in the fishery. There have been calls over the years to mandate better handling procedures in the fishery to produce a higher quality product from the fishery than now is produced. Others have called for dismantling or modifying some of the many management regulations thought to hinder economic efficiency.

Figure 1. Map of the Bristol Bay area showing the five commercial salmon fishing districts.



Yet others argue that implementing permit buybacks, permit stacking programs and mandatory quality standards will only perpetuate a flawed system that will continue to encourage overcapitalization and dissipation of wealth from the fishery over time and discourage true wealth-generating innovation. This argument suggests that problems in the fishery lie at the heart of its very organization – the "common property" nature of the fish stocks will always provide perverse incentives for fishers to dissipate wealth in the fishery through a race against each other to catch the fish. At the extreme, this argument maintains that as long as this perverse incentive for participants to waste resources competing against one another is present, restructuring the fishery is a waste of time and resources. This view sees that if the "race for fish" is not removed, the fishery will fall well short of capturing the available wealth from the resource, and, most importantly, well short of making the fishery economically viable in the harvest and price conditions we see today and expect in the future.

The purpose of this study was to identify and examine the options available to restructure the Bristol Bay salmon fishery and compare them, in terms of anticipated effects, to the option of not making changes to the fishery. The intended audience for this report is fishery participants, local residents and decision makers from government agencies. We assume that the reader is familiar with the Bristol Bay salmon fishery and that the purpose of restructuring is to increase net incomes from the fishery for its participants. The report is intended to raise the level of discourse on this issue, spur informed discussion, and focus debate on policy choices before the industry. Hopefully, the results from the analysis will shape and provide guidance for future decisions regarding the fishery. Should the industry choose restructuring over the status quo, we intend to solicit further input and work with the industry to begin to develop specific and detailed proposals to restructure the Bristol Bay salmon fishery.

The analysis begins by presenting a "Historian's Perspective" that describes the major eras in the development of the fishery over the last 120 years. Next, we present a "Stakeholders' Perspective" - a summary of the input we received to the study from those who know the fishery better than anyone: fishers, processors, local residents and community leaders. Another view, presented as an "Economist's Perspective" describes what many economists believe is needed for the fishery to regain its economic viability – change the incentives that dissipate wealth. The study team interprets and builds upon these three perspectives to examine how the industry arrived to where it is today and to see if there are any lessons to be learned that are applicable to resolving the current crisis. The analysis continues with an examination of the implications of what many see as the "default" option, which is to leave the fishery alone and let the tough economic times run their course.

The thrust of the report revolves around the concept of restructuring the fishery to create new wealth. Only through the creation of new wealth can net incomes be improved. The analysis identifies potential sources of wealth in the Bristol Bay salmon fishery that are currently foregone due to flaws in the structure of the fishery. The expected benefits of these actions are summarized in a preliminary map of the "landscape of wealth." This is followed by an examination of several actions that have been advanced as ways to capture that wealth and improve the economics of the Bristol Bay salmon fishery. This analysis indicates that there are essentially just three restructuring "options" available to the industry. The report ends with a series of conclusions and recommendations of what the industry might do next.

2 An Historian's Perspective: A Brief History of the Bristol Bay Salmon Fishery, 1883-2002

For most of those who participate in the Bristol Bay fishery today, their experience encompasses the best times the fishery has ever seen in its 120-year history. As the fishery encounters tough times now, it is important to look back over the history of the fishery to see how we got to the current situation and look for lessons that may help overcome today's obstacles to a viable fishery. At a minimum, a review of the history of the fishery helps to put in perspective the current crisis. At best, it helps to uncover valuable insights into how to deal with the future. The following history of the Bristol Bay fishery has been prepared by Bob King, a regional historian. As its history reveals, Bristol Bay has seen as tough or tougher times than we see today many times in the past. The industry overcame the obstacles each time in the past and if tough and forward-thinking decisions are made now the industry could overcome its current problems as well.

2.1 Introduction

It is the premier salmon fishery of Alaska and one of the great fisheries of the world. Located in remote Southwest Alaska, its extensive lakes, broad rivers, and pristine habitat create an ideal nursery for the largest runs of sockeye salmon anywhere. It is Bristol Bay, and during its 120-year history, fishermen have caught more than 1.5 billion sockeye salmon from the near-shore waters of this corner of the Bering Sea. One of five species of Pacific Salmon, the sockeye is uniquely valued on world seafood markets for its firm flesh, bright color, rich texture, and healthy oils. Fortunes have been made in Bristol Bay, access to the fishery is coveted, and the region has seen its share of international intrigue. "The Bay," as the thousands who participate in the fishery each year know it, is also the birthplace of many of the techniques of modern salmon management.

But it also has been a risky business. Bristol Bay's history is one of outstanding peaks and disastrous valleys. Salmon returns are naturally variable, due to annual changes in run strength and long-term cycles of productivity. Salmon are subject to short-term weather patterns and long-term climatic changes, fluctuations in abundance of feed and predators – both natural and human. Salmon spend most of their life on the high seas where their fate is neither well understood nor under our control. The economics of the fishery are complicated by the fact that the entire run occurs within the span of six weeks. The industrialists who succeeded have done so by matching entrepreneurial skill with sometimes ruthless efficiency. Meanwhile, the fishermen who work its waters face the perils of winds, tides, shoals, and unpredictable weather, and suffer from one of the highest workplace mortality rates in the nation.

Today's generation of Bristol Bay fishermen who have reaped the rewards of a rare combination of strong markets and the strongest sustained production in the history of the commercial fishery are largely unaware of the fishery that preceded them. Fishermen accustomed to annual harvests that averaged 30 million sockeye in the 1990s may be surprised to learn that the long-term average catch for Bristol Bay is just 15 million sockeye, and decades of production averaging less than 10 million salmon annually occurred in the not too distant past. For more than half of its history, fishermen worked the shallow, silty waters of Bristol Bay in sailboats, and there were far fewer of them than the almost 1,900 gillnetters permitted today. Prior to Limited Entry, an average of about 1,200 gillnetters fished each season, with as many as 1,500 boats during peak years. With two-man crews and only their arms to pull nets and offload their catch, they fished for days on end and at times were more productive than the modern, mechanized gillnetters of today.

In its beginnings, the fishery was completely controlled by the cannery operators and there were few, if any, fishing regulations. Today, fishing is tightly controlled with a web of rules and regulations, some dating back 80 years. Some of these rules were pioneering efforts to protect the salmon while others are obsolete relics of a distant past. Together, these regulations reflect attempts to sustain one of the world's richest fish stocks while balancing the power among those who reap its rewards – the harvesters, processors, and communities that developed along its shore.

2.2 Exploration and Early Development, 1778-1898

For millennia, Bristol Bay's abundant returns of salmon attracted Native peoples from across Alaska. Yup'ik from the northwest, Aleuts from the south, and Athabaskans from the interior, all made Bristol Bay their home. It was not until 1778 that Bristol Bay was put on the map. Captain James Cook charted the region and named the Bay after a friend, Augustus John Hervey, the 3rd Earl of Bristol. Cook arrived in the Bay in early July and then, as today, it was near the peak of the sockeye run. As fish jumped in the water around his vessel, Cook wrote in his log, "It must abound with salmon."[1]

Russian fur traders established a trading post at Nushagak Point in 1819 and made limited use of salmon, mostly for local consumption. The Russians exported small amounts of salted salmon but lacked the ability to preserve large volumes of fish. Salmon canning techniques developed in California in 1864 and by the time the United States acquired the Alaska territory three years later, canneries were already spreading northward. In fact, Alaska's rich, untapped fishery resources helped convince a skeptical Congress to purchase the territory from Russia.

The first Alaska salmon cannery was built at Klawock in 1878 and the industry continued to look for bigger and better runs, often establishing salteries at likely sites to scope out the resource potential in new areas. In 1883, one such exploratory vessel named the *Neptune* anchored near the site of the old Russian fort on Nushagak Bay. The results were good enough to prompt the owners to build a cannery at nearby Kanulik. It was risky at first. "Profits have been very light," wrote one early Alaska historian of the first canneries. "The amount of capital needed to conduct and establish the business is disproportionately large."[2] But by the late 1880s, new canneries were built at Scandinavian Creek, Kanakanak, and Clarks Point, and a small industry had been established along the shores of the Nushagak.

"The bay is dotted with the sails of over 100 fishing smacks," observed the 1890 census, referring to the sailboats, similar to those used on the Columbia River that caught salmon with linen gillnets. But already the fledgling industry was in trouble. With a harvest of over one million salmon, the four Nushagak canneries packed more salmon than there were buyers. It was a problem facing salmon packers across Alaska and together they formed a cartel, the Alaska Packers Association or APA, to sell off surplus inventory and control production. All four Nushagak canneries joined the APA and two plants were idled as the industry sought to regain its profitability. With the efficiencies provided by the cartel, it wasn't long before the industry regained its momentum. By 1895, Bristol Bay's catch jumped to 5 million sockeye and the APA and its competitors built new canneries on the Ugashik, Egegik, Naknek, and Kvichak Rivers.

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[1] *The Journals of Captain James Cook, Part I*, edited by J.C. Beaglehole III, page 397.

[2] Hubert Howe Bancroft, *History of Alaska 1730-1885*, page 743-744.

2.3 Growth of an Industry, 1898-1919

While the Klondike stampede of 1898 captured the nation's attention, Alaska's "Silver Horde"[3] of salmon produced more riches than the gold that prospectors sluiced from their mines. Public acceptance of canned salmon grew quickly at the turn of the century, boosted by military food demands during the Spanish American War. As markets grew, so did the industry. By 1901, there were 18 canneries across Bristol Bay and the catch topped 10 million sockeye. Increased mechanization of the canning process helped speed the booming industry. New machines were forming and filling the cans. No single invention had more profound an effect than the "Iron Chink," a machine that cleaned and gutted the salmon. Named for the Chinese laborers it was intended to replace, it had the opposite effect. Mechanization allowed for increased efficiency, production, and profits; and as the harvest and number of canneries grew, there was increased need for Chinese and other minority laborers.

"The canneries are practically in full operation for about one month and during this time they present a busy scene," wrote Navy Commander Jefferson Moser in a 1900 report on Bristol Bay. "Everyone is worked to his full capacity, and nothing is thought of, talked of, dreamed of, but fish."[4] Almost all those workers came from the San Francisco, Portland, and Seattle areas. Local hire in Bristol Bay was virtually non-existent. While canners offered jobs to local residents, they found few takers among the Native population. Cash paying jobs meant little to Native residents who did not need money for their food, clothing or shelter, and there were few places to spend it other than the stores operated by the canners themselves.

To import the needed workers, the APA operated its own fleet of sailing ships. Called the "Star Fleet," the APA's three-masted barks invoked the romantic era of tall ships but, in fact, that era had long since passed. The APA used the sailing ships because they were readily available and relatively inexpensive, the discards of shippers who had already converted to steam. For an industry that operated just a few months every year, the obsolete sailing ships made more economic sense than investing in new steam ships.

By 1912, the canned salmon industry in Bristol Bay reached an early peak in production. That year, 19 canneries operated in the five major rivers in the Bay using 1,083 gillnetters, and for the first time, the annual catch topped 20 million salmon. For the next 70 years, peak production in the Bay would range from 20 to 25 million. The outbreak of war in Europe in 1914 created a surge in demand for canned foods. With fishing allowed seven days a week, 24 hours a day, salmon catches continued at historic highs. Giddy with profits and a seemingly limitless supply of fish, the salmon canners regaled themselves with elaborate annual banquets in Seattle complete with self-congratulatory speeches, cigars, brandy, and dancing girls. But the party would soon be over. In 1919, sockeye runs crashed throughout the Bay. The catch of 7 million sockeye was down two-thirds from the recent average. It was the first major run failure in Bristol Bay's history and dispelled the notion that the Bay's salmon runs were inexhaustible.

[3] As the bountiful salmon harvest was referred to by Rex Beach in his 1909 novel set in Bristol Bay, *The Silver Horde*.

[4] Jefferson F. Moser, *Salmon Investigations of the Steamer Albatross in the Summer of 1900*, from Bulletin of the United States Fisheries Commission for 1901, page 184.

2.4 Conservation and Regulation, 1920-1940

Sent to study the 1919 failure, biologist Charles Gilbert issued a dire warning that unless steps were taken immediately, "total exhaustion of the fisheries will occur; if not tomorrow, then the day after."[5] Gilbert's proposed remedy was to limit the number of canneries that could operate in the Bay, and represented the first attempt to limit effort. President Warren G. Harding responded by creating a fishery reservation that froze the number of canneries in the region. Denounced as anti-competitive by some, including Alaska's delegate to Congress, the reservation system soon gave way to a more comprehensive plan to manage the fishery.

The White Act, passed in 1924, gave the federal government the responsibility of managing the salmon fishery in Alaska and mandated that 50 percent of the annual salmon run be allowed to escape upriver. Federal managers lacked the ability to count the spawning "escapement," but attempted to meet the requirement with a 36-hour closed period every week. The White Act also banned powerboats, purse seines and fish traps in Bristol Bay. The APA proposed the restrictions after two floating processors brought powered seiners to the Bay two years earlier and proved very effective fishing off Ugashik. The offshore operations that targeted mixed-stocks raised a legitimate conservation concern, but could have been addressed with time and area closures. Those directly affected saw the restriction on powerboats as an attempt to keep competitors from entering the fishery.

The elimination of fish traps didn't have much an effect. A favored gear elsewhere in Alaska, fish traps never worked well in Bristol Bay. Fewer than two dozen traps ever operated in the Bay, and only two traps remained when the White Act took effect. The swift currents and large tides of Bristol Bay posed problems for traps, which would get plugged with large pulses of sockeye, only to be left high and dry twice a day.

Using their new powers under the White Act, fishery managers took steps to protect and maintain the salmon runs, and regulations started to evolve. New rules cut the allowable limit of gillnet gear from 200 fathoms to 150, required identification of the owner of fishing boats and gear, and in an attempt to limit fishing effort, set the number of boats each cannery could use based on the number of canning lines that operated. Enforcement of the regulations was largely non-existent, however, and the boat quotas were largely ignored.

Despite increasing regulation and a 4-cent-a-case tax on canned sockeye, the industry prospered in the 1920s and early 30s. Salmon canning became the number one industry in Alaska and accounted for over 80 percent of the tax revenues collected by its territorial government. Much of that came from Bristol Bay. "The fishing industry is our most important asset," boasted Gov. George Parks in his 1933 speech to the territorial legislature. "The records of the last five year indicate that annual production is fairly well established. Scientific management has rehabilitated the fisheries, which were almost destroyed."[6]

But weakened prices due to the depression weighed heavily on the canners and some scientists questioned whether runs had been rehabilitated. Cyclic weaknesses apparent in Bristol Bay sockeye returns culminated in 1935 when federal regulators recommended that the Bay be closed for an entire season. Financially strapped by the depression, the canners went along with the closure but local fishermen objected strenuously. A full-season closure would have meant the loss of the only cash income to the region. Fishermen rejected a $100,000 relief fund offered by the canners saying they would rather fish than be on the dole. The federal government finally agreed to conduct the

[5] *Alaska Fisheries and Fur Industries in 1919*, U.S. Department of Commerce, page 146.

[6] *Pacific Fisherman*, April 1933, page 10.

fishery with strict limits on canners and effort, and steps to measure the run in season through aerial escapement surveys and daily catch reporting. The 1935 catch was indeed poor – a fleet of just 300 vessels caught 3 million salmon, the weakest harvest in decades – but the shift to managing the fishery based on in-season indications of fish abundance was a significant advance in the science of managing salmon harvests.

Other threats to Bristol Bay's salmon industry loomed on the horizon. In 1930, Japanese cannery ships anchored 20 miles off Port Moller, at the southern edge of Bristol Bay. They fished for king crab but in time turned their attention to Bristol Bay salmon, which pass through the same waters on their homeward migration. Bristol Bay cannery operators considered the encroachment a foreign invasion and became further outraged in 1937 when Japanese laid claim to the Bering Sea as "an extension of the Bay of Tokyo."[7] Diplomatic efforts between Washington and Tokyo thwarted the Japanese incursion but the claim was just a prelude to the hostilities soon to come.

2.5 War and Restructuring, 1941-1959

The bombing of Pearl Harbor in December of 1941 put the nation at war and the bombing of Dutch Harbor seven months later gave Bristol Bay a front row seat to the fighting. Fighter planes and bombers roared over Bristol Bay en route to the Aleutian campaign, and the military built a major air base at King Salmon and conscripted cannery ships and power scows into service. Manpower restrictions forced the salmon industry to rethink its hiring practices and the result brought profound changes to Bristol Bay.

For residents of Bristol Bay, the restructured industry meant jobs. Due to manpower and shipping shortages, the government cut the number of operating canneries in half. Meanwhile, a lack of available manpower forced canners to hire locals. Prior to the war, Native hire in Bristol Bay canneries was almost non-existent. Out of a work force that routinely exceeded 6,000 individuals, only about 500 jobs went to Alaska Natives. During the war that number doubled, as canners hired Bristol Bay residents and imported other workers from the Kuskokwim River area. The trend continued even after the war, doubling again to over 2,000 cannery and fishing jobs going to resident Natives.

As jobs and money flowed into the region, local fishermen and communities began to organize. Dillingham fishermen formed a co-op in 1944 to break away from the company store and a resident cannery workers union was organized. The first town meeting in Dillingham was held in 1946. Two years later, a rural electrification district was formed, followed by a public utility district, and in 1963, Dillingham was incorporated as a city. A volunteer fire department was formed in Dillingham in 1947 and published Dillingham's first newspaper as a way to attract volunteers. An independent publisher soon acquired the mimeographed paper and it became a voice for local fishermen in their frequent battles with the salmon canners. A 1952 story about alleged communist influence in a rival cannery workers union was headlined "SALMON INDUSTRY BETRAYS NATION."[8] Meanwhile in Naknek, canners and the territorial government combined to build a road to the war-era air base at King Salmon. The modern transportation link gave Naknek River canneries a tremendous advantage and by 1951, all but one of the Kvichak River canneries had closed. The growth of communities in Bristol Bay was part of the statewide movement. Shortly after Alaska was admitted as a state in 1958/59, residents of Naknek, South Naknek and King salmon formed the Bristol Bay Borough, the state's first regional government, to capitalize on tax revenue from the salmon industry.

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[7] *Pacific Fisherman*, May 1937, page 19.

[8] The *Beacon of Dillingham*, March 21, 1952, page 1.

Organizational changes and unionization among fishermen helped bring major changes to the fishery itself. Immediately after the war, resident and non-resident fishermen challenged the long-obsolete ban against powerboats. Processors insisted that the restriction was needed to manage the fishery and strenuously opposed the change. Fishermen considered that a weak argument in an age of airplanes, electronics, and the atomic bomb. The political influence of the canners dragged the issue out for several years, but in 1951, fishermen ultimately won and powerboats were allowed in Bristol Bay, limited to 32 feet in length. Slightly longer than the sailboats that preceded them, the reasons for choosing a length of 32 feet have never been explained even though the limit remains enshrined in regulations today.

While a time of tremendous growth and organization in Bristol Bay, the salmon industry emerged from World War II in perilous trouble. Salmon runs were in decline, weakened by relaxed catch restrictions to meet wartime food needs. A downturn in ocean productivity, now recognized as the Pacific Decadal Oscillation, was also to blame. Canneries, many of them 50 years old, desperately needed modernization, but even the largest owners like the APA were reluctant to invest in a period of diminishing returns. After company officials cut their superintendents' capital request by 75 percent, one worker sent back a scathing review of the industry. "The cannery organization as a whole is startling in its unwillingness to accept new or efficient methods for doing anything. Never–even in foreign countries, where slavery and peonage exist, and even in our armed forces, where man hours or man days mean absolutely nothing–have I ever seen such a complete disregard, by men in high places for the established rules of labor management."[9] Several canneries shut down during the war never reopened.

Meanwhile, two other threats loomed over the industry. A 1952 treaty between the U.S., Canada, Japan, allowed the resumption of high seas salmon fishing by the Japanese. The signers of International North Pacific Fishery Convention (INPFC) drew a line in the Bering Sea east of which the Japanese could not fish. But the line – at 175 degrees west longitude – failed to capture the full extent of the ocean migration of sockeye salmon. Japanese high seas catches soared to 50 million salmon by 1955; including millions of immature Bristol Bay fish. So great was the take by the Japanese fleets that the estimated high seas catch of Bristol Bay sockeye in 1957 exceeded the inshore return.[10] For runs that were already weakened, the high seas interceptions made them even worse. In the 1950s, inshore catches averaged just 6.7 million sockeye annually, making it the worst decade in Bristol Bay's history.

As the salmon industry stalled, seafood producers turned their sights elsewhere. After the war, processors invested millions of dollars in the rapidly growing tuna fishery. The Columbia River Packers Association, formed 50 years earlier to can Bristol Bay sockeye, closed its Nushagak cannery and later changed its name to Bumble Bee Seafoods after a tuna boat in its fleet. Chicken of the Sea and Starkist also emerged as brand names in the 1950s, backed by aggressive marketing campaigns in magazines and even television. Canned tuna was abundant, inexpensive, and marketers stressed quality. A bumblebee, a mermaid, and a beatnik fish named Charlie the Tuna became advertising icons for parents of the postwar baby boom. Unable to compete with volume or price, Alaska salmon saw the domestic canned market built over the past 50 years slowly erode.

[9] Letter from Don Jacobs to Ted Kister, APA Archives, Alaska State Library, Ms.9 6:3.

[10] The estimated Japanese high seas catch from the brood years expected to return to Bristol Bay in 1957 was 7.3 million sockeye, compared to the 1957 inshore catch of 6.3 million. See Kenneth Middleton, *Bristol Bay Salmon and Herring Fisheries Status Report through 1982*, Alaska Department of Fish and Game, pages 14 and 19.

2.6 Statehood and Limited Entry, 1959-1978

Statehood culminated a dream for most Alaskans and brought with it hopes of self-determination and prosperity. For the Alaska fishing industry, statehood shifted the balance of power from the producers in favor of harvesters. The ban on fish traps was the most obvious example, but traps had been banned in Bristol Bay almost 40 years earlier. In the Bay, state fishery managers initiated aggressive forms of in-season management, closely monitoring the runs and escapement. The program built on the extensive field work of the cannery-financed Fisheries Research Institute in the late 1940s and 1950s, and the work of Canadian biologist Bill Ricker who, in 1954, argued that salmon harvests could be maximized if escapement levels were held at or near an optimal level.[11] State biologists soon developed escapement targets for the major spawning stocks in Bristol Bay and to reach these targets, managers opened and closed the fishery based on in-season indications of run strength rather than pre-season expectations.

Despite the best intentions of state biologists, decades of mismanagement could not be easily overcome. Sockeye catches in the 1960s improved little from the previous decade; in fact, harvests became increasingly variable, largely due to the new management style. Catches were low in poor years because fishing was restricted to attain escapement goals and harvests spiked sharply when strong returns allowed. "Las Vegas? Who needs it!" quipped Robert Silver, vice president of the New England Fish Company. "For excitement, adventure, high risk, thrills, frustrations–yes, and fulfillment, too – there's no greater gamble in the world than the salmon business."[12]

Following a succession of harsh winters, sockeye returns to Bristol Bay fell to historic lows in 1973 and 1974. Fewer than one million sockeye were harvested in 1973 and only slightly more the following year. *Alaska Magazine* published an article titled "Requiem for a Fishery," in which they blamed high seas interceptions for the collapse. "In this time of world food needs, the persistent actions of the Japanese in destroying the remnants of these once great salmon runs are an affront to all humanity and surely one of the great tragedies of history."[13] Anticipating the poor returns, the state took several actions including a sliding gear scale, which limited individual drift gear license holders to 25 fathoms of net but allowed multiple license holders to operate on a single vessel. The measure was intended to favor resident fishermen with extended families in the region but had unintended consequences. Minor children were exposed to the dangers of the fishery when parents bought gear licenses in their children's names in order to maximize their catch.

President Richard Nixon declared Bristol Bay a disaster area and the state was already working on a plan to respond. Plans to limit the number of participants in the fishery had been proposed and tried before but were either ineffective or rejected by the courts. The low runs of the late 1960s and early 1970s gave state politicians the incentive to enact a program to limit the number of licenses in the fishery. It required an amendment of the Alaska Constitution that voters approved in 1972. Working with remarkable speed, a study group developed a limited entry plan to give the state Legislature the next winter. "The plan is intended to work fairly to leave in the fishery those people who depend most on fishing and have been at it the longest. The result will be a stable fishery that permits more

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[11] W. E. Ricker, 1954, *Stock and Recruitment*, Journal of the Fisheries Research Board of Canada. 11:559-623.

[12] *Pacific Packers Report*, April 1971, page 25.

[13] *Alaska Magazine*, July 1974, page 33.

effective sustained yield management and allows commercial fishermen the opportunity to make an adequate livelihood from the fishery."[14]

The state issued limited entry permits based on an individual's experience and economic dependence on the fishery. The program allowed permits to be transferred, a provision most residents wanted in order to keep permits within their family. The initial number of drift permits for Bristol Bay, 1,738, was slightly more than the maximum number of boats that ever operated in the fishery. The number of set net permits initially issued, 945, was almost twice the average effort. When initial applications were sent out, few people applied for set net permits. In order to attract applicants, the state drastically reduced the eligibility requirement, allowing anyone who applied to get a set net permit. The result was a flood of applicants.

In the processing sector, significant changes also were underway. Japanese companies started buying into the Alaska seafood industry in the late 1960s and early 70s. The salmon industry was at an all-time low, but the Japanese correctly saw changes that were ahead. Their high seas fleets faced increasing pressure because of the depressed inshore returns. At one point, Gov. William Egan threatened to enclose Bristol Bay rivers with dams to create a land-locked fishery that was not subject to high seas nets.[15] Momentum was also building for the United States to join other nations in claiming jurisdiction to the outer continental shelf. In 1976, the U.S. asserted a 200-mile limit and even more significantly, the following year, the INPFC shifted the line over which the Japanese fleets could not fish westward by ten degrees, significantly reducing their high seas catches of Bristol Bay salmon. Unseen by all, the subtle shifts in ocean temperature and pressure that now define what's known as the Pacific Decadal Oscillation, were starting to swing in the salmon's favor. The combination of new investment, new markets, reduced high seas interceptions, a limit on fishing effort, effective management, and favorable climatic conditions all set the stage for what would be the most productive and lucrative era in Bristol Bay's history.

2.7 Rise..... 1978-1996

The first sign of change in Bristol Bay's fortunes occurred late in 1978 when, after a lackluster sockeye season, pink salmon surged into the Nushagak River. Unprepared for the tidal wave of pinks, processors' canning lines were plugged and some fishermen reluctantly had to dump their catch back into the sea. The following year the sockeye run was unexpectedly strong and demand pushed prices over $1 a pound. A huge run of sockeye salmon returned to the Bay in 1980, but the catch was reduced by a lengthy price dispute between fishermen and processors. The total return that year, over 64 million sockeye set a record that has not since been equaled. During the next two seasons, catches remained strong, above 20 million sockeye. Shifts in the market became apparent in 1982 when, for first time, frozen salmon production exceeded canned output. A new harvest record was set in 1983 – 37 million sockeye – that was 50 percent higher than the previous record. In 1988 sockeye prices soared as high as $2.40 a pound and value of the Bristol Bay catch exceeded $200 million. As the average gross earnings of a drift boat topped $100,000, and highliners took home significantly more, the value of Bristol Bay drift permits surged to almost a quarter of million dollars. As catch value and permit prices rose, more and more people wanted to get into the lucrative fishery, and Bristol Bay residents increasingly worried about the shift in fishing permits to non-residents.

[14] *A Limited Entry Program for Alaska's Fisheries* by the Governor's Study Group on Limited Entry, 1973, Introduction.

[15] Egan Declares Fish War, *Anchorage Daily Times*, Nov. 13, 1972, page 1.

Despite the word "limited" in its name, the number of limited entry permits slowly grew as the cap on effort became the most litigated law in state history. Seeking to overturn the law, Naknek resident Hank Ostrosky challenged the constitutionality of limited entry all the way to the U.S. Supreme Court where he lost. Meanwhile, those who felt they had been unfairly denied a permit filed dozens of other lawsuits. As cases settled, often in the fishermen's favor, the number of drift permits inched upward to the current number of 1,866. Likewise, the number of setnet permits topped out at over 1,100. Although the number of permits increased, limited entry proved to be an effective cap on effort. With strong catches and prices, effort would have undoubtedly increased substantially in the 1980s without limited entry. Some today estimate that the limited entry program saved hundreds of millions of dollars by preventing further overcapitalization of the Bristol Bay fishery.

Drift net permit holders were still limited to 150 fathoms of gear and to 32-foot long vessels, but fishermen modified their boats and their behavior in order to catch more fish. Bristol Bay gillnetters got wider and faster. Some boats were loaded with electronics, power gear, and every amenity to pack bigger crews on board to pick fish around the clock. Others lacked any amenity at all and were merely platforms for catching salmon. Much of the investment in new boats was driven by new entrants to the fishery that sought every technical advantage to make a profit on their investment in an inflated permit. In the race for fish, what was considered a gentlemanly fishery in the past gave way to a more aggressive style of fishing, with effort crowded along, and frequently over the district boundaries where the salmon first enter the districts. Some fishermen employed spotter pilots to find hot spots, and cash buyers tried to lure fishermen away from the canneries with slightly higher prices, beer, cocaine, and any number of other incentives. Setnetters, too, became more aggressive and used airplanes to fly their catch off the beach and some marked the outer reach of their nets with spiked guard buoys that would shred the nets of any drift fishermen that ventured too close. Annual Board of Fish meetings became combat zones of their own as fishermen fought heated battles among themselves over district boundaries, setnet allocations, and interceptions within Bristol Bay's own districts and from outside areas. Meanwhile, a new form of interceptions resumed far out at sea. A fleet of 1,000 foreign vessels, supposedly fishing for squid, set thousands of miles of driftnet each night targeting Alaska-bound salmon.

Unnoticed by most fishermen, in 1986, salmon farmed in Chile was first exported to Japan. It was an insignificant amount at first but over the next decade the volume grew exponentially. Norway, too, began exporting an increasing amount of farmed coho and Atlantic salmon to Japan and elsewhere. Economists who saw the shift in markets warned of the consequences, but most fishermen ignored them. The Alaska Legislature rebuffed the recommendations of University of Alaska economist Mark Herrmann, who saw a major challenge looming from farmed salmon.[16] The Legislature and many in the industry had faith in the superiority of Alaska wild salmon and could not believe that the fixed costs of artificially farming fish could ever compete with a wild product. But farmed salmon offered other advantages that were changing the market itself. Farmed fish could be delivered fresh year round, offered premium quality, and the product could be tailored to meet specific market demand. And the fish farmers soon did this in volumes that challenged Alaska's hold on the salmon market.

The impact that farmed fish were having on the market was soon apparent in Bristol Bay. A year after fish prices peaked, the price paid for sockeye fell back to $1.09 a pound. When processors opened the 1991 season with an offer of 50 cents a pound, fishermen reacted angrily with a protracted strike. Industry pointed to the increased competition with farmed fish. Many fishermen blamed price fixing among the Japanese dominated processors and initiated an anti-trust suit that is still pending before

[16] Dr. Herrmann submitted a report to the Alaska Legislature and published several works on the topic, including: Hermann, M. 1994. The Alaska Salmon Fishery: An Industry in Economic Turmoil. Journal of Aquatic Food Product Technology, Vol. 3(3): 5-21.

the courts.[17] While prices slumped, Bristol Bay held onto its place on the world salmon market through sheer volume. A new harvest record of 40 million sockeye was set in 1993, followed by an unprecedented catch of 45 million in 1995. And then the bottom fell out.

2.8 …and Fall, 1997-2002

The summer of 1997 was unusually hot throughout Western Alaska. Skies were sunny and temperatures soared into the mid-80s. People swam in Lake Aleknagik and even took dips in the usually frigid Nushagak River. A healthy run of salmon was forecast to return to Bristol Bay that summer and the early indications from the Port Moller test fishing boat a couple hundred miles down the Alaska Peninsula confirmed people's expectations. But as the fleet basked in the sun, the run failed to materialize. The catch, 14 million sockeye, was half what was forecast. Biologist Don Rogers, who ran the Port Moller test fishing project for the University of Washington's Fisheries Research Institute, theorized that millions of fish died as they entered the unusually warm waters of Bristol Bay. Others disagreed and pointed to more subtle changes in ocean temperature and pressure that heralded a shift in a long-term cycle of ocean survival and productivity, what was now being called the Pacific Decadal Oscillation.[18]

Whatever the cause, for fishermen the economic fallout was even more troubling. In previous years when runs were weak, the law of supply and demand kicked in and prices increased accordingly, but in 1997 salmon prices barely budged. After a decade of growth in the salmon farming industry, the abundance of farmed fish had redefined world salmon supply. Bristol Bay's volume of premium sockeye salmon used to drive world prices. By 1997, the huge volume of fresh, farmed salmon on the market was now in the drivers seat, and Bristol Bay uncharacteristically found itself only along for the ride. The total value of the 1997 fishery, $63 million, was less than half that of the previous year and a quarter of what fishermen earned in peak years. Gov. Tony Knowles declared Bristol Bay a disaster area and offered assistance to tide fishing families through the winter. But the next season was even worse.

In 1998, the sockeye catch unexpectedly fell again to just over 10 million salmon and prices continued to tumble. This time, the federal Government joined the state in declaring the region a disaster area and pumped millions of dollars into assistance for the region. Runs rebounded in 1999 and 2000, with catches of more than 20 million sockeye, and prices edged back over a dollar, but it did not last. In 2001, both runs and prices faltered again, with a catch of 14 million sockeye worth a mere 40 cents a pound. Anticipating the poor season, about 300 drift permit holders opted to sit out the season. It was the first time in several decades that a significant number of permit holders voluntarily sat out a season. Many of those who fished did not even break even. The state again declared the Bristol Bay an economic disaster area, but this time the federal government did not step in and the state could offer little in additional aid to the region.

With a forecast of an even worse return in 2002, the number of no shows increased to almost one in four permit holders. A number of canneries and freezer plants also opted not to open for the season. This time the dire prognosis proved accurate. The catch slipped again to just over 10 million sockeye. The Kvichak, long the sustainer of Bristol Bay strongest salmon runs, fell desperately short. Despite

[17] *Alakayak, et. al. v. B. C. Packers, et. al.,* Opinion No. 5575 (Alaska 2002).

[18] University of Washington biologist Steven Hare described the process in a 1996 Ph.D. thesis on the impact of climate on marine salmon survival. It first appeared in the scientific literature in: Mantua, N. J., S. R. Hare, Y. Zhang, J.M. Wallace, and R.C. Francis. 1997. A Pacific interdecadal climate oscillation with impacts on salmon production. Bulletin of the American Meteorological Society 78: 1069-1079.

severe restrictions to protect its runs, the Kvichak escapement fell below one million salmon for the first time since the disaster of 1973, and well short of its goals. Once again, sockeye prices barely responded to the shortfall in catch. The total ex-vessel value of the fishery, just over $30 million, was down almost 90 percent from its peak just ten years earlier. As runs faltered and prices fell, the once-coveted Bristol Bay drift permit, previously worth more than a quarter million dollars, plunged in value to less than $20,000. What was a considerable investment for some and a retirement plan for others became almost worthless.

2.9 Postscript

Today, Bristol Bay faces what is perhaps the greatest challenge of its 120-year history. And it is not alone. The same market forces and climatic changes at play in Bristol Bay are affecting salmon fisheries across Alaska and fishermen from Ketchikan to Kotzebue are seeking ways to remain competitive in a changing world marketplace.

The salmon industry is an ever-changing business. For almost half of its history, Bristol Bay was controlled by the canning industry. Most of the regulations of the fishery, some of which still exist today, were written explicitly in industry's favor. After statehood, the power shifted to fishermen, especially resident fishermen, and again laws were crafted in their favor. With the advent of industrial-scale, farmed salmon, now the consumer is in control. They have choice in what they want to pay, what product form they want, and what quality they expect. This latest shift presents both challenges and opportunities. Farmed salmon has penetrated markets that Alaska producers have long desired, namely the domestic market.

If Bristol Bay today is at a crossroads, it has been there before. Time and time again, the salmon industry has been buffeted by the forces of supply and demand, technological change or the resistance to the same, high seas interceptions, run mismanagement, and natural forces outside our control that vary in both short and long-term cycles. Each time to date, the industry has rebounded, either through initiatives of its own or someone else's making.

The 1919 run collapse fostered necessary regulation of the industry to sustain salmon production. The planned closure of Bristol Bay in 1935 forced fishery managers to look at techniques to manage runs in-season. In the 1950s, runs were weakened by mismanagement and interceptions but little was done on either front, and salmon lost significant market share to a new competitor, tuna. In the early 1970s, sockeye runs declined again despite active management. Steps were taken to restrict interceptions and limit effort, and new investment emerged that tailored the product to a new market.

Despite today's challenges, Bristol Bay remains a remarkable source of high quality salmon. Even with an apparent shift toward a cycle of low productivity, returns are generally healthy. While serious concerns remain about the Kvichak, Bristol Bay overall remains very well managed. In 2003, Bristol Bay fishermen find themselves faced with their biggest challenge in history. However, many times before people have written a requiem for Bristol Bay, only to see the fishery rebound with stunning strength. This is no guarantee for the future; rather it is a challenge to today's leadership.

3 Stakeholder Perspectives

From the beginning, the sponsors of this study recognized the importance of soliciting and incorporating the views of people involved in the fishery. A bedrock principal of the Study required that it be grounded in the facts of the fishery and not be an idealized or academic pursuit removed from the realities of Bristol Bay or the seafood industry. In this section, we summarize key aspects and results from the public input process, although input from those in the industry permeates every aspect of this report. A full description and summary of the Pubic Outreach and Response component of this study is presented in Appendix A. In addition to a summary, Appendix A also contains interesting verbatim input from the public.

To communicate the goal of the study and to promote widespread participation, the study team designed and implemented a multi-pronged public outreach process with 5 major components:

- Distributed 4,000 brochures explaining the study, laying out general options and providing a tear-out card for the reader to submit with their ideas.
- Conducted three well-attended town meetings in the Bristol Bay region.
- Established a website.
- Initiated numerous one-on-one meetings.
- Participated in a regional radio call-in show.

Each element in the outreach effort was directed toward the same goals: to describe the Study and to solicit as much input as possible from those most familiar with the fishery.

Participation in the public outreach exceeded the study team's expectations and was a sign of how much interest there is in the issue of restructuring the Bay fishery. Brochures appeared to have reached nearly every permit holder and 154 written response cards were returned. At least 280 people from all aspects of the fishery attended three public meetings held in Egegik, Naknek and Dillingham in June 2002. Audiences at these meetings vigorously presented and discussed a wide array of restructuring options and their potential impacts. A project website was established (www.bbsalmon.com) to disseminate information about the project and solicit input to the study. The website received over 1,800 hits and prompted about 40 email responses. Finally, the study team members spent considerable time formally and informally discussing the project with hundreds of industry leaders, fishers, fishery managers and other government officials at a wide range of venues over an 8-month period.

Although the public input was not structured as a formal *survey* of opinions, the Study Team engaged an estimated 500 individuals from every facet of the Bristol Bay fishery. Input was highly varied but the overwhelming majority of comments were thoughtful reflections on the current situation and about actions that might improve the economic conditions in the fishery. The vast majority of the input received was genuine and it was clear that a large portion of the industry has been actively thinking about restructuring issues.

The public responses impressed the study team in the following general ways:

- There appeared to be much broader support for making a structural change to the fishery than the study team believed to be the case.
- People had stronger feelings about how bad the situation is and the need for change than was evident from similar meetings over the past 2 or 3 years.

- Most people had a long-term view of searching for solutions; these people felt that chasing "quick fixes" was likely going a waste valuable time.
- People were generally convinced no single or isolated action could do enough to "save" the fishery. There were many suggestions for a combination of measures to be applied over time in stair-step fashion.
- People were very supportive of this study being conducted.

In terms of options, two broad observations were often made:

- Consolidating the fishing fleet will improve the economics of the fishery from several angles.
- Eliminating the race for fish might substantially improve the economics of the fishery but the compressed run timing of Bristol Bay salmon may limit how much this change could improve the economics of the fishery.

The most common suggestions for improving the fishery were:

- Reduce the number of permits to reduce harvesting and processing costs and improve quality.
- Improve the quality of the harvest to raise the price paid for fish.
- Invest in marketing and infrastructure to increase revenue and lower costs.
- Eliminating the race for fish to solve several problems all at once.

Finally, the study team noticed a phenomenon that has been happening over the last few years. The perspectives of stakeholders toward restructuring, like those of the study team, appear to have been changing over the last few years. There has been a clear shift in attitudes, with a greater proportion of participants encouraging or recommending restructuring and a much greater willingness to discuss what were once seen as radical solutions (e.g., harvest shares, alternative harvest gear). A lot was learned from an experiment with harvest shares and a harvesting cooperative in the Chignik salmon fishery in 2002 and this has likely spurred more reflection and debate among those in the industry. Based on these observations, we have little doubt that if permit holders were resurveyed again this summer (2003), we might receive more and possibly different input than was received over the last year.

4 An Economist's Perspective

To get an economist's perspective of the prospects for the future of the Bristol Bay salmon fishery we recruited Jim Wilen, a natural resource economist from University of California, Davis. Dr. Wilen has a combination of theoretical and practical experience with fisheries from around the world that provides insight into the issues before Bristol Bay. Dr. Wilen has studied fisheries operated under many different management systems or "rules of the game" and published extensively in scholarly journals and books on what has worked and what has not worked[19]. Coincidentally, one of Dr. Wilen's first tasks upon graduating about 30 years ago was to examine the implications of implementing a limited entry licensing program in Alaska's salmon fishery. Since then he has continued to assess the effectiveness of a variety of other fisheries management systems around the world, including individual transferable quota programs, area licensing, cooperatives, co-management schemes, and variants on conventional command and control regulations.

In the section below, Dr. Wilen articulates how restructuring efforts can be viewed as ways to create new wealth, the role of innovation in creating wealth and the role of institutions to encourage innovation. His message – that without fundamental change in the "rules of the game" for the fishery to eliminate the race for fish – restructuring will fail to generate significant improvement to the economics of the fishery and the well being of its participants. This may be a sobering and disturbing message for many who have invested money and many years of effort to become experts at operating under the current rules of the game. But it is also a hopeful message – there may indeed be ways to bring the Bristol Bay fishery back to long-term profitability.

4.1 Mapping the Landscape of Potential Wealth

Any restructuring to improve the economic viability of the fishery must create new wealth. New wealth means that after the change is made there must be more net income in the hands of industry participants. A useful metaphor in this respect is that any restructuring must "make the pie bigger" –

[19] **Property Rights and the Texture of Rents in Fisheries** in Donald Leal (ed.) Evolving Property Rights in Marine Fisheries, PERC Press, forthcoming 2003.

The Marine Environment: Fencing the Last Frontier, (winner: AAEA 21st Century Essay Contest), Review of Agricultural Economics, 24(1), 2002 (with Marty Smith), pp. 31-42.

Avoiding Surprises: Incorporating Fishermen Behavior into Management Models, Bulletin of Marine Science, 70(2), 2002 (with Marty Smith, Dale Lockwood, Lou Botsford), pp. 553-575.

Renewable Resource Economists and Policy: What Differences Have We Made?, invited paper for the 25th Anniversary Issue of the Journal of Environmental Economics and Management, Vol. 39, no. 3, 2000.

The Sea Urchin Fishery: Harvesting, Processing, and the Market, Marine Resource Economics, vol. 15, 2000, (with Julie Reynolds).

What Do Regulators Do? Dynamic Behavior of Resource Managers in the North Pacific Halibut Fishery (with Francis Homans). *Ecological Economics* 29, 1998.

A Model of Regulated Open Access Resource Use, Journal of Environmental Economics and Management, vol. 30, no. 1, 1997, (with Frances Homans).

The Effects of Individual Transferable Harvest Quotas in the British Columbia Halibut Fishery (with K. Casey, C. Dewees and B. Turris). Marine Resources Economics 10(5): 1995.

in contrast to options or changes that only redistribute or re-slice the pie among participants, such as changing the harvest allocation among user groups. Re-slicing the pie will only transfer wealth from one group to another, and overall, the entire industry will not be any better off than it was before restructuring. New wealth can be created by decreasing harvesting and processing costs and/or by increasing the value of the harvest through better quality and investments in marketing.

A useful way to think of the *initial* task of examining the numerous suggestions put forth to improve the fishery is to "map the landscape of potential wealth." Mapping something involves quantifying the magnitude of features (for example, how high mountains are or how much wealth restructuring options might create) and then describing the relationships or similarities between different features across some area (fish stocks, fishery and region). Therefore, mapping potential wealth from restructuring options involves quantifying how much wealth the different options may create and how these options might affect the fish stocks, fishery, and region. Mapping the landscape of wealth will hopefully allow decision makers to identify which options offer the greatest improvements and those that will fall short of making any meaningful improvement. At this stage, the task is to "distinguish mountains from mole hills."

Once new wealth has been identified, those in the industry may want to design how it will be distributed among participants. This task is a separate issue from "making the bigger pie." How to *distribute* a bigger pie is a public policy choice and is a separate issue from making the pie bigger (see the section below: *Engineering the Distribution of a Bigger Pie*).

4.2 Restructuring the Fishery to Capture Wealth

In order to find ways to improve the economics of the fishery, it is important to first inventory where in the fishery more money is spent to harvest and process the fish than is necessary, as well as identify ways that the harvest might be sold for more than it has been. Why? Implicit in calls to restructure the Bay salmon fishery, is the assumption that the current system is inefficient and/or it doesn't capture the full value of the harvest that is possible. To identify the most promising restructuring options, it is useful to start the analysis of opportunities by first examining the current structure of the fishery to find places where it could be done better – options arrived at in this manner will be ones that target the sources of real opportunity. Starting the analysis with existing options narrows the discussion down to pros and cons of specific options, possibly at the expense of identifying the real source of wealth in the fishery.

Before getting into specific wealth-capturing opportunities in the Bristol Bay fishery, we explore the important concepts of how innovation creates wealth and the role policy has in creating the incentives to innovate.

4.3 Role of Innovation to Capture Wealth

How is wealth created in a market-based economic system? While a complete answer to this question is complicated, the essence of the answer is: by innovation. Innovation creates wealth in two ways: by creating new products that consumers value and are willing to pay more for, or by reducing the costs of producing existing products (or both). In market economies, value creation and cost savings happen more or less automatically, as a "bottom-up" process, without anyone orchestrating necessary changes. This happens because individual entrepreneurs are driven, in a Darwinian (survival-of-the-fittest) system of competition for wealth, to experiment, innovate and adopt better ways of doing things with resources at their command. In contrast, in "top-down" managed economies like the former Soviet system, bureaucrats did much of the organization of production in a planned fashion. The inability of the Soviet system to keep pace with the market system over the past half century is a reflection of how difficult it is to orchestrate an economic system from the top down.[20]

Commercial fisheries around the world are a curious hybrid of systems, guided by both the automatic incentives of a bottom-up market system and the planned directives of a top-down managed system. At heart, the conflicting incentives generated by the hybrid system are why most of the world's fisheries are relatively poor generators of wealth. Recent reports on the status of the world's fisheries bear this out in a depressingly stark manner. Since extension of jurisdiction offshore in 1976, many of the world's fisheries have undergone conscious stock rebuilding efforts, emerging with relatively healthy stocks compared with the situation in the late 1960s. FAO reports suggest that about 75% of the worlds' fisheries are at or below full exploitation – a record that reflects significant progress.[21] At the same time, other FAO reports also suggest that the world's fisheries are not producing any wealth.

Widely cited data show that while worldwide landings in 1990 generated about 70 billion dollars in revenues, those revenues did not actually cover costs, which were on the order of 92 billion dollars.[22] How has this happened? How can natural resources with such potential for generating wealth actually be earning negative returns? The answer lies in the hybrid system alluded to above. In bottom-up market economies, participants have incentives to direct innovation toward activities that maximize net surplus, or the difference between revenues and costs. In most top-down or hybrid fisheries systems, in contrast, fishermen are led to direct their innovation mostly toward maximizing their share of the allocation of harvest every year, rather than maximizing the net value of that harvest.

The term "open access" has been used to describe these perverse incentive structures in fisheries. Open access is a somewhat dated term; it is more correct to think of fisheries as either "regulated open access," or "regulated restricted access." A regulated open access system is open to all entrants, but each participant must adhere to regulations that ultimately remove some control and the freedom to innovate and make independent production/marketing decisions. A regulated restricted access system operates similarly, except that participation is limited to a restricted class, such as those with limited entry licenses. How do regulated open (and restricted) access systems inhibit wealth generation? The answer to this question is most easily understood by comparing farming and fishing.

Consider a hypothetical agricultural area in which the highest valued use of the farmland is to produce corn, on farms of 1000 acres each. Assume that each farm of that size can earn $500 per acre in revenues at a yearly variable input cost of $200 per acre, divided equally into expenses for a

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[20] At minimum, an enormous amount of resources are used up simply in making planning decisions about what should be produced, how, and to whom goods and services should be distributed. Worse yet, innovation is not directed at ways of conserving the most scarce resources, nor it is directed at producing products that are valued most in the economy.

[21] Food and Agriculture Organization (FAO). The State of the World's Fisheries, FAO Information Service, 2000. Curiously, the same statistics are used by critics as indication of failure of management. Often the same numbers are stated as "75% of the world's fisheries are either fully or overexploited," the intent being to suggest a glass that is "half empty." Misunderstood is the simple point that if we are interested in using marine resources efficiently, it would be desirable to have 100% of the fisheries in the fully exploited category.

[22] Food and Agricultural Organization (FAO). Marine Fisheries and the Law of the Sea: A Decade of Change, in *The State of Food and Agriculture*, 1992. FAO Fisheries Circular No. 853, Rome. Costs were broken into capital maintenance (30 billion), insurance (7 billion), fuel (14 billion), supplies and gear (18.5 billion, and labor (22.6 billion) with the difference made up in subsidies

tractor ($100/acre) and for all other inputs ($100/acre).[23] At this hypothetically most efficient configuration of inputs, the net profits from farming would be $300 per acre. This surplus of value over all costs can be thought of as the return to the productive capacity of the land itself. In a competitive market for farmland, potential renters for farmland would bid the rental value of land up to $300 per acre. In addition, potential buyers of farmland would bid land sale prices up to levels reflecting the value of the flow of these net returns. In most situations, land prices are some multiple of cash rents (returns), often 10 or 12 times rents. This is similar to the manner in which the stock market values stocks at multiples of earnings or dividends.

In farming, since each landowner captures the surplus of crop sale value over the cost of production, there is a continually operating incentive to experiment with production methods and inputs used, since any successful cost-reducing innovation will generate more net value, which he/she can pocket and add to wealth. A farmer who learns how to successfully cut pesticide, herbicide and fertilizer use can pocket the difference and this is added to his/her wealth produced from the land. At the same time, there are incentives to innovate on the market side as well, since a different kind of crop, produced under different conditions (e.g., organic) might well yield higher revenues. This constant and automatic bottom-up drive to generate improvements ultimately generates more wealth out of the fundamental productive capacity of the land. When the land base is fixed and incapable of expansion, the extra wealth that is generated from innovation is reflected in higher land values for the owners.

4.3.1 Farming Under Regulated Open Access—A Fable

Suppose, in contrast, that farming operated under the typical top-down control system and associated incentives that most fisheries operate under. Imagine a farming season with an "opening date" each growing season. Suppose farmers were required to line up on the state's borders until regulators opened the farming season. At the season's opening, each farmer would race to "claim" a patch of farmland by plowing and planting it. What would we expect to happen under this hypothetical open access farming system? First, farmers would most likely build very large and very fast tractors designed to lay claim to large tracts before their competitors did. The first few innovators would temporarily lay claim to proportionately larger tracts in the first few seasons, but ultimately, everyone would invest in oversized tractors, and the attempt to gain a competitive advantage over one's neighbor would be mitigated by his similar decision. In addition, a "fast" tractor designed to maximize claim over the land resource would be inefficient in conducting other needs to plow, cultivate and harvest the crop. The ultimate result would thus be wasted expenses on tractors that were effective in the "race to farm" and inefficient at actually plowing, tilling and harvesting the crop. How far would this process go? One of the insights from studying open access processes is the realization that the process inevitably continues until **all** sources of potential wealth generation are wasted by excessive input costs. In this example, after a few seasons, all farmers would have invested in larger and larger tractors until the tractor component of total costs had risen to $400 per acre. At that point, revenues would be $500 per acre, tractor costs would be $400 per acre, and other input costs would be $100 per acre. Instead of earning $300 per acre as under conventional farming with control over all inputs, the open access system would generate no wealth. The potential wealth that could have been earned would instead be tied up in inefficiently large tractors that sat idle much of the season, and that were fundamentally not best suited to careful high valued farming methods.

Actually, we know that the situation under regulated open access and regulated restricted access can be far more perverse than just described. In our regulated open access farming fable, since a

[23] Including a fair wage for the farmer/owner's time and effort in on-farm work and management.

particular farmer could not be assured of claiming the same piece of land year after year, he/she would invest in seeds and inputs that would be high yielding but at the cost of degrading the productive potential of the land. Over time each plot of land would become less productive. In addition, since each farmer always faced the risk of another poaching his crop, farmers would begin to harvest earlier than optimal for the market, foregoing the highest valued fresh market niches for other lower valued industrial markets capable of taking less than ripe corn. Revenues would fall to $450 then $400 per acre, and so on. In the long run, we would anticipate, in response to public outrage over declining productivity of the public land resource, that regulators would be induced to step in and manage farming. Regulators (largely trained as agronomists) would focus on returning the degraded land to its initial levels of high productivity, measured in tons/acre. The first action taken by regulators would be in response to the huge bloom of tractor capacity waiting to claim land at the beginning of the season. In order to manage the race to claim plots, regulators would attempt to limit total tractor capacity. In the first year they would do this by restricting the time at which a claim can be validated to the first 20 days following the opening. In response, farmers would build faster and larger tractors designed to lay claim to more (or the same) land over the now shortened season. As everyone invested, regulators would have to reduce the window to 15 days, then 10, and so on. At the same time, in order to restore productivity to the land to former levels, regulators would initiate a series of regulations banning high-yield/high-impact corn varieties and regulations limiting plow width to ten feet. At harvest time, as each farmer rushed to harvest his/her crop first, processors would be overwhelmed with raw corn that was often poorly harvested. The crop would sit on processing loading docks in the sun, compressed and squashed into forms that had to be downgraded into increasingly lower valued end uses.

4.4 Creating Institutions that Encourage Innovation

While the above "farming under regulated open access" is a fable, the intended message is a serious one. In a market economy, the ultimate source of wealth is the creative process. But the creative process can be directed at wasting potential wealth as well as creating new wealth. In a bottom-up market economy, individual players have strong incentives to experiment with new methods that reduce costs and increase efficiency or creating new products that garner higher market prices. In contrast, in a hybrid top-down system like Bristol Bay's regulated restricted access salmon fishery, incentives are mainly directed at individuals to maximize their *share* of the allowable harvest. A look at the history of most fisheries reveals that fishermen are exceptionally innovative and resourceful in seeking ways to increase their potential shares of quantities harvested. But these individual expressions of innovation, while successful in the short run, are ultimately futile because regulators must ensure that allowable harvests are not exceeded. Thus as fishermen figure out new ways to increase their shares, regulators must meet these innovations in lock step with efficiency-stifling measures of their own. This manifests itself in the so-called race for fish, which refers to the process whereby potential catching power is continually increased, causing managers to shorten seasons, causing further rounds of capacity growth. In the long run, since overall harvest cannot be expanded, all of these harvesting capacity-increasing innovations serve no other purpose other than to drive costs up so that no wealth is generated.

This farming parable raises the important point that societies have *choices* over establishing rules of behavior regarding resource use. The United States had the choice to open up farming on the frontiers using a top-down system, either by trying to manage the free-for-all under regulated open access described in the above parable, or even with more strictly managed Soviet-style collectives a la farming in the Soviet system. Instead, we chose, as a nation, to decentralize the control over a large fraction of agricultural lands by granting, homesteading, and selling public lands and converting them to private property. Property law confers every landowner the right to experiment, innovate, and often to patent new ideas and new products, thereby appropriating the gains from innovation. Not all of the resources originally in control of the federal government in the United States have been converted into private property.

Many of the natural resources in Alaska and the Western U.S. are managed using hybrid top-down/bottom-up institutions. In most cases, however, users do not have to compete with each other for access to the basic resource base. For example, grazing rights are granted to individuals with relatively long term and secure (but partially restricted) use rights. The restrictions (e.g., maximum stocking rates) are designed to meet multiple objectives of public and private stakeholders at the same time as providing incentives to innovate. In other cases, such as with most commercial fisheries, users have very tenuous and circumscribed rights that generate few incentives to make long-term investments in innovations to reduce costs and/or increase market value. This, in fact, is the essence of the problem with fisheries like the Bristol Bay salmon fisheries. As with the case of the farming fable under open access, the result is a familiar one in which everyone wastes resources by competing for a **share** of the common resource rather than organizing activities to maximize the **net value** of what is produced. The process of competing for a share of the resource results in over-investing in some inputs, choosing others in ways that do not minimize costs of production, and competing at a disadvantage in the market place with relatively inferior products.

How can the process of wealth destruction be reversed and turned into one of wealth creation? It can be done by choosing new institutions or "rules of the game" under which resources are utilized and managed. Restructuring the fishery can be seen as redesigning the institutional and governance structures that give foundation and direction to individual initiative and innovation. A hint at one of the possible choices has been provided above; namely some different management structure that mimics the features in private property systems that lead to wealth generation by encouraging innovation in harvesting, handling, processing and marketing. Obviously, full property rights like farmers enjoy to their own pieces of land are not possible with highly mobile and migratory fish. On the other hand, there are restructuring options that generate similar behavior and outcomes. Based on these arguments, an important mechanism for generating wealth is to create secure control over a share of the productive resource via an individual or group allocation.

4.5 Are Those in the Bristol Bay Fishery Irrational?

Many people look at the Bristol Bay salmon fishery and see an industry that has a far greater number of vessels catching fish than necessary in ways that reduce and destroy quality so that in the end, almost no net income is generated from the fishery. The situation begs the question "Are those in the Bristol Bay fishery irrational?" The answer is NO. People in the industry are very rational; they are also smart, innovative and adaptable. As we outlined above, these people are channeling that experience, knowledge and innovation in *the* most rational way that is possible under the current structure of the fishery.

The calls to restructure the Bristol Bay salmon fishery stem from a desire by those in the industry to innovate – to find new and more efficient ways to harvest fish and to improve the value of the harvest. As would be expected, the motivation to find new ways of doing business is as strong ever because the industry is on the verge of financial insolvency.

5 An Interpretation of History

Can history provide any insight into how the fishery got to the point where it is now and how it should proceed in light of the conditions seen in the fishery today? We think it can. In this section, we draw upon and extend some of Mr. King's observations (An Historian's Perspective) and salmon market information discussed in Appendix G (An Analysis of Prices of Bristol Bay Sockeye) to present an interpretation of historical events that can provide insight into challenges associated with restructuring the fishery.

The Bristol Bay salmon fishery has a long, rich and colorful history. Much has happened in the fishery over the last 120 years and separating fact from fiction and meaningful patterns of change from spurious or ephemeral change is difficult. As a result, interpretation of history is often open to debate and our examination of the Bay fishery is no exception. Probably the strongest or most defensible conclusion that can be made about its history is that the Bay fishery has been exposed to nearly constantly changing conditions. Average annual catches have varied from less than a million fish to nearly 50 million fish. The structure of the industry has evolved from one dominated by a cartel of processors who salted and canned fish to one with nearly 3,000 fishing permit holders and dozens of processors who organize, fish, process and sell their fish in all sorts of ways. Along the way, the Bay region transformed from an almost pre-European-contact society dependent on a subsistence way of life, to a blend of a regional economy dominated by the salmon fishing and processing industry and a subsistence-based culture and economy.

The Bristol Bay salmon industry has been a conservative industry compared to many other industries. The conservatism is reflected in slow or gradual changes in processing and harvesting methods, product mixes produced from the catch and response to changes in consumer demand. There has been a revolution in the salmon supply and demand over the last two decades and for much of this time, it has been "business as usual" in much of the Bristol Bay fishery. Conservatism in the industry could be in response to several factors, including variable and uncertain harvests among years, high fixed-capital costs, and the generally high cost of doing business in the region. Over the long run, these factors favor conservative business practices, as those operations that are less conservative would probably have not survived in this environment. Another factor that likely promoted conservatism was that, for at least the first half of its history, the Bristol Bay processing sector was essentially a cartel, creating monopolistic (and later "oligopolistic" - few operators acting similar to monopolies) control over much of the industry. Industries are often slow to change and evolve if competition is weak or absent. Regardless of its source, conservatism has lead to a situation where the fishery has changed little over the recent two decades, despite several signs over the last 15 years that "times are changing."

The Bristol Bay fishery has always been operated under various forms of open and limited access over its history. We use the term open access here to mean that fishers operating in the fishery are left to capture as great a share of the allowable harvests as they can (in compliance with various regulations that may restrict their operation), often at the expense of their competition[24]. This form of

[24] Open access is a somewhat dated term; it is more correct to think of these fisheries as "regulated open access," or "regulated restricted access." A regulated open access system is open to all entrants, but each participant must adhere to regulations that ultimately remove some control and the freedom to innovate and make independent production/marketing decisions. A regulated restricted access system operates similarly, except that participation is limited to a restricted class, such as those with limited entry licenses. Open access systems contrast to systems where a right is assigned to individuals or organization to capture

organization in a fishery creates a derby-style fishery and a powerful incentive for fishers to race for fish before others can harvest the catch. The most notable outcome of the derby-style fishery is a large, heavily capitalized fishing fleet making little or no profit. Each fisher "racing for fish" under a system of open access is acting rationally to maximize their returns, but over time and collectively, the entire industry suffers. Other predictable outcomes are fishers trading off quality for quantity during the race for fish and little cost-saving cooperation among harvesters and processors. In fact, Bristol Bay is often held up as a classic example of the failures of open-access fishery management systems in Alaska[25] and elsewhere.

Near monopolistic control of Bristol Bay processing operations in the early stages of the fishery and more recent allegations of collusion among processors have contributed to what have been, at times, acrimonious relations between harvesters and processors in the Bay. Despite poor relations, full-blown strikes by harvesters (to provide fish to processors) have been relatively rare, with major ones in recent history occurring in 1965, 1980 and 1991. When strikes have occurred, they have been bitter. During the 1991 strike, processors offered just $0.50/lb and pointed to increased competition from farmed fish as reason for a dramatic drop in price. Many fishers argued low prices were caused by price fixing among the Japanese-dominated processors. Some fishers eventually went fishing; many others did not and initiated an anti-trust suit that is still pending before the courts.[26] The pending lawsuit further stifled what had been little cooperation and innovation among processors and fishers because of fears of additional legal suits accusing processors of collusion.

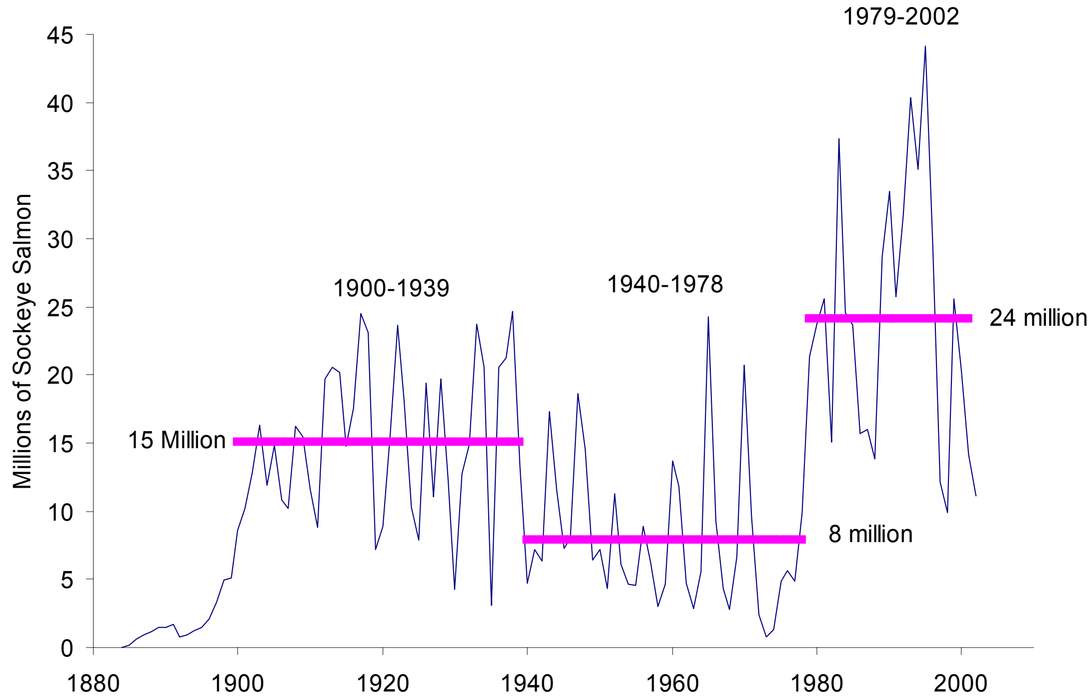
Catches and income from the Bristol Bay fishery over the last 20 years has been extremely anomalous compared with the previous 100 years (Figure 2). For the period 1979 to about 1996, there was a unique alignment of events to create unprecedented wealth in the fishery. Average catch from Bristol Bay for the period 1979-2002 was about 300% greater than the average from the previous four decades (1940-1978, Figure 2). This increased catch can be attributed to a shift to favorable ocean conditions for salmon survival, to better fishery management geared to achieve fixed escapement goals, and to reduced interceptions of Bristol Bay fish in high-seas fisheries. For the previous period, from about 1900-1939, catches from the Bay fishery were more similar to the recent two decades, although still lower. The 1979-2002 average catch was about 60% larger than the 1900-1940 catch (24 million versus 15 million). Another way of looking at the differences in catch among periods is to note that the poorest catches in the last 2 decades (1997, 1998, and 2002) were 25 to 50% larger than the average catch for the 39 years from 1940 and 1978. It would have been hard for someone who fished in Bristol Bay for 30 or 40 years during 1940-1978 period to imagine a harvest of 12 million fish spurring Federal and State disaster declarations for the region it did in 1997.

a specific share of the harvest. These rights-based systems often remove much of the incentive to race for fish and without that incentive, fisheries develop in much different ways than open access fisheries.

[25] "Like it or not, Bristol Bay is a flagship fishery for the Alaska salmon industry. This fishery is the most overcapitalized [in the state] and the ups and downs of this fishery have statewide economic repercussions." From: *Attempting the Salmon Turnaround*. A Report to the [Alaska] Joint Legislative Salmon Industry Task Force and to the Salmon Industry at Large, By Kate Troll. September 2002.

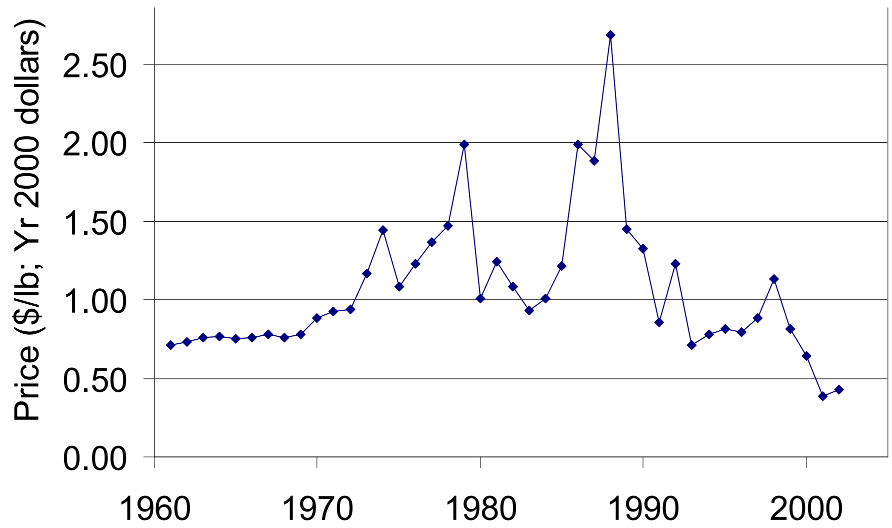
[26] *Alakayak, et. al. v. B. C. Packers, et. al.,* Opinion No. 5575 (Alaska 2002).

Figure 2. Annual Bristol Bay Sockeye Salmon Harvests 1884-2002



Coinciding with recent high catches from the Bay were high, some would argue artificially high, prices paid for salmon. The Japanese economy, a major buyer of salmon, was booming, and their appetite and willingness to pay for Bristol Bay sockeye salmon was at an all time high. Three things happened to destroy this unique constellation of events. In order of relative importance these three things were: world aquaculture production of salmon and trout increased 700% over the same two-decade period, the booming Japanese economy crashed, and Mother Nature created environmental conditions that resulted in lower-than-recent-history survival rates for juvenile salmon at sea. Although there were other factors, like a strong US currency that made imports from low-cost aquaculture areas cheap, most of the problems are ultimately related to these three factors. From a situation of high catches and high prices for nearly two decades, the industry now finds itself in a situation with moderate catches and low prices (Figure 2 and Figure 3).

Figure 3. Bristol Bay Sockeye Salmon Prices, 1961-2002 (Corrected for Inflation)



As world production of farmed salmon and trout increased dramatically over the last two decades (Figure 4), it had a profound effect on the market place for Bristol Bay salmon. The tremendous increase in production of a high-quality, year-round supply of farmed salmon (often produced at a low cost) has helped to create a steady decrease in the price paid for Bristol Bay sockeye salmon (Figure 3) and dramatically lower revenue to the fishery (Figure 5).

Figure 4. Salmon Production from Aquaculture and from Bristol Bay, 1970-2002

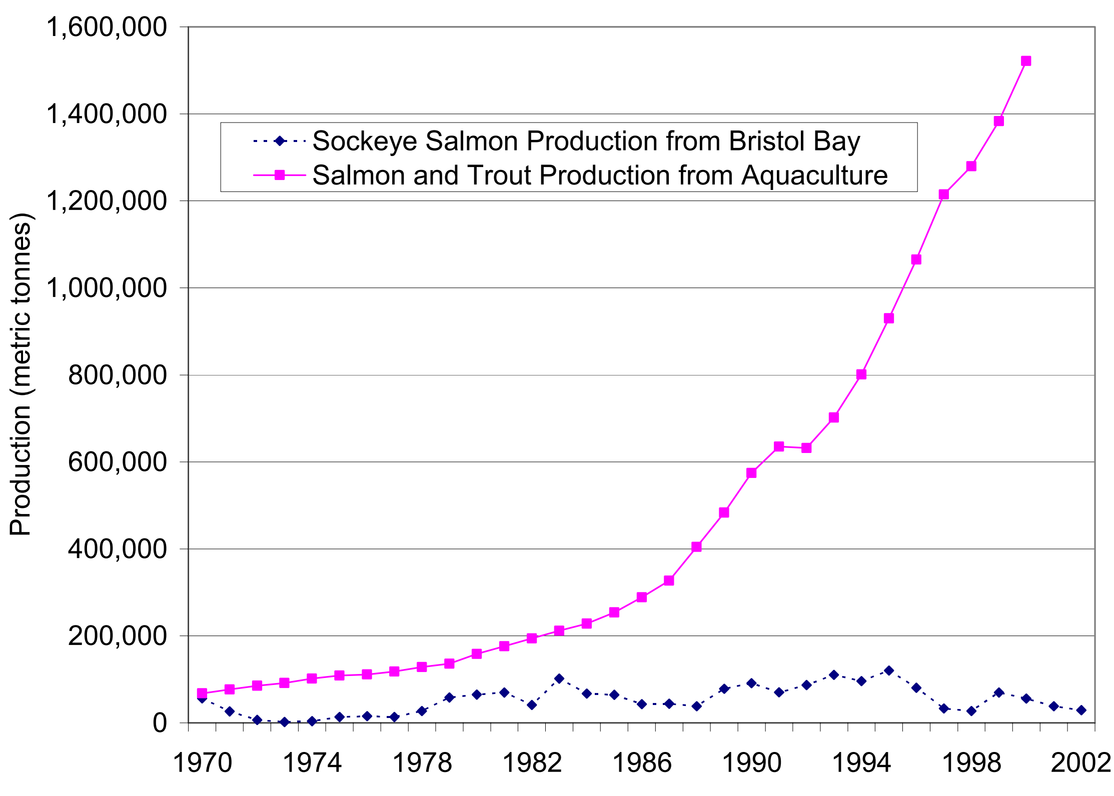
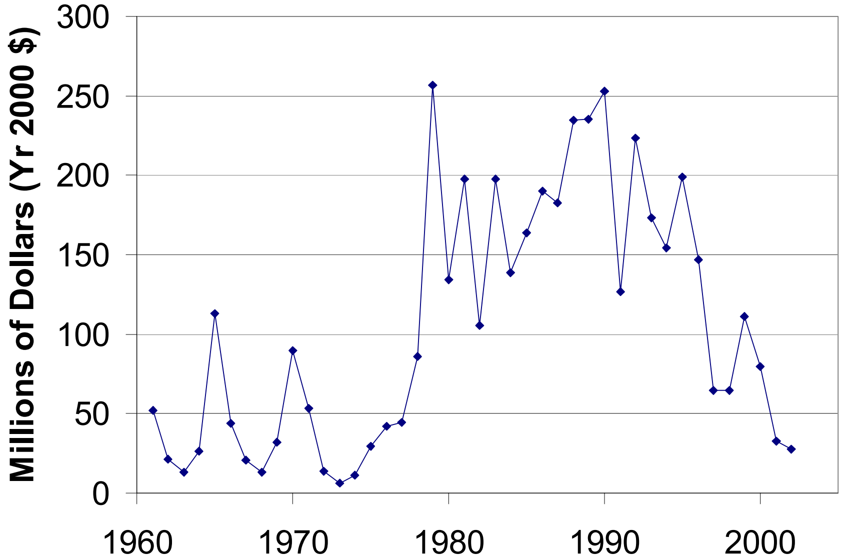
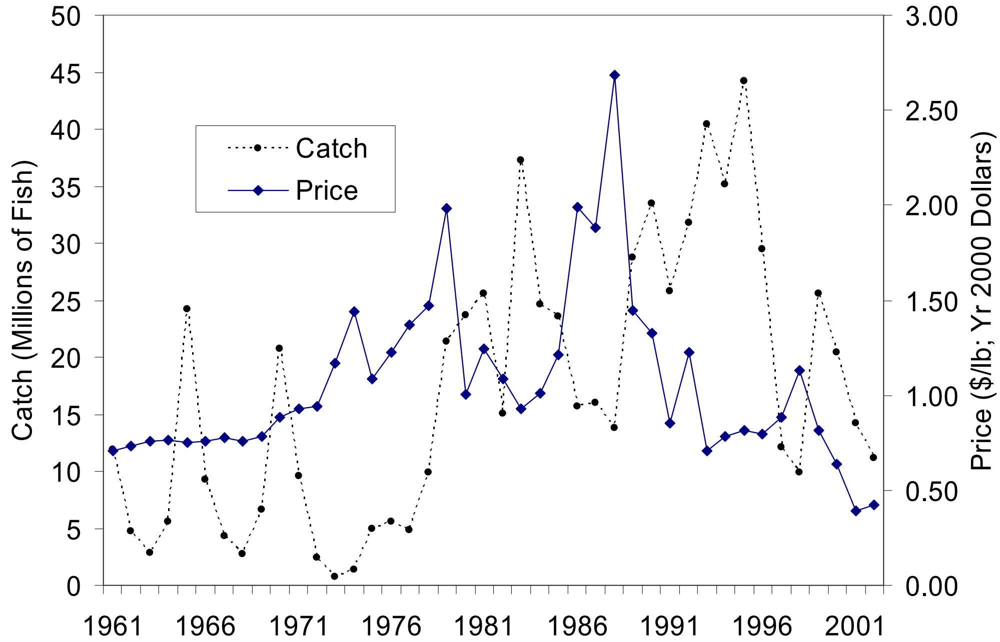


Figure 5. Annual Ex-vessel Value of Bristol Bay Sockeye 1961-2001 (Corrected for Inflation)



In addition to negatively affecting the price of Bristol Bay fish, world farmed fish production has fundamentally changed the role Bristol Bay production once played in the marketplace. In the past, Bristol Bay used to be an important supplier of salmon in the world market and when the runs to the Bay were low, it often meant higher prices paid by customers for the fish (and vice versa; Figure 6). This recent uncoupling of the fish price from the magnitude of the Bristol Bay harvest has removed what used to buffer the among-year peaks and valleys in the revenue received from the catch for harvesters and processors. In the last few years, low catches in the Bay have coincided with the poorest prices in 40 years (Figure 6).

Figure 6. Sockeye Salmon Catch and Price from Bristol Bay, 1961-2002



The unique constellation of events that lead to the creation of tremendous wealth from the fishery from the late 1970s to the mid 1990s left a legacy in the structure of the fishery and expectations of its participants. The capacity of the industry to catch and process fish increased dramatically from the mid 1970s to the mid 1990s. There was an increase in the number of participants in the fishery, an increase in the average revenue per permit holder, and the fishery began to support a greater portion of a permit holder's annual living costs than in the past. The number of fishing vessels and the efficiency of vessels in the fishery have increased during the boom times of the last two decades (Figure 7). Once averaging 1,200 drift gillnet vessels prior to limited entry (pre 1973), the fleet has expanded by about 55% to almost 1,900 driftnet permits and vessels. The number of setnet operations operating in the Bay each year increased by about 78% from an average of 511 for the decade prior to 1974 to an average of 908 since 1980. This increase in the number of vessels combined with newer and more efficient gear has significantly increased the fishing power of the fleet. With fixed escapement goals, managers have responded to this greater fishing power with shorter and shorter fishing periods, especially in recent years of modest harvests (~10-15 million fish). This concentration of harvest in time has increased crowding on the fishing grounds and contributed to less-than-optimal levels of quality.

Figure 7. Number of Permits Fished in Bristol Bay Driftnet and Setnet Fisheries 1890-2002

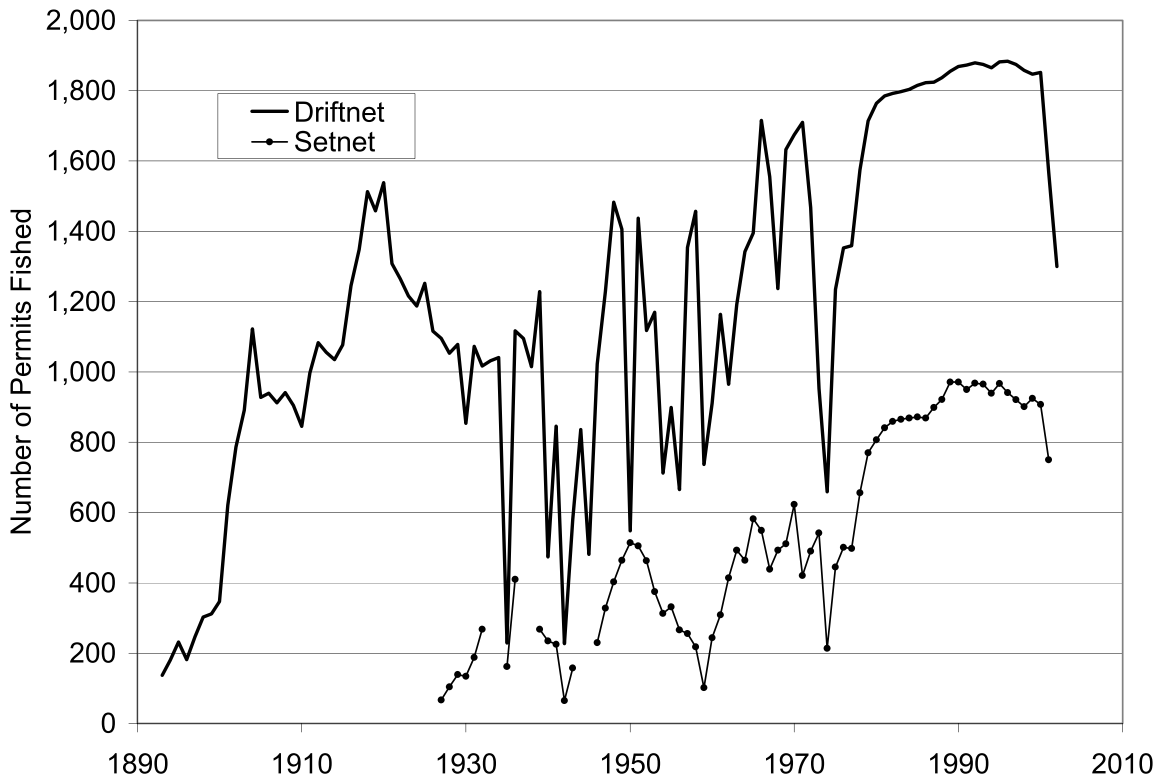
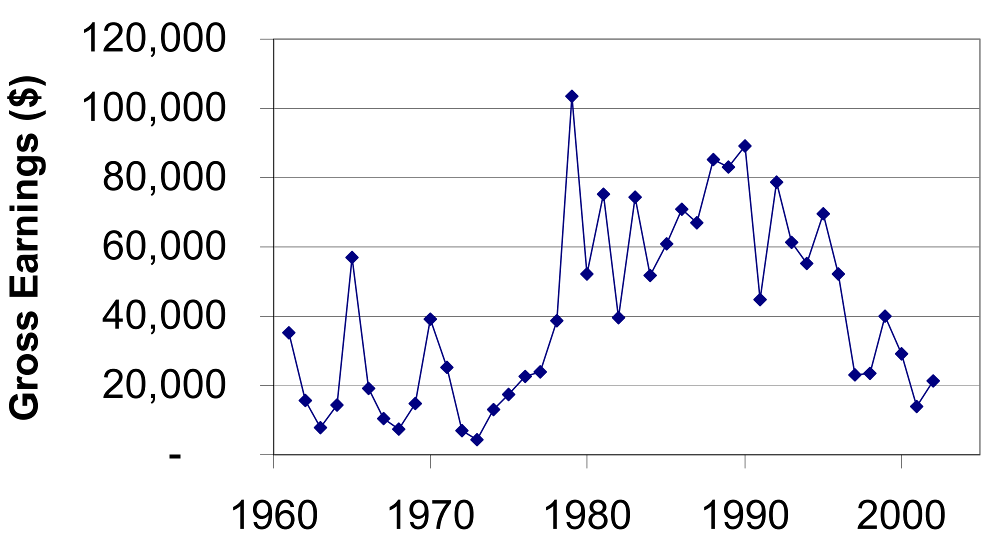


Figure 8. Average Gross Revenue per Permit (set and driftnet combined), corrected for inflation.



In summary:

1. The industry has a rich history and has experienced almost continually changing economic conditions and highly variable returns for 120 years.
2. The processing industry has been relatively conservative.
3. The fishery developed under a system of open- and limited-access conditions and a derby-style fishery that rewarded winning the race for fish. This, combined with abundant wealth in the fishery over the last two decades, created the predictable overcapitalization of the fleet now that makes little or no profit. The current limited-access, derby-style fishery in Bristol Bay has long conditioned fishers and processors to operate under a system that rewards fishers for winning the race for fish, often at the expense of others and, ultimately, the entire industry.
4. There has been an often mistrustful or acrimonious relationship between many harvesters and processors.
5. A recent and unprecedented alignment of the highest prices and highest catches ever created the highest income from the fishery in its entire 120-year history.
6. There have been substantial increases in the number of permit holders in the fishery over the last 40 years and dramatic increases in the income per permit holder.
7. There has been a fundamental change in the salmon market that has led to low prices and to Bristol Bay fish representing a much smaller portion of world supply than once was the case.
8. There has been a shift to somewhat lower annual catch in the last few years, although still high relative to much of the historical period.
9. Participants have been accustomed over the last two decades to a much higher return from the fishery than can be expected in the future, especially if nothing is done to lower costs and/or increase prices for Bristol Bay sockeye salmon.
10. There was a resistance or reluctance among many in the industry to change or adapt to changing market conditions.

Looking ahead, these events suggest:

- The chance of several favorable conditions aligning in a similar pattern (the "perfect constellation") in the near future and a return to the "good old days" of the 1980s and early 1990s seems unlikely.
- The industry will likely not support the numbers of participants (harvesters or processors) it once did without at least some sort of significant changes in the cost and/or revenue structure of the fishery.
- A long history of a less-than-harmonious relationship between harvesters and processors may continue to discourage collaboration, cooperation and innovation among those in the industry.

6 Implications of Not Actively Restructuring – the *Status Quo* Option

Possibly the most profound and apparently the easiest decision to make regarding restructuring the fishery is to leave the fishery alone and let market conditions shape the industry by sorting out the high-cost operators from the low-cost operators. We refer to this option as the *status quo* or "the-way-things-currently-are" option. Some see this as the best option because it requires no active effort to change laws, regulations, or ways of operating. However, as described below, we can expect plenty of change in the industry under the *status quo*, but instead of by design, current conditions may force the industry to change in ways that many may want to avoid. A key question to attempt to answer then becomes "Will *change by design* be more beneficial than change forced upon the industry by *doing nothing*?" Before comparing the differences between restructuring options that deliberately change the fishery to the option of doing nothing, we must first characterize the current structure and conditions in the industry. Furthermore, we must quantify how much economic wealth (or net income) is generated each year in the current fishery and compare that to estimates of the wealth generated under various forms of a restructured fishery. If additional wealth from the fishery can be captured through restructuring, it will presumably help to avoid some of the social costs expected under the *status quo*.

This section presents a summary of wealth generated by harvesters and processors under the status quo. The full version of this analysis and material is contained in Appendix F.

6.1 Overview of Participation and Wealth under the Status Quo in the Drift Gillnet Fishery

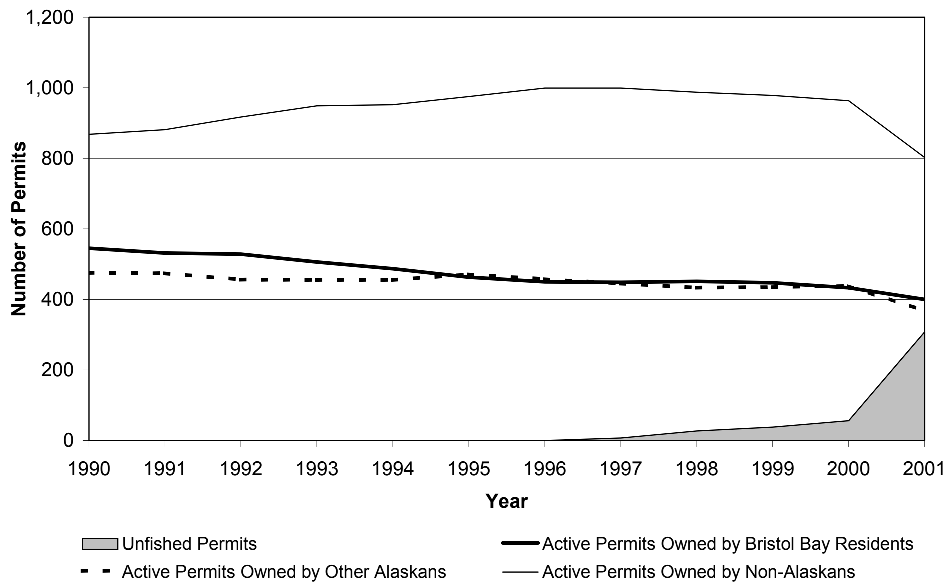
The distribution and activity of Bristol Bay drift gillnet permits are shown in Table 1 and in Figure 9. Figure 9 also shows the number of inactive permits. From 1990-2001, residents of Bristol Bay held 25.5 percent of the active permits, while other Alaskans owned 24.0 percent. The remaining 50.5 percent were owned by non-Alaskans - a distribution that has been relatively stable. Participation has been remarkably stable over the period shown, however in 2001 there were 265 fewer participants than in 2000. In 2002, there were 1,183 active driftnet permits in the Bay.

Table 1 . Permits Fished in the Bristol Bay Drift Gill Net Fisheries by Residence Status, 1990-2001

Years	Local Residents	Other Alaska	Alaska Total	Non-Alaska	Total	Local Residents	Other Alaska	Alaska Total	Non-Alaska
	Number of Permits					Percent of Total			
1990	545	475	1,020	868	1,888	28.9	25.2	54.0	46.0
1991	531	474	1,005	881	1,886	28.2	25.1	53.3	46.7
1992	528	456	984	917	1,901	27.8	24.0	51.8	48.2
1993	506	455	961	949	1,910	26.5	23.8	50.3	49.7
1994	487	455	942	952	1,894	25.7	24.0	49.7	50.3
1995	463	471	934	975	1,909	24.3	24.7	48.9	51.1
1996	450	457	907	999	1,906	23.6	24.0	47.6	52.4
1997	448	445	893	999	1,892	23.7	23.5	47.2	52.8
1998	451	433	884	987	1,871	24.1	23.1	47.2	52.8
1999	447	435	882	978	1,860	24.0	23.4	47.4	52.6
2000	433	438	871	963	1,834	23.6	23.9	47.5	52.5
2001	400	367	767	802	1,569	25.5	23.4	48.9	51.1

Source: CFEC Census Area Reports.

Figure 9. Drift Gillnet Permits Fished in Bristol Bay by Residence, 1990-2001



Source: CFEC Census Area Reports.

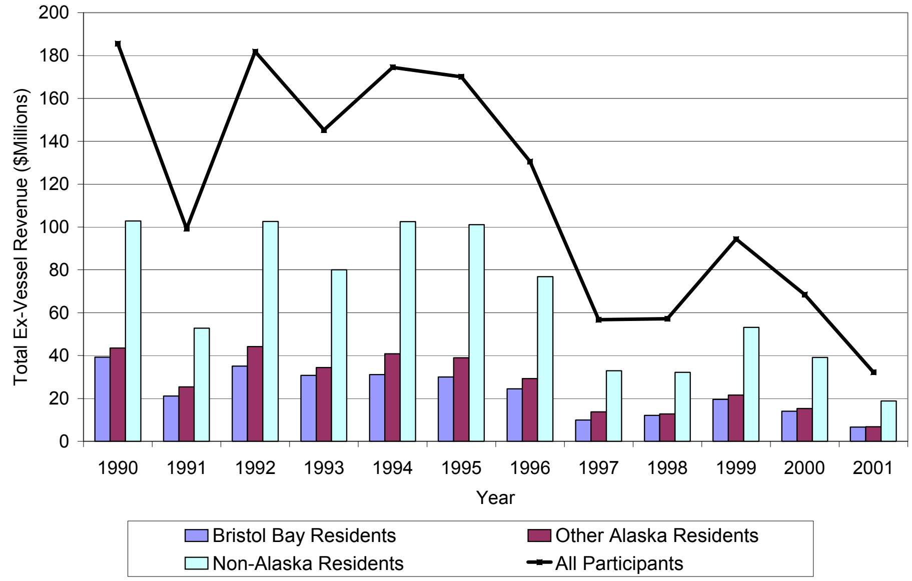
Table 2 and Figure 10 show the total ex-vessel revenues and its distribution by residence in the Bristol Bay drift gillnet fishery from 1990-2001. A significant decline in revenues began in 1997. Average fleet-wide drift gillnet revenue was $155.3 million from 1990-1996 and dropped to $61.8 million from 1997-2001. Gross revenues were estimated at $30.9 million in 2001 - a decline of over 50 percent from 2000. The decline appears to have been evenly distributed among residence groups. Over the 12-year period, Bristol Bay residents earned an average of 19.6 percent of the gross revenues. Other Alaskans averaged 23.4 percent and Non-Alaskans generated 56.9 percent of the total. In recent years, Alaska residents have earned a slightly smaller percent of the total compared to non-Alaskans.

Table 2. Landed Value in the Bristol Bay Drift Gill Net Fisheries by Residence Status, 1990-2001

Years	Local Residents	Other Alaska	Alaska Total	Non-Alaska	Total	Local Residents	Other Alaska	Alaska Total	Non-Alaska
	Landed Value ($Millions)					Percent of Total			
1990	39.26	43.55	82.82	102.80	185.61	21.2	23.5	44.6	55.4
1991	21.10	25.35	46.45	52.76	99.22	21.3	25.5	46.8	53.2
1992	35.04	44.21	79.24	102.63	181.87	19.3	24.3	43.6	56.4
1993	30.82	34.44	65.26	80.00	145.26	21.2	23.7	44.9	55.1
1994	31.14	40.89	72.03	102.46	174.49	17.8	23.4	41.3	58.7
1995	29.99	38.97	68.96	101.14	170.10	17.6	22.9	40.5	59.5
1996	24.47	29.25	53.72	76.82	130.54	18.7	22.4	41.2	58.8
1997	9.98	13.76	23.74	32.96	56.70	17.6	24.3	41.9	58.1
1998	12.12	12.82	24.94	32.25	57.19	21.2	22.4	43.6	56.4
1999	19.59	21.60	41.19	53.16	94.35	20.8	22.9	43.7	56.3
2000	14.10	15.32	29.42	39.09	68.51	20.6	22.4	42.9	57.1
2001	6.06	6.48	12.54	18.39	30.93	20.7	21.0	41.7	58.3

Source: Estimated by Northern Economics from CFEC Census Area Reports. Estimates are adjusted upward to account for confidential information excluded from CFEC reports.

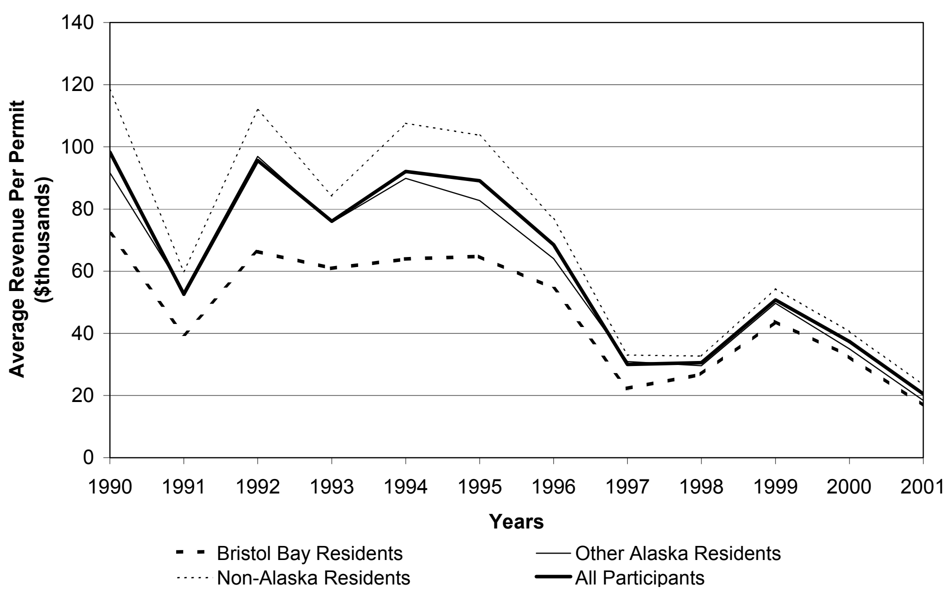
Figure 10. Total Ex-vessel Revenues in Bristol Bay Drift Gillnet Fishery by Residency, 1990-2001



Source: Estimated by Northern Economics from CFEC Census Area Reports. Estimates are adjusted upward to account for confidential information excluded from CFEC reports.

Figure 11 shows average revenue per active driftnet permit from 1990-2001. Throughout the period shown, gross revenue per permit generated by residents of Bristol Bay has been 76 percent ($47,027) of the fleet-wide average ($61,793). Recently (1997-2001), local residents have improved relative to others but still only represent 84 percent of the fleet-wide average. Over the last five years the fleet-wide average per permit has been $33,807, compared to the fleet-wide average from 1990-1996 of $81,766. Throughout the period shown, non-residents have generated an average of $94,685, 14 percent more than the fleet-wide average. In 2001, the average active permit grossed only $20,000.

Figure 11. Average Gross Revenue per Permit by Residency in the Drift Gillnet Fishery, 1990-2001



Source: Estimated by Northern Economics from CFEC Census Area Reports. Estimates are adjusted upward to account for confidential information excluded from CFEC reports.

Cost and net revenue estimates in 2001 were generated for nine classes of permit holders based on the residency of the permit holder and rank (low, medium, high) in terms of gross revenue within the residence class (see Table 3). Cost information were obtained from the 2001 CFEC survey of drift gillnet permits holders. Overall, the 1,566 active driftnet permits in 2001 generated **$3.8 million in net revenues** (excluding debt service) on 80 million pounds of catch. Total gross revenue was estimated at nearly $30.9 million, and total costs were $27.3 million. The average active permit holder in the Bristol Bay drift gillnet fishery is estimated to have earned just $2,316 in 2001 before factoring in opportunity cost. Table 3 also estimates that total income earned by the 4,061 crew and skippers was $9.8 million in 2001.

Table 3. Total Participation, Catch, Revenue and Costs by Class, 2001

	Local Permit Holders			Other Alaska Permit Holders			Non-Alaska Permit Holders			All
Item	LR-Low	LR-Med	LR-High	OA-Low	OA-Med.	OA-High	NA-Low	NA-Med.	NA-High	Permits
Permits Fished	123	146	146	108	137	145	214	268	279	1,566
Total Catch	3,239,789	6,019,502	8,384,923	2,895,560	5,128,869	9,968,756	8,027,734	14,033,473	22,857,796	80,556,401
Total Revenue	1,171,179	2,194,905	3,068,169	1,100,474	1,968,536	3,831,219	3,154,244	5,477,426	8,968,459	30,934,610
Total Cost	1,496,865	1,914,990	2,789,874	1,412,195	1,896,120	2,997,524	3,308,285	4,647,303	6,844,438	27,307,594
Total Net Rev.	-325,687	279,915	278,295	-311,722	72,416	833,695	-154,042	830,123	2,124,021	3,627,016
Crew & Skippers	291	308	404	292	355	392	529	716	774	4,061
Total Income	-19,377	555,457	914,533	-5,083	454,796	1,534,131	517,240	1,907,727	3,984,395	9,843,820

Source: Estimated by Northern Economics, Inc., based on information provided by CFEC in a Special Report in October, 2002.

Table 4 shows high and low estimates of fleet-wide net revenues for the years 1990 – 2001.[27] Because of the inherent uncertainty, the estimates have been rounded to the nearest $1 million. For the fishery as a whole, "hindcast" estimates of net revenue are as high as $143 million in 1990, and have exceeded $100 million in 3 other years between 1990 and 1996. Since 1997, hindcast estimates of net revenues have been significantly lower. Figure 12 plots the average between the low and high estimates of net revenues for resident sub-fleets from 1990-2001, and provides a graphical representation of the decline in net revenues in the fishery.

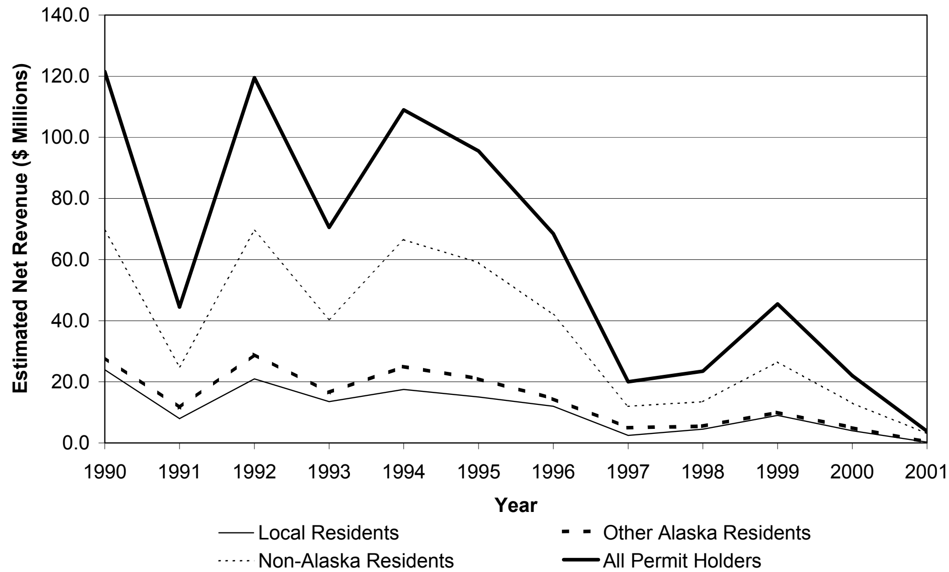
Table 4. Low and High Estimates of Net Revenue in the Drift Gillnet Fishery, 1990-2001

	Local Residents		Other Alaska		Non-Alaska		All Permits	
	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate
Year	Estimated Net Revenue in $ Millions							
1990	20.0	29.0	24.0	33.0	62.0	80.0	105.0	143.0
1991	5.0	12.0	8. 0	16.0	19.0	33.0	32.0	61.0
1992	18.0	26.0	25.0	34.0	62.0	80.0	104.0	140.0
1993	9.0	20.0	11.0	23.0	30.0	54.0	50.0	97.0
1994	14.0	22.0	21.0	31.0	57.0	78.0	92.0	131.0
1995	11.0	20.0	16.0	28.0	48.0	73.0	75.0	122.0
1996	8.0	16.0	11.0	20.0	34.0	53.0	53.0	88.0
1997	1.0	4.0	4.0	7.0	9.0	16.0	15.0	28.0
1998	4.0	6.0	4.0	7.0	11.0	17.0	19.0	30.0
1999	7.0	12.0	8.0	14.0	21.0	33.0	35.0	59.0
2000	2.0	7.0	2.0	8.0	9.0	20.0	13.0	35.0
2001	0.0	0.0	0.3	0.3	3.3	3.3	3.6	3.6

Source Estimated by Northern Economics, Inc.

[27] Estimates are calculated using gross revenues from the year shown and costs that are based on estimates from 2001. The difference between high and low estimates is a result of assumptions used to back-cast costs to earlier years. In the high estimates, it is assumed that annual costs, such as repairs and maintenance, are unchanged from 2001 levels. In the low estimates, it is assumed annual costs increase or decrease depending on gross revenues in the year.

Figure 12. Estimates of Net Revenue from Harvesting in the Bristol Bay Drift Gillnet Fishery, 1990-2001



Source: Estimated by Northern Economics, Inc.

6.2 Details about Set Gillnet Harvesters under the Status Quo

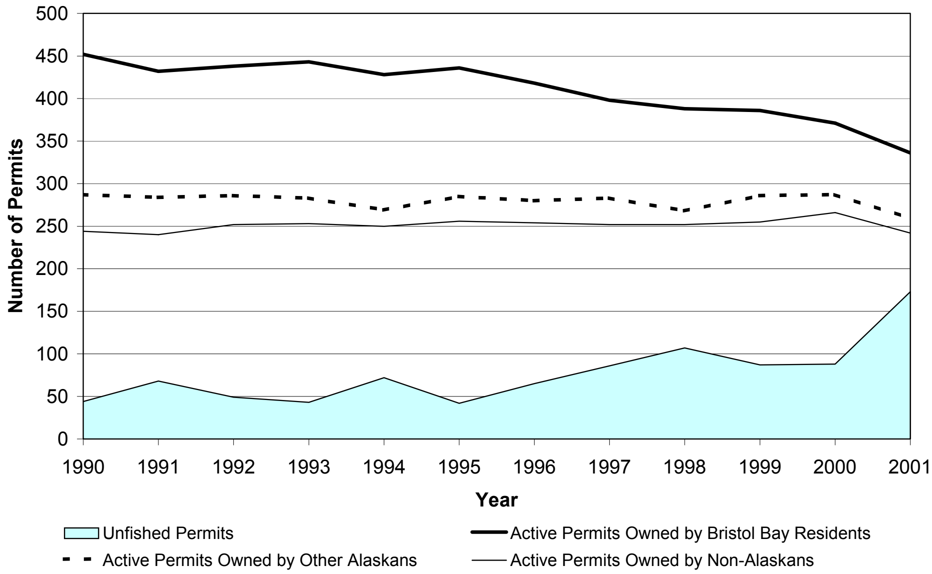
The distribution and activity of Bristol Bay set gillnet permits are shown in Table 5 and in Figure 13. Figure 13 also shows the number of inactive permits. From 1990-2001, residents of Bristol Bay held 43.6 percent of the active permits, while other Alaskans owned 29.7 percent. The remaining 26.7 percent were owned by non-Alaskans. Participation by locals has been declining at a rate of about 9 permits per year, while participation by other Alaskans and non-residents has been relatively stable. The number of inactive permits increased from 65 in 1996 to 173 in 2001. In 2002, approximately 650 set net permits were fished, which translates to over 300 inactive permits.

Table 5. Permits Fished in the Bristol Bay Set Gill Net Fisheries by Residence Status, 1984-2001

Years	Local Residents	Other Alaska	Alaska Total	Non-Alaska	Total	Local Residents	Other Alaska	Alaska Total	Non-Alaska
	Number of Permits					Percent of Total			
1990	452	287	739	244	983	46.0	29.2	75.2	24.8
1991	432	284	716	240	956	45.2	29.7	74.9	25.1
1992	438	286	724	252	976	44.9	29.3	74.2	25.8
1993	443	283	726	253	979	45.3	28.9	74.2	25.8
1994	428	269	697	250	947	45.2	28.4	73.6	26.4
1995	436	285	721	256	977	44.6	29.2	73.8	26.2
1996	418	280	698	254	952	43.9	29.4	73.3	26.7
1997	398	283	681	252	933	42.7	30.3	73.0	27.0
1998	388	268	656	252	908	42.7	29.5	72.2	27.8
1999	386	286	672	255	927	41.6	30.9	72.5	27.5
2000	371	287	658	266	924	40.2	31.1	71.2	28.8
2001	336	259	595	242	837	40.1	30.9	71.1	28.9

Source: CFEC Census Area Reports.

Figure 13. Set Gillnet Permits Fished in Bristol Bay by Residence, 1990-2001



Source: CFEC Census Area Reports.

Gross revenue generated in the Bristol Bay set gillnet fishery by residence is shown in Table 6 and in Figure 14. From 1990-1996, total revenue for the set net fleet declined by an average of $1.1 million per year. For the average active permit holder this translates into a decline of $1,047 per year (5 percent of the average revenue per active permit). As seen in Figure 15, annual revenues per permit have declined from approximately $28,000 in 1990 to just over $10,000 in 2001.

Table 6. Total Landed Value in the Bristol Bay Set Gill Net Fisheries by Residence Status, 1984-2001

Years	Local Residents	Other Alaska	Alaska Total	Non-Alaska	Total	Local Residents	Other Alaska	Alaska Total	Non-Alaska
	Landed Value ($Millions)					Percent of Total			
1990	11.31	8.48	19.80	8.25	28.04	40.3	30.2	70.6	29.4
1991	7.22	4.70	11.92	4.43	16.34	44.1	28.8	72.9	27.1
1992	10.26	8.15	18.41	8.05	26.46	38.8	30.8	69.6	30.4
1993	8.21	6.88	15.09	6.67	21.76	37.7	31.6	69.4	30.6
1994	8.91	7.35	16.26	6.73	23.00	38.7	32.0	70.7	29.3
1995	10.53	7.85	18.38	7.63	26.01	40.5	30.2	70.7	29.3
1996	8.73	6.52	15.25	6.12	21.37	40.9	30.5	71.3	28.7
1997	3.79	4.34	8.13	4.13	12.26	30.9	35.4	66.3	33.7
1998	5.20	4.26	9.46	4.51	13.97	37.2	30.5	67.7	32.3
1999	7.76	7.16	14.91	6.83	21.74	35.7	32.9	68.6	31.4
2000	6.12	5.16	11.28	4.79	16.07	38.1	32.1	70.2	29.8
2001	3.62	2.64	6.26	2.20	8.46	43.3	31.1	74.4	25.6

Source: Estimated by Northern Economics from CFEC Census Area Reports.

Figure 14. Total Ex-vessel Revenues in Bristol Bay Set Gillnet Fishery by Residency, 1990-2001

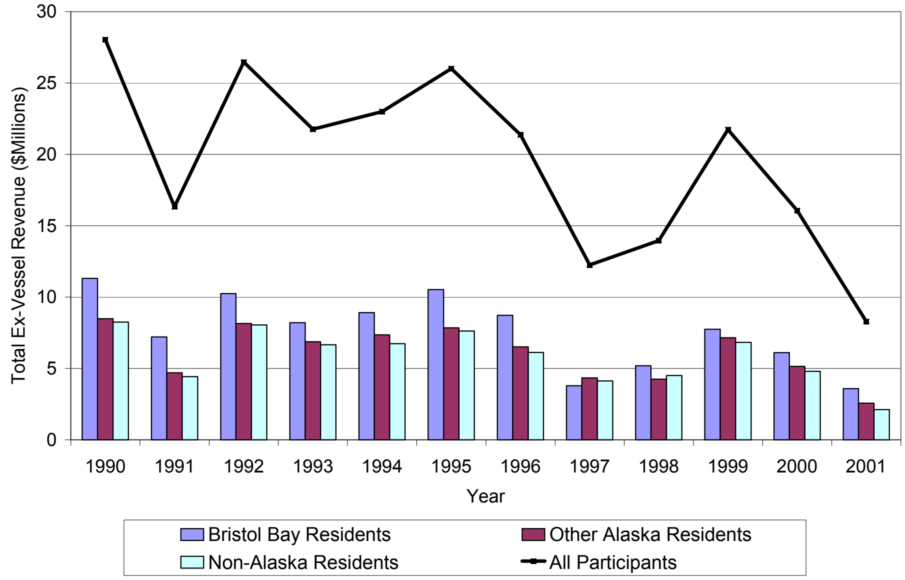
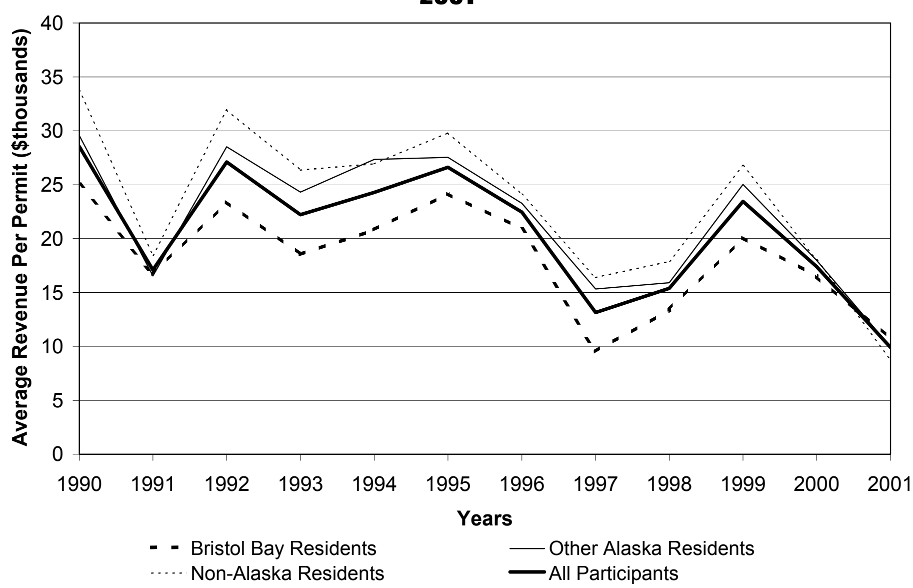


Figure 15. Average Gross Revenue Per Permit by Residency in the Bristol Bay Set Gillnet Fishery, 1990-2001



Source: Estimated by Northern Economics from CFEC Census Area Reports. Estimates are adjusted upward to account for confidential information excluded from CFEC reports.

Operational costs in the set gillnet fishery in 2001 were estimated by Northern Economics, Inc. on the basis of 15 telephone interviews with setnet operators. As with the drift fleet, set net permit holders were divided into 9 classes based on residence and rank in terms of gross revenue. Table 8 provides total catch, gross revenue, total cost, and net revenue for each permit class and for the fishery as a whole. In general, non-Alaska permit holders under-performed other classes, both in total and per permit holder. Overall, the 842 active permits in 2001 generated $3.5 million in net revenues (excluding debt service) on 21 million pounds of catch. Total gross revenue was estimated at nearly $8.5 million, and total costs were $5.0 million. The average active permit holder in the Bristol Bay set gillnet fishery is estimated to have earned just $4,182 in 2001. Table 7 also estimates the total number of crewmembers and permit holders in the set net fishery in 2001 provides an estimate of net income. In general the set net fishery generates less income per crewmember than in the drift fishery because a large portion of set net crew is made up of unpaid family members. In 2001, it is estimated that a total of 2,681 persons were active as crew or permit holder generating incomes of $3.9 million.

Table 7. Total Participation, Catch, Revenue and Costs by Class in the Set Gillnet Fishery, 2001

	Local Permit Holders			Other Alaska Permit Holders			Non-Alaska Permit Holders			All
Item	LR-Low	LR-Med	LR-High	OA-Low	OA-Med.	OA-High	NA-Low	NA-Med.	NA-High	Permits
Permits Fished	78	124	143	56	94	112	53	95	87	842
Total Catch	671,131	2,719,179	5,814,643	478,975	1,875,135	4,232,233	332,502	1,728,163	2,949,613	20,801,574
Total Revenue	272,866	1,090,956	2,352,349	196,082	773,497	1,733,296	137,644	717,495	1,216,651	8,490,836
Total Cost	296,450	637,606	1,012,247	240,881	516,801	821,196	242,345	553,542	648,554	4,969,622
Total Net Rev.	-23,584	453,350	1,340,102	-44,799	256,696	912,101	-104,701	163,953	568,097	3,521,214
Crew & P.Holder	156	372	572	112	282	448	106	285	348	2,681
Total Income	-10,608	505,228	1,451,963	-35,474	293,478	994,524	-98,156	198,072	625,952	3,924,978

Source: Estimated by Northern Economics, Inc., based on information provided by CFEC in a Special Report in October, 2002.

Estimates of the operational costs for 2001 are used in Table 8 to generate estimates of net revenue for previous years. Two sets of estimates are provided—a high estimate and a low estimate. The difference between the high and low estimates is in the treatment of fixed costs. In the high estimate, fixed costs are fixed regardless of the amount of catch or revenue generated. The low estimate of net revenues assumes that fixed costs tend to increase in good years and decrease in poor years. In a year with high catches and high prices, it is more likely that vessel maintenance costs will be higher than in a year characterized by low catches and low prices.[28] Table 8 and Figure 16 show the estimated fleet-wide net revenue from 1990–2001. Because of the inherent uncertainty, the numbers have been rounded to the nearest $1 million. For the fishery as a whole, estimated net revenue was $18-22 million in 1990, but has trended downward since then.

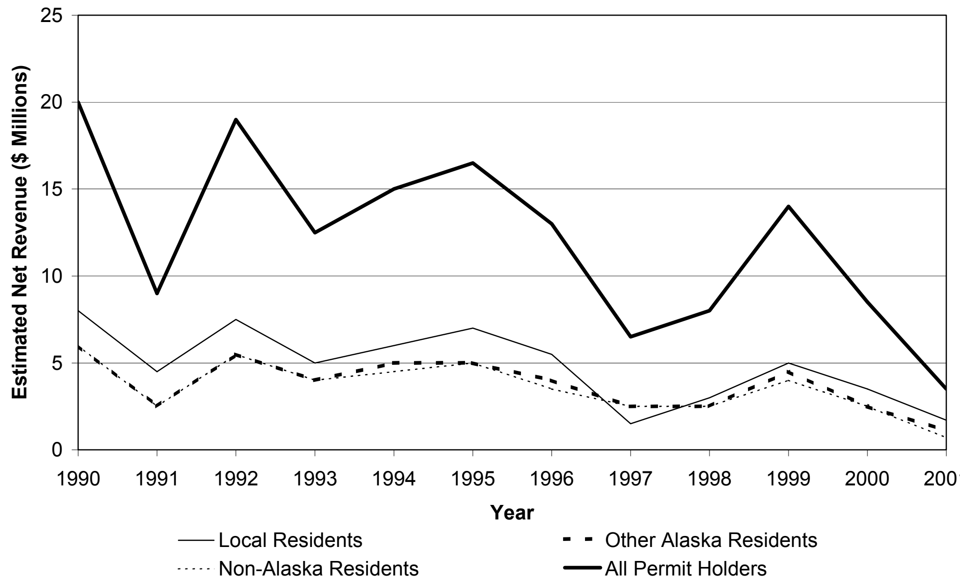
Table 8. Low and High Estimates of Net Revenue in the Set Gillnet Fishery, 1990-2001

	Local Residents		Other Alaska		Non-Alaska		All Permits	
	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate
Year	Estimated Net Revenue in Millions							
1990	7.0	9.0	5.0	7.0	5.0	7.0	18.0	22.0
1991	4.0	5.0	2.0	3.0	2.0	3.0	7.0	11.0
1992	7.0	8.0	5.0	6.0	5.0	6.0	17.0	21.0
1993	4.0	6.0	3.0	5.0	3.0	5.0	10.0	15.0
1994	5.0	7.0	4.0	6.0	4.0	5.0	13.0	17.0
1995	6.0	8.0	4.0	6.0	4.0	6.0	14.0	19.0
1996	5.0	6.0	3.0	5.0	3.0	4.0	11.0	15.0
1997	1.0	2.0	2.0	3.0	2.0	3.0	5.0	8.0
1998	3.0	3.0	2.0	3.0	2.0	3.0	7.0	9.0
1999	4.0	6.0	4.0	5.0	3.0	5.0	12.0	16.0
2000	3.0	4.0	2.0	3.0	2.0	3.0	7.0	10.0
2001	1.7	1.7	1.1	1.1	0.7	0.7	3.5	3.5

Source: Estimated by Northern Economics, Inc.

[28] It can be argued that "discretionary" fixed costs should not be designated as "costs," but rather as "capital accumulation" expenditure, and therefore should be attributed to the overall wealth that is generated in the fishery.

Figure 16. Estimates of Net Revenue from Harvesting in the Bristol Bay Set Gillnet Fishery, 1990-2001



Source: Estimated by Northern Economics, Inc.

6.3 Processing Sector Participation and Wealth under the Status Quo

This section provides an overview of processing of Bristol Bay salmon from 1984-2001. In general, there is less data regarding the activities of processors than the activities of harvesters. This is true primarily because harvesting activities are directly regulated by fishery management agencies, while processing activities are indirectly managed. Philosophically, there is some justification for this relative lack of agency oversight - specifically, harvesters are capturing a public resource, they are in effect privatizing the fish. Once the resource has been removed from the public domain by the harvesters, further government interaction is considered inappropriate within the "laissez-faire" economic system that has developed over time in the US. Data on processing activities are not as systematically studied or verified, and therefore tend to be less accurate. Notwithstanding these caveats, processing data collected by the Alaska Department of Fish and Game (ADF&G) and reported in the Commercial Operators Annual Report (COAR) are presented and discussed in this overview.

According to COAR data shown in Table 9, there were 11 companies with floating processors and 25 companies with shore-based processors participating in the Bristol Bay salmon fishery in 2001.[29] In 2001, processors reported purchasing 90.5 million pounds of Bristol Bay sockeye, at a total ex-vessel value of $38.2 million. For the same year CFEC Census area reports indicate 80.6 million pounds of catch of all salmon species worth an estimated $30.9 million. For all other years at least back through 1990, with the exception of 1992, the COAR data reports greater purchase amounts than CFEC data — on average COAR purchase pounds exceed CFEC pounds by 4 percent and purchase value by 5 percent. This discussion is not intended to be critical of either ADF&G or CFEC, rather the intent is to indicate that the two primary data sets used in this analysis are different and therefore estimates reported in the processor section will vary slightly from estimates reported in harvesting sections.

[29] Due to the nature of the COAR data, there may be some overlap among companies with floating processors and companies with shore-based plants.

Table 9. Participation by Processors in the Bristol Bay Sockeye Salmon Fishery, 1984-2001

	Floating Processors				Shore-based plants				All Processors			
	Companies	Raw Fish Purchases		Wholesale Value	Companies	Raw Fish Purchases		Wholesale Value	Companies	Raw Fish Purchases		Wholesale Value
Year	Number	Lbs-Millions	$ Millions	$ Millions	Number	Lbs-Millions	$ Millions	$ Million	Number*	Lbs-Millions	$ Millions	$ Million
1984	21	37.2	25.7	4.4	20	72	45.7	82.4	21	109.2	71.4	127.8
1985	39	55.8	48.5	71.0	21	59.2	47.4	71	39	114.9	95.9	142.0
1986	24	37.1	53.2	750.1	16	44.3	62.4	70.7	24	81.4	115.6	140.8
1987	21	48.3	68	68.8	13	44.1	61.3	77.7	21	92.3	129.3	146.5
1988	18	36.4	77.4	108.9	17	33.5	69.4	109.1	18	69.8	146.9	218.0
1989	23	72.7	91	136.3	23	83.2	104.6	179	23	155.9	195.6	315.3
1990	23	74.9	84.3	131.1	24	103.9	111.1	133.6	24	178.8	195.3	264.7
1991	21	64.7	49.9	90.5	24	79.3	58.1	121.4	24	144	107.9	211.9
1992	25	89.8	102.2	175.3	18	72.6	80	169.3	25	162.3	182.2	344.6
1993	24	111.1	75.4	140.6	20	118.7	78.3	155.1	24	229.8	153.8	295.7
1994	25	91.8	88.4	152.6	21	94.2	90.4	171.3	25	186	178.7	323.9
1995	24	100	79.7	126.1	21	120.9	90.6	207.3	24	221	170.2	333.4
1996	20	66.2	55.1	109.6	23	105.8	85.3	188	23	172	140.4	297.6
1997	16	26.1	24.3	42.1	22	42.5	37.9	83.5	22	68.6	62.1	125.6
1998	13	16.5	21.3	38.3	18	35.9	42.6	91.8	18	52.4	63.8	130.1
1999	14	39.1	32.7	70.1	21	79.6	67.3	132.1	21	118.6	100	202.2
2000	14	30.8	21.5	49.2	31	83.4	54.8	130.6	31	114.2	76.2	179.8
2001	11	23.6	10.4	31.7	25	66.8	27.8	90.4	25	90.5	38.2	122.1

Source: Estimated by Northern Economics, Inc. from ADF&G Commercial Operators Annual Report (COAR), 2002.
Note: The total of processing companies was not available because of possible double counting. The number of processors listed in the table is the higher of either the shore-based or floating processor companies. Revenues are adjusted by a US Seafood Producer Price Index, using 2000 as a base year.

Operational models of floating and shore-based processors were developed by Northern Economics, Inc. based on interviews with processors. The models assume that all processors in the region can be represented by a "typical" floating processor or by a typical shore-based plant. Table 10 shows the results of the models used to generate operational estimates of processing wealth. Based on the model results, it is estimated that wealth (or contribution to owners) generated by processors in the Bristol Bay Salmon fishery was $14.2 million in 2001. The model results indicate that total revenues by both sectors was $119.6 million, variable processing costs were $26.8 million, overhead costs were $19.4 million, and the cost of raw fish was $59.2 million. As shown in Figure 10, the cost of raw fish was the largest component of processing costs in Bristol Bay in 2001. Shore-based plants are estimated to spend 50 percent of their total expenditures to obtain raw product, while floaters spend slightly less (47 percent). Floating processors currently devote a higher share of expenditure to cover overhead than shore-based processors, but this may be in part due to low harvest levels in the *opilio* tanner crab fishery. The contribution to margin for floaters is nearly equal to shore-based processors on a percentage basis - 11 percent for floaters and 12 percent for shore-based plants.

Table 10. Summary of Model-Based Estimates of Processor Wealth, 2001

	Units	Floating Processors	Shore Plants	All Processors
Facilities	Number	5	7	12
Pounds Purchased	Millions of Lbs.	23.6	66.2	89.8
Pounds Produced	Millions of Lbs.	18.9	50.8	69.7
Wholesale Value	$ Millions	31.4	88.1	119.6
Variable Processing Cost	$ Millions	6.5	20.3	26.8
Overhead Cost	$ Millions	6.5	12.9	19.4
Cost of Raw Fish	$ Millions	15.0	44.2	59.2
Contribution to Owners	$ Millions	3.5	10.7	14.2

Note: This estimate does not include estimates of the opportunity cost of capital and labor.

Figure 17. Comparison of Cost Components of Floating and Shore-based processors, 2001

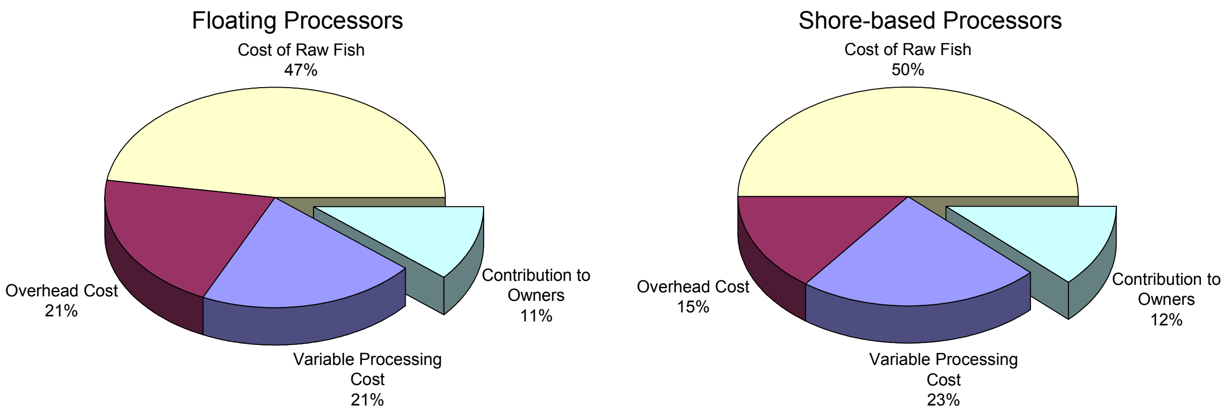


Table 11 shows hindcast estimates of processing costs and wealth generation (contribution to owners) from 1990-2001. Estimates for years prior to 2001 are based on costs developed for the 2001 fishery, and assume that overhead costs per facility remain constant, but that the number of active facility increases or decreases based on catches in earlier years. These hindcast estimates of processing costs and wealth generation by processors indicate that for processors, the early part of the period (1990-1996) was not as disproportionately lucrative as it was for harvesters. Figure 18 provides a graphical representation of the historical estimates of wealth generation by processors.

Trends in net revenues (or contributions to owners as defined in this analysis) of processors appear to have followed a somewhat different pattern than the trends seen in the harvest sector. As shown in Table 11, the early part of the 1990s do not appear to have been as lucrative for processors as they were for harvesters. It is estimated that in 1990, when harvesting wealth generation was at it highest during the period shown, the processing sector as a whole lost money ($10.0 million). Floating processors are estimated to have had a very profitable year (due largely to high catches and earning in the *opilio* crab fishery[30]), while the shore-based plants are estimated to have had a disastrous year with losses estimated at over $40 million. Estimated contributions to owners (wealth) improved dramatically for the processing sector as a whole in 1991 and 1992, and then dropped back down in 1993. These big swings appear primarily due to differences in amounts paid for raw products (ex-vessel and tendering costs) compared to values received for products. During the period 1990-1996, the three worst years in terms of net revenues for processors correspond to years in which total catches are the highest. During the latter part of the period shown, contributions to owners for the processing sector appear to be much less volatile than in the earlier part of the decade.

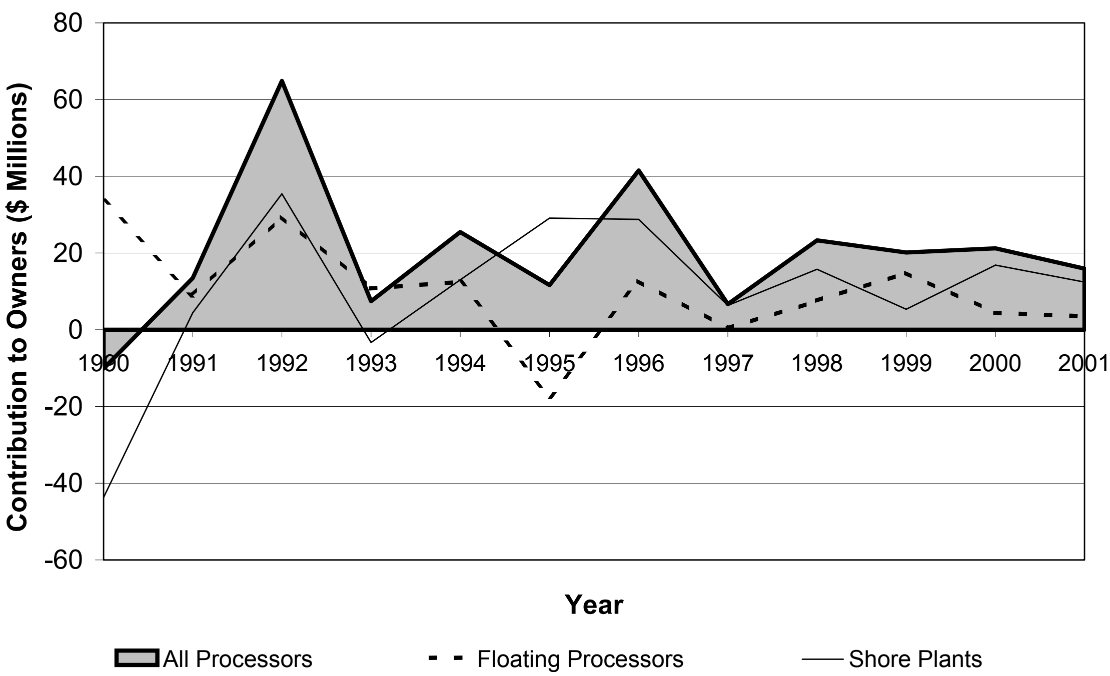
[30] As discussed in detail later, floating processors are highly dependent fisheries other than the Bristol Bay Salomon fishery. In particular, floating processors depend on the *opilio* tanner crab fishery during the winter and spring to cover a significant portion of their fixed costs. If the *opilio* fishery is at low levels, more of the overhead costs must be borne by the salmon fishery leading to lower net revenues.

Table 11. Historical Contributions to Owners from the Bristol Bay Salmon Processing Sector, 1990-2001

	Floating Processors				Shore-based Processors				All Processors			
Year	Raw Product Cost	Production Cost	Total Overhead Cost	Contribution to Owners	Raw Product Cost	Production Cost	Total Overhead Cost	Contribution to Owners	Raw Product Cost	Production Cost	Total Overhead Cost	Contribution to Owners
	$ Millions				$ Millions				$ Millions			
1990	68.0	21.0	0.5	8.0	130.0	32.0	2.0	18.0	199.0	53.0	1.0	27.0
1991	59.0	18.0	0.3	4.0	77.0	24.0	2.0	18.0	136.0	42.0	1.0	23.0
1992	115.0	25.0	0.3	6.0	97.0	22.0	2.0	17.0	213.0	47.0	1.0	22.0
1993	91.0	31.0	0.4	8.0	105.0	36.0	2.0	20.0	196.0	67.0	1.0	29.0
1994	103.0	25.0	0.6	12.0	114.0	29.0	2.0	18.0	217.0	54.0	1.0	30.0
1995	99.0	28.0	0.9	17.0	124.0	37.0	2.0	20.0	223.0	65.0	1.0	37.0
1996	64.0	18.0	0.9	14.0	110.0	32.0	2.0	20.0	174.0	51.0	1.0	34.0
1997	29.0	7.0	0.7	6.0	49.0	13.0	2.0	17.0	77.0	20.0	1.0	23.0
1998	24.0	5.0	0.4	2.0	51.0	11.0	2.0	15.0	75.0	16.0	1.0	17.0
1999	40.0	11.0	0.5	4.0	90.0	24.0	2.0	15.0	130.0	35.0	1.0	19.0
2000	27.0	9.0	1.3	9.0	78.0	26.0	2.0	13.0	105.0	34.0	2.0	22.0
2001	15.0	6.5	1.3	6.5	47.0	20.0	2.0	13.0	61.5	26.8	1.6	19.4

Source: Estimated by Northern Economics, Inc.
Note: Estimates of costs and contributions to owners rely on survey data from a limited number of industry participants and should not necessarily be considered factual. Estimates of overhead costs do not included overhead costs of plants that are not active in the fishery during a given year.

Figure 18. Estimated Contribution to Owners from the Bristol Bay Salmon Processing Sector, 1990-2001



Source: Estimated by Northern Economics, Inc.
Note: Estimates of costs and contributions to owners rely on survey data from a limited number of industry participants and should not necessarily be considered factual. Estimates of overhead costs do not included overhead costs of plants that are not active in the fishery during a given year.

6.4 Summary of Estimates of Wealth under the Status Quo

The previous two sections provided estimates of total net revenues (or contributions to owners) earned in the Bristol Bay salmon fishery by harvesters and processors. The total contribution to owners is a direct estimate of the total amount of wealth generated in the fishery. Table 12 summarizes the estimated wealth generated by the harvesting sector and the processing sectors and combines the two for an estimate of the total wealth derived from the Bristol Bay salmon fishery from 1990-2001. The peak year for all sectors combined was 1992 with over $204 million in wealth. The peak year generated 9 times more wealth than the $21 million generated in 2001. It is very clear that during the period from 1990-1996 both harvesters and processors were better off than during the more recent period from 1997-2001. During the early period, it is estimated that an average of $127 million was generated annually from fishing and processing, compared to just $48 million per year from 1997-2001.

Table 12. Total Contribution to Owners by Sector from the Bristol Bay Salmon Fishery, 1990-2001

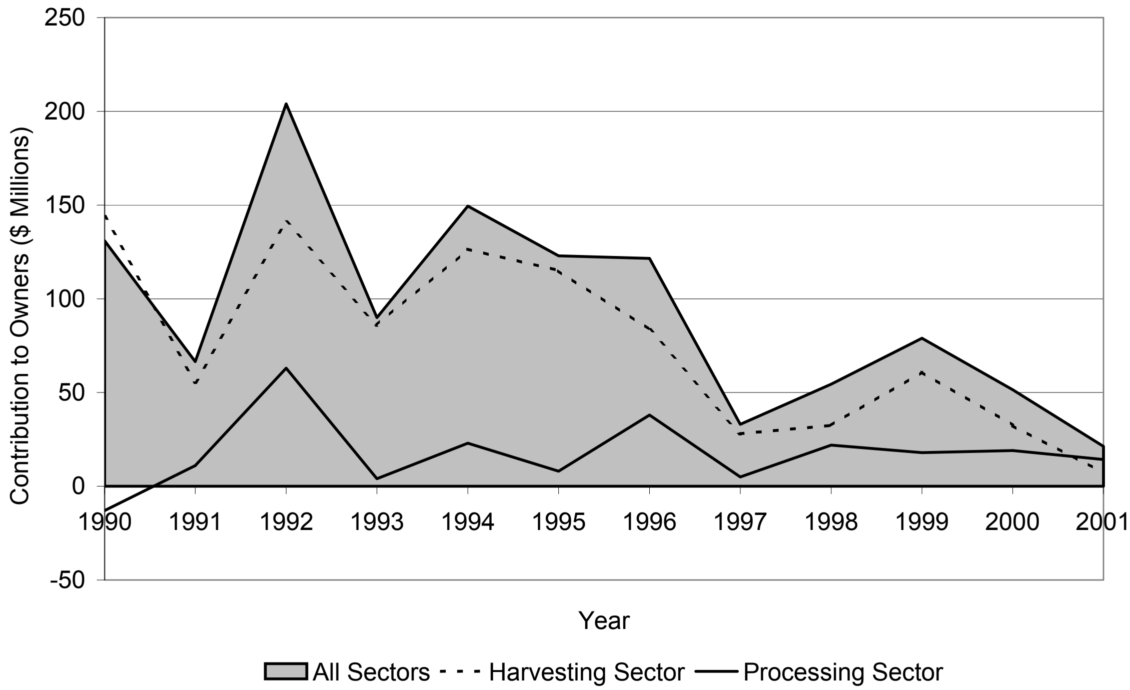
	Harvesting Sector Wealth			Processing Sector Wealth			Total Wealth
Year	Set Gillnet	Drift Gillnet	All Harvesters	Floating	Shore-Based	All Processors	All Sectors
1990	20.0	124.0	144.0	34.0	-47.0	-13.0	131.0
1991	9.0	46.5	55.5	9.0	2.0	11.0	66.5
1992	19.0	122.0	141.0	29.0	33.0	63.0	204.0
1993	12.5	73.5	86.0	11.0	-7.0	4.0	90.0
1994	15.0	111.5	126.5	12.0	10.0	23.0	149.5
1995	16.5	98.5	115.0	-17.0	26.0	8.0	123.0
1996	13.0	70.5	83.5	13.0	26.0	38.0	121.5
1997	6.5	21.5	28.0	0.0	5.0	5.0	33.0
1998	8.0	24.5	32.5	8.0	15.0	22.0	54.5
1999	14.0	47.0	61.0	15.0	3.0	18.0	79.0
2000	8.5	24.0	32.5	4.0	14.0	19.0	51.5
2001	3.5	3.6	7.1	3.5	10.7	14.2	21.3

Source: Estimated by Northern Economics, Inc.

Figure 19 depicts the estimated total contribution to owners in the harvesting and processing sectors. Through 2000, wealth generated by harvesters has been a much larger component of total wealth generated in the fishery. In fact, 2001 was the first year during the period that the estimated wealth generated by processors exceeded the wealth generated by harvesters.

While the preceding discussion may lead to the impression that wealth generation in the Bristol Bay salmon fishery is a zero-sum game, the analytical team concludes that wealth generation is a shared process with both harvesters and processors contributing to the size of the total pie. In recent years the total amount of wealth generated in the fishery has declined, but with changes in the way the fishery is conducted, it is possible that the pie can be made larger, and if total wealth increases then it is likely that both harvesters and processors will be better off.

Figure 19. Total Contribution to Owners by Sector from the Bristol Bay Salmon Fishery, 1990-2001



Source: Estimated by Northern Economics, Inc.

6.5 The Future under the Status Quo

The status quo option, by definition, assumes there are no changes made to the way the fishery is managed, but does not mean that the fishery does not experience changes. Indeed the fishery is likely to continue to change in response to changing external factors. Some of the more significant external factors expected to affect the rate of change include:

- Demand for wild Alaska salmon
- Supply of farmed salmon
- Monetary exchange rates, in particular the Dollar, Yen, the Euro, and the Chilean Peso
- Ocean and freshwater habitat conditions
- Global economic climate
- Producer prices index (a measure of inflation in production inputs)
- Domestic interest rates

The first five bullets refer to things that will directly affect prices or run sizes for Bristol Bay salmon and therefore directly affect the gross revenue that can be attained from the fishery. The last three bullets refer to things that will directly affect the cost of harvesting and processing Bristol Bay salmon. The direction of the net effect of these factors can have a significant effect on the fishery. The following sections address potential changes in the fishery under two different scenarios created by the combination of the external factors listed above: 1) increasing net revenues, and 2) constant or declining net revenues.

6.5.1 Increasing Net Revenues

If the status quo fishery experiences significant gains in net revenue, due either to increasing prices or decreasing costs then it is possible that the fishery could return to a state of relative prosperity. However, increases in net revenues would have to be significant enough to accommodate the 350 drift net vessels that did not participate in 2001, and the 600+ vessels that did not participate in 2002. If we assume that costs in the fishery stayed relatively constant over the last two years, it would take an increase in net revenues of over 20 percent from the 2001 fishery to get the entire fleet of 1,888 permit holders up to an average of $2,316 in net revenues—the average net revenue estimated in 2001. Similarly, it would take an increase of well over 50 percent in fleet-wide net revenues over 2002 to accommodate the entire fleet at projected net revenues from last year.

This means that if total salmon return increased by 20 percent from 80 million pounds in 2001 to 100 million pounds and all permits holders returned to the fishery, then the average active permit holder would be no better of than they were in 2001. In order to attained estimated net revenues seen in 1999—the last "decent" year in Bristol Bay—total revenues would have to increase by over 320 percent from 2001 levels.

While it is not unimaginable that run and prices could increase by 320 percent such that total revenue was equal to 1999 levels, it is clear that the current high number of latent vessels means that real improvement in financial viability will result only if net revenue increase dramatically.

6.5.2 Constant or Declining Net Revenues

If prices and fish returns stay relatively constant, then there may be a tendency to think that at least for permit holders that were active in the last few years net revenues will remain constant. However, the large number of latent vessels and permit holders in the fishery may mean that currently active permit holders will face increasing competitive pressures just to remain at the current level of financial viability.

Permit and vessel owners that are currently inactive, as well as some active participants may not be able to continue without facing financial insolvency. If existing owners sell out to new participants, then new participants may have significantly lower capital costs than existing owners—this is particularly true with current low interest rates. If new participants enter the fishery, they may be more willing and more able to accept lower ex-vessel prices. If new owners are willing to fish at lower prices than others have in the past, then prices for all participants may fall. Lower prices may force owners that were marginally profitable under current prices into financial insolvency. If these vessel and permit holders are forced to sell out, then new participants may have even lower capital costs and the cycle known as a debt spiral could continue. A debt spiral is a situation where financial insolvency leads to lower capital cost for new entries, which leads to increasing downward price pressure, which can lead to lead to lower net revenues for current participants and additional insolvencies.

Similar situations can occur as processors exit the fishery and sell out to new owners. The new owners are likely to have lower capital cost (particularly if opportunity costs are factored in) and are not likely to have the same ties to harvesters or to communities in the region. Lower capital costs and the lack of long-time ties to current participants may make it easier for new processors to reduce prices and to demand changes in harvesting and delivery standards. These changes could force current participants out of the fishery if they are unable to adapt to the new standards and practices (for example, by adding chilling systems to increase quality).

6.5.2.1 Potential Future Impacts Resulting from Exit of Wards Cove, Inc. from Bristol Bay

In early 2003, Wards Cove, Inc. announced that it would be pulling out of the salmon processing industry. Over the years, Wards Cove, Inc. has operated three processing facilities in Bristol Bay, including a plant in South Naknek, the "Red Salmon" plant in Naknek and the cannery at Ekuk. The plant in South Naknek has been idle the last few years but the plant in Naknek has operated through 2002 and the one in Ekuk through 2001. According to the Alaska Daily News (March 11, 2003), the Red Salmon Plant has been sold to Yard Arm Knot, Inc. who indicated that they plan to operate the facility in 2003. According to industry sources, no prospective buyers are apparent for the other two facilities.

If the facility in Ekuk does not operate in the future, then it appears that setnet operators at Ekuk, Clarks Point and across Nushagak Bay on the Igushik River (primarily residents of Manokotak) may be without a buyer of their fish.[31] In 2001, setnet operators from these communities generated nearly $367,000 in revenues, and over the last 10 years have averaged approximately 6 percent of total setnet revenues in Bristol Bay (CFEC Census Data Files). Without a buyer for their salmon, the 404 residents of Manokotak face a very uncertain future.

Regardless of whether a buyer for setnet operators at the mouth of the Nushagak River is found, it is unlikely that the closure of the plant at Ekuk will mean lower overall harvests. Other fishers will no doubt be able to catch any fish that are not harvested by lower river setnet operators.

[31] Trident Seafoods, Inc. owns a facility at Clark's Point but they indicate they will not be operating that facility in 2003 (Benson, Dave, Trident Seafoods. Personal Communication. March 11, 2003).

7 Potential Sources of Wealth Currently Foregone in the Bristol Bay Salmon Fishery

Addressing the question of how much wealth is being wasted or foregone under current arrangements in Bristol Bay can be approached by answering another question: what would a decision maker with full ability to do whatever he/she wished with the fishery do in order to generate new wealth? More specifically, if one were able to fully control and coordinate the whole system from harvest through handling and processing and finally to marketing, what could be done, and how much surplus might be appropriated? In the final analysis, this is a good perspective from which to judge the kinds of restructuring options that the Bristol Bay industry ought to choose to adopt. We have posed this question to a number of knowledgeable industry participants at various levels of the process. We summarize in this section insights and knowledge that we have uncovered, together with some rough estimates of the amount of wealth generation that is possible through restructuring.

From the public input stage, including one-on-one interviews the study team held with individuals from industry, and from looking at experiences from elsewhere in Alaska and around the world, we identified six ways to capture new wealth from the Bristol Bay salmon fishery:

1. Reduce excess fishing capacity.
2. Spread out harvesting across time.
3. Explore alternative harvesting methods.
4. Improve product quality.
5. Market the harvest more/better.
6. Reduce or eliminate the race for fish.

This list encapsulates the significant sources of wealth in the Bristol Bay salmon fishery that may be captured through restructuring efforts. Substantial debate, deliberation and analysis went into arriving at this list and in this section we summarize attempts to quantify how much wealth each action might create.

None of these actions have been experimented with to any great extent in Bristol Bay, so our estimates of potential wealth that might be generated with them are somewhat speculative, but useful nonetheless. In addition to little direct experience with these actions making it difficult to estimate wealth, several of these activities are interrelated and as a result, partitioning the amount of wealth from each is difficult. For example, the return from marketing programs will be much better if the quality of the product is better than it is now. Eliminating the race for fish will likely result in significant improvements to quality (as will reducing excess fishing capacity) and this will make marketing programs more worthwhile than under current conditions.

In order to determine which "mountains" of wealth are most promising and warrant further exploration, we tried to *roughly* estimate their height. The exercise focused on how much wealth these actions might create and does not delve into specifically what they might look like if implemented in the Bay. The design of specific restructuring options and how they might be implemented in Bristol Bay are discussed in the following section (Analysis of Specific Ways to Capture Wealth in the Bristol Bay Salmon Fishery).

7.1 Assessment of Potential Wealth Sources

7.1.1 Reduce Excess Fishing Capacity

There was a consensus among everyone we consulted that there is far more fishing capacity in the Bristol Bay salmon fishery than is needed to harvest the annual catch. Even at levels near the 1,200 drift net permits active in 2002, most felt that there was excess harvesting capacity in the fishery and that reducing current capacity could create new wealth in the fishery by dramatically lowering overall harvesting costs and to a lesser extent, tendering and processing costs. Reducing excess fishing capacity may also increase revenue from the harvest by improving product quality.

Does empirical data support the assertion that there is far more fishing effort in the fishery than is needed? Many involved in the harvesting and processing sectors of the fishery asserted quite strongly to us that between 500 and 1,000 driftnet boats and a few hundred setnet operations could easily capture the annual catch. Some have countered that this is speculative, as there has not been this few harvesters in the fishery since the 1940s, 50s and 60s, rules of the game have changed and runs are typically bigger today than they were then. However, the people making the claims of how little fishing capacity is needed are still very knowledgeable and their educated guesses are based on many years of observations on the fishing grounds. In addition, there *is* some empirical evidence to ballpark the amount of fishing effort needed to catch the available surpluses each year. Probably the most convincing evidence is the fact that the first 4 or 5 decades of the 20th century saw an average of about 1,000 *sailboats* and a few hundred setnet operations harvest between 5 and 25 million fish annually (average ~15 million). Compare these sailboats to today's fleet of vessels in the fishery and one cannot help but conclude that a fleet of 500 to 1,000 driftnet boats and 300 to 500 setnet operations, all with powered boats and modern fishing gear, would be sufficient.

We will describe different methods of how the fishing capacity in Bristol Bay might be reduced (e.g., permit stacking, permit buyback) later in the report (see section: Analysis of Specific Ways to Capture Wealth in the Bristol Bay Salmon Fishery). In this section we look at a permit buyback program as an example to roughly quantify the amount of wealth that could be captured or "saved" with substantially fewer permit holders in the fishery. How much wealth might be created if the number of permitted driftnet vessels were reduced to 1,000? The majority of wealth that would be created from any significant reduction in the amount of fishing capacity will come from the savings by maintaining, insuring and operating less fishing equipment (labor and supplies). An additional amount of savings could be captured from reduced harvesting costs associated with less crowding (and competition) on the fishing grounds and an accompanying improvement in the quality of catch that could be expected with less congestion on the fishing grounds.

7.1.1.1 Estimates of Potential Wealth Created by a Vessel Buyback in the Bristol Bay Drift Gillnet Salmon Fishery

There is considerable uncertainty surrounding estimates of wealth generated in a post-buyback fishery. For example, it is unknown which vessel owners will choose to participate, and it is not known how much it will cost to convince owners to sell their permits. It is also not known whether locally owned boats will sell their permits at the same rate as non-local owners. Again, for illustrative purposes only, we structured an analysis of the buyback assuming that 877 permits would be bought, and that all permits that were not active in 2001 would be among the permits that are bought out. Additionally we assumed that the distribution of remaining vessels would be in proportion to the existing distribution of the active fleet in terms of residence and catch. The principal buyback assumptions are shown in Table 13. The first part of the table shows the existing distribution of Bristol

Bay drift gillnet permits. The second section shows the distribution of permits that are assumed sold during the buyback program. The third section shows the assumed distribution of permits after the buyback. In general, the distribution of permits by residence remains approximately the same.

Table 13. Distribution of Permits before a Buyback and the Assumed Distribution after a Buyback

	Residents of Bristol Bay	Other Alaska Residents	Non-Alaska Residents	All Permit Holders
Distribution of Permits in 2001				
Permits Held in 2001	471	478	928	1,877
Active in 2001	415	390	761	1,566
Percent of Permits Active in 2001	26.5	24.9	48.6	100.0
Permits Assumed to be Purchased in a Buyback Program				
Inactive in 2001	56	88	167	311
Other Permits Sold	150	141	275	566
Total Permits Sold	206	229	442	877
Percent of Permits Sold	23.5	26.1	50.4	100.0
Permits Remaining After a Buyback Program				
Remaining Permits	265	249	486	1,000
Percent of Remaining Permits	26.5	24.9	48.6	100.0

Based on input from managers and those in the industry, several other assumptions were made to estimate the impacts of a buyback on the wealth in the fishery.

- The post-buyback fleet will have the physical capacity to harvest the amount of salmon available regardless of the number and types of vessels removed from the fleet. In other words, we do not attempt to determine the actual harvesting capacity of the remaining fleet, but assume that it can handle the size of runs returning to Bristol Bay.
- Vessels remaining in the fleet after the buyback harvest the same amount relative to other remaining vessels. In other words, if a smaller vessel typically harvested 50 percent as much as a larger vessel in the pre-buyback fishery, after the buyback it continues to harvest 50 percent as much as the larger vessel.
- Crew payments and raw fish taxes are assumed to increase proportional to changes or revenue resulting from the buyback. Fuel and net repairs are assumed to increase proportionally to catch after the buyback. All other cost components (fixed costs) are assumed unchanged from pre-buyback estimates.
- All costs of vessels removed during the buyback are no longer associated with the fishery.
- Catch and ex-vessel revenue in the post-buyback fishery are based on the 2001 fishery.

Three options for financing the buyback are considered and estimates under each scenario were developed:

1. Government funds the entire buyback
2. Industry funds the entire buyback with a low-interest 20-year loan from the government[32]

[32] Low interest government loans are available for vessel buybacks meeting criteria explained in federal code at 50 CFR Part 600. Subpart L. The loans would have a fixed interest rate equal to 2 percent over the yield on Treasury bonds with the same maturity. For example, if there were a loan for 20 years in 2003, the interest rate would be equal to rates for bonds Treasuries maturing in 2023 plus 2 percent. As of March 7, 2003 the 20-year rate plus 2 percent would be 6.67 percent.

3. Government funds 50 percent of the buyback with grant and industry funds 50 percent with a low-interest 20-year loan from the government.

Table 14 uses the assumptions specified above to estimate the economic performance in the fishery after a government-funded buyback of 877 driftnet permits—leaving 1,000 in the fishery. Note that the total catch and total revenue in the fishery are identical to estimates used in the status quo. Costs in the post-buyback fishery are considerably lower - primarily due the lower fixed costs of the remaining fleet - and therefore net revenue for the fishery increases to $9.8 million. This estimate of *wealth in the post-buyback fishery is 2.7 times the wealth estimated in the 2001* fishery. Total income to crewmembers, skippers, and owners in the fishery increases from $9.8 million under the status quo to $16.0 million, an increase of 160 percent. Under a buyback with 1,000 vessels remaining in the fishery, the total number crew and skippers in the fishery drops to 2,593, down from 4,061 under the *status quo* conditions.

Table 14. Permits Fished, Catch, Costs and Revenues after a Government-funded buyback

	265 Local Permit Holders			249 Other Alaska Permit Holders			486 Non-Alaska Permit Holders			All
Item	**LR-Low**	**LR-Med**	**LR-High**	**OA-Low**	**OA-Med.**	**OA-High**	**NA-Low**	**NA-Med.**	**NA-High**	**Permits**
Permits Fished	79	93	93	69	87	93	137	171	178	1,000
Total Catch	3,239,789	6,019,502	8,384,923	2,895,560	5,128,869	9,968,756	8,027,734	14,033,473	22,857,796	80,556,401
Total Revenue	1,171,179	2,194,905	3,068,169	1,100,474	1,968,536	3,831,219	3,154,244	5,477,426	8,968,459	30,934,610
Total Cost	1,151,255	1,444,633	2,181,225	1,087,311	1,447,575	2,321,557	2,509,392	3,567,780	5,409,882	21,120,611
Total Net Rev.	**19,924**	**750,272**	**886,944**	**13,163**	**520,961**	**1,509,661**	**644,852**	**1,909,646**	**3,558,577**	**9,814,000**
Crew and P.Holder	186	197	258	186	226	251	338	458	494	2,593
Total Income	326,234	1,025,814	1,523,182	319,801	903,341	2,210,097	1,316,133	2,987,249	5,418,951	16,030,803

Under an assumption that government funds the buyback entirely, none of the costs of the buyback are paid by fishers. In Table 14, none of the costs of the buyback are included, just as the costs incurred by ADF&G in managing the fishery are not shown. However, if we assume that industry will have to fund at least some of the buyback it becomes necessary to estimate the cost of buying back permits. Many factors will influence the amount that a current permit holder is willing to accept to sell his permit, including:

1. Expected earnings from the fishery in the future
2. Other income generating potential of the permit holder
3. How close the permit holder is to retiring
4. Whether or not the permit holder wishes pass on the permit to children

The factors listed above are subjective and not necessarily conducive to analysis. However, there are two indicators that provide an estimate of the willingness to sell - the current trading price of drift gillnet permits (approximately $20,000), and estimates developed by the CFEC in their optimal number's study (approximately $50,000). Our analysis assumes the higher estimate developed by the CFEC from survey responses—if the fishery is better off with an expensive buyback than under the status quo, then it is certainly better off with a less expensive buyback. Table 15 shows estimates of the cost of the buyback if 877 permits are purchased at an average cost of $50,000 per permit. The total cost of the buyback is estimated at $43.9 million. If the buyback is funded by industry using a low-interest (4.5% is assumed) 20-year loan from government then the annual payment from industry is estimated to be $3.4 million. If government and industry split the cost of the buyback with 50 percent of the buyback covered by a government grant, then industry would be required to pay $1.7 million annually for 20 years. In either case the fishery is still appears to be significantly better off in the first years after a buyback assuming returns and prices similar to those seen in 2001.

Table 15. Estimated Net Revenue with a 1,000 Permit Fishery under Various Buyback Financing Assumptions

Scenario	100 Percent Government Financed	50 Percent Industry Financed $ Millions	100 Percent Industry Financed
Buyback Amount	43.9	43.9	43.9
Grant Amount	43.9	21.9	0.0
Annual Loan Payment	0.0	1.7	3.4
Fleet Net Revenue	**9.8**	**8.1**	**6.4**

Note: Assumes that 877 permits are purchased and the average cost to buyback a permit is $50,000.

Table 16 is very similar to Table 15 except that 1,377 permits are bought back at $50,000 leaving 500 permits in the post-buyback fishery. Total cost of the buyback is $68.9 million and annual loan payments required of industry to pay back the low-interest loan would be $5.3 million with no government funding, or half that amount ($2.6 million) with 50 percent of the funding with a government grant. Initially, annual net revenue in the post-buyback fishery is estimated at $15.3 million if funding for the buyback is totally government funded. If the buyback is totally industry funded with low-interest loan, initial annual revenue drops to $10.0 million.

Table 16. Estimated Net Revenue with a 500 Permit Fishery under Various Buyback Financing Assumptions

Scenario	100 Percent Government Financed	50 Percent Industry Financed $ Millions	100 Percent Industry Financed
Buyback Amount	68.9	68.9	68.9
Grant Amount	68.9	26.7	0.0
Annual Loan Payment	0.0	2.6	5.3
Fleet Net Revenue	15.3	12.6	10.0

Note: Assumes that 1,377 permits are purchased and the average cost to buyback a permit is $50,000.

As indicated earlier, Table 15 and Table 16 show the estimated net revenue assuming permits are obtained at an average price of $50,000 per permit. Unfortunately, it is not known whether or how much government funding will be available, nor is it known what the average purchase price of permit might be. Table 17 shows the purchasing power of various funding levels assuming a range of average permit purchase prices. There are two parts to the table—the upper part shows the number of permits that could be purchased, while the lower part shows the number of remaining permits. At $20,000 per permit, 1,000 permits could be purchased for $20 Million—leaving 1,377 vessels in the fishery. The purchase of 1,000 permits at an average of $40,000 per permit would cost $40 million and leave 877 permits. In the table the cells shaded black are cells where the buyback funding would be excessive at the average price shown in the row. The gray cells represent funding and average price levels that would result in a buyback of latent permits only—in 2001 there were 311 inactive permits—buying back fewer than 311 permits would have no immediate effect on the fishery.

Table 17. Purchasing Power of Various Funding Levels Varying Average Permit Prices

Total Funding	$10 Million	$20 Million	$30 Million	$40 Million	$50 Million	$60 Million	$70 Million
Average Price/Permit	**Number of Permits Purchased**						
$20,000	500	1,000	1,500	1,877			
$30,000	333	667	1,000	1,333	1,667		
$40,000		500	750	1,000	1,250	1,500	1,750
$50,000		400	600	800	1,000	1,200	1,400
$60,000		333	500	667	833	1,000	1,167
$70,000			429	571	714	857	1,000
	Number of Permits Remaining in Fishery						
$20,000	1,377	877	377				
$30,000	1,544	1,210	877	544	210		
$40,000		1,377	1,127	877	627	377	127
$50,000		1,477	1,277	1,077	877	677	477
$60,000		1,544	1,377	1,210	1,044	877	710
$70,000			1,448	1,306	1,163	1,020	877

Table 18 provides initial estimates of net revenues in a post-buyback fishery under the three main funding scenarios using the funding and permit price assumptions developed in Table 17. The table is divided into 3 parts corresponding to the different funding scenarios; the top portion shows estimated revenues with 100 percent government funding, the middle section shows estimated revenues with 50 percent government funding and remainder paid back by industry with a low-interest loan, and the bottom section shows estimated net revenue with a 100 percent industry-funded buyback. Differences in net revenues in the three sections reflect the annual loan repayment that would be required with industry funding. The table carries forward the black and gray cell formatting from Table 17. In addition, the light gray shading highlights funding and price combinations that result in lower net revenues than were estimated to have been generated in the 2001 fishery ($3.6 million).

Table 18. Initial Estimated Net Revenue of Buyback at Various Funding and Average Price Levels under the Three Main Funding Scenarios

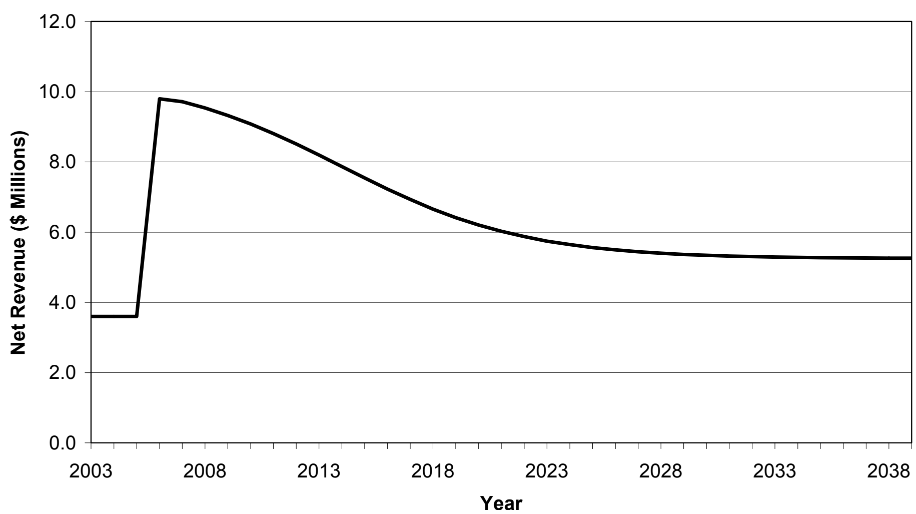
Total Funding	$10 Million	$20 Million	$30 Million	$40 Million	$50 Million	$60 Million	$70 Million
Average Price/Permit	**Estimated Net Revenue with 100 Percent Government Funding ($ Millions)**						
$20,000	5.69	11.16	16.62				
$30,000	3.87	7.52	11.16	14.80	18.45		
$40,000		5.69	8.43	11.16	13.89	16.62	19.36
$50,000		4.60	6.79	8.97	11.16	13.34	15.53
$60,000		3.87	5.69	7.52	9.33	11.16	12.98
$70,000			4.92	8.05	8.03	9.60	11.16
Average Price	**Estimated Net Revenue with 50 Percent Government Funding ($ Millions)**						
$20,000	5.31	10.39	15.47				
$30,000	3.48	6.75	10.01	13.26	16.53		
$40,000		4.92	7.27	9.62	11.97	14.32	16.67
$50,000		3.83	5.63	7.43	9.24	11.04	12.84
$60,000		3.10	4.54	5.98	7.41	8.85	10.29
$70,000			3.76	5.72	6.11	7.29	8.47
Average Price	**Estimated Net Revenue With Industry Funded Buyback ($ Millions)**						
$20,000	4.92	9.62	14.32				
$30,000	3.10	5.98	8.85	11.72	14.60		
$40,000		4.16	6.12	8.08	10.05	12.01	13.98
$50,000		3.06	4.48	5.90	7.31	8.73	10.15
$60,000		2.33	3.39	4.44	5.49	6.55	7.60
$70,000			2.61	3.40	4.19	4.98	5.78

Note: Industry funded scenarios assume a 20-year loan to cover buyback expenses with annual 4.5% interest.

7.1.1.2 Dissipation of Wealth over Time with a Buyback Alone

The estimates of net revenues under a buyback provided in the previous tables are based on the assumption that fixed costs in the post-buyback fishery remain the same as in the pre-buyback fishery. However, if the race for fish continues in the post-buyback fishery, it is likely that permit holders will invest more into their vessels in order to gain a competitive advantage over other remaining permit holders. This is usually the case if there is wealth available in the fishery above normal profits (something that would occur under initial buyback conditions) because it once again becomes worthwhile for individuals to invest further in their operations to increase their share of the annual catch. This situation creates the phenomenon known as "capital stuffing" and results in higher variable costs and higher fixed costs over time. These higher costs will inevitably push profitability back down toward pre-buyback levels. That these higher costs will occur is certain if the race for fish continues—the only uncertainties are how fast and how far profitability will drop. Figure 20 demonstrates, in a hypothetical scenario, how capital stuffing might reduce net revenues over time in a post-buyback fishery assuming future returns to Bristol Bay and ex-vessel prices are constant at 2001 levels. In this hypothetical scenario, 1,000 permits remain after a post-buyback fishery and immediately following the buyback net revenues jump to $9.8 million as estimated in Table 15. However, it is assumed that the current race-for-fish management regime continues and therefore, each year, costs to catch the same amount of fish increase and net revenue declines. In this hypothetical scenario depicted, the decline occurs over a twenty-year period, and eventually reaches a new equilibrium at $5.2 million. The length of time it will take to bottom out will most likely depend on the expected useful life of vessels, engines and equipment used in the fishery. Even though the initial return to higher net revenues is expected to be somewhat temporary, a buyback is expected to improve net revenues even in the long-run—as long at the "new equilibrium" is higher than pre-buyback levels, the fleet as a whole better off.

Figure 20. Consequences of Capital Stuffing in a Post-Buyback Fishery—a "Hypothetical Scenario"



In summary, almost $9.8 million annually might be captured by reducing the fleet to 1,000 boats. If the reduction in the fleet was funded entirely by the industry, the net amount would be almost that amount (~$6 million). A more radical reduction to just 500 driftnet permits might make available as much as $15 million annually to those remaining in the fishery (prior to debt servicing for the permit reduction costs). The $15 million is probably an overestimate because we likely did not accurately account for additional costs in catching the annual harvest in a 500 boat driftnet fleet.

7.1.2 Spread Out Harvesting Across Time

The efficiency of the fishing fleet in Bristol Bay has clearly increased over time and harvesting occurs over shorter and more punctuated periods than in the past. This phenomenon is difficult to demonstrate with catch and effort data because overlaid on a change in the efficiency of the fleet was a large increase in the annual catch. A case for demonstrating increased efficiency over the last 25 years can be made by noting specific changes in the way the fishery was prosecuted from the 1960s to the late 1990s. In the 1960s and 1970s, fishing periods were often 24 hours per day and the fleet would spread out over large parts of the fishing district. As efficiency of the fleet increased in the 1980s in response to the new and significant wealth available, it was able to take a large portion of the fish present in the district in the first few sets and vessels quickly moved to the fishing boundaries to catch newly arriving fish to the district. These "line fisheries" created substantial enforcement problems related to interference among vessels and gear. The greater efficiency of the fleet and subsequent development of line fisheries led managers to often shorten fishing periods to just one or two tides (7 or 13 hours). These changes compressed the fishing effort to shorter periods and further reduced the quality of fish compared with slower, more deliberate fisheries in the past that were spread out over time and area.

Those responsible for coordinating fishing fleets, tenders, and processing plants suggest that significant savings could be made if the harvest in the Bay could be spread more across time than is currently done. These people argue that if less intense, but near continuous fishing were possible, fish could be captured, tendered and processed for less cost by better utilizing equipment and labor. Slowing down the harvest requires greater control of the fleet and harvest levels that may be possible through current district registration and time and area closures.

Fishery managers in Bristol Bay manage the harvest largely to meet escapement goals and use time and area closures to regulate fishing effort. They currently cannot regulate the number of fishing vessels that register or fish a particular fishing district and period. If a large number of vessels are in a particular fishing district, managers must "pulse" fish for short periods in order to ensure that not too many fish are taken at all at once. If too many fish are captured in a particular opening, the fishery may remain closed for an extended period while escapement rates into terminal rivers pick up. This way of regulating the fishery can add or increase costs to both the harvesting and processing compared with more continuous fishing and processing activity. The added cost occurs because under this type of harvesting schedule, capital and labor must sit idle for a portion of the season, while at other times, the same inputs are utilized at high and inefficient levels (decreasing quality as well as increasing costs). The harvesting and processing sector would require less labor and less capital equipment if harvests could be spread out more over time within a given season.

How might it be possible to slow down or stabilize the harvesting across time? By having greater control over the amount of fishing effort allowed in a particular area. For example, if a manager could be assured or be able to mandate that only 200 boats were going to fish in the Nushagak District for the last two weeks of June, it might be possible to spread fishing (and processing) effort over 24 hours per day, 7 days per week. Skippers could have smaller crews working less intensively for 5, 6 or 7 days per week than having to use large crews working very intensively for 1, 2, or 3 days per week. Obviously, this approach would not be done if doing so jeopardized meeting escapement goals, but the point is that with greater control over the amount of effort in a district, those managing the effort could slow down the harvesting and better utilize fishing and processing capacity. A significant additional benefit to spreading the harvest across time is that fishers could take better care of their catch and quality could be improved.

In practice, how might managers decrease the number of vessels operating and increase the period over which they fish? Within the current limited-access, derby-style fishery, it would require regulation that would allow managers to set or reduce the number of permits able to fish a particular period. This might be accomplished by granting permission to permit holders to fish one of two fishing days or weeks (e.g., A-B licenses) and then allow permit holders to stack both A and B licenses onto a single boat thereby allowing the vessel and crew to fish both periods (i.e., continuously). Such a measure could reduce the number of boats by half, but it could still result in too many vessels early and late in the season to allow continuous fishing and too few boats to harvest all the fish during the peak periods. Another possible mechanism under the limited-access, derby-style fishery would be to conduct a daily or weekly lottery for how many permits are allowed to fish a particular day or week. The numbers of people permitted each day or week could be adjusted by managers based on in-season indications of the strength of the run to strive for stable and near continuous harvesting and processing.

The savings from such top-down managed effort would likely be small. Many fishers would gear up for a season only to sit out if their number wasn't drawn or if they chose not to stack an A-B license. It would also be difficult for managers to quickly recruit a large number of boats to capture a sudden spike in abundance. In addition, managers would be under pressure to equalize the harvests among groups, further adding to the complexity and cost of such a system. In summary, the cost savings would likely be small for both fishers and processors and the flexibility for managers to harvest large and small numbers of fish when needed would likely be very limited under a limited-access, derby-style fishery.

Another way of spreading the harvest across time would be to allow managers to set harvest levels daily or weekly and work with fishers and processors to decide on the level of fishing effort to deploy to stabilize the flow of harvest. This is really only feasible under various forms of harvest shares or harvest quota assigned to individuals and/or groups of fishers (discussed in a later section of this report). Such a system would rely on fishers and processors to find ways of regulating the fleet to most cost-effectively conduct near continuous fishing, taking into account the expected and actual abundance of fish in the districts and rivers. For example, a manager could strive to harvest 40-60,000 fish per day early in the run from the Egegik district. Under the current derby-style fishery, the manager must open the fishery for a 4, 5 or 7-hour (or other) period, monitor the catch and let fishers race against one another during that period. If a large number of boats turned up, say 600, and they took 100,000 fish, the fishery might then have to be closed for 24, 36 or 48 hours while the cumulative escapement returns to desired levels. Under forms of a harvest share system, the manager might work with industry (e.g., cooperatives) to deploy say, 200 boats that go out to each catch 2,500 fish each while fishing 24 hours per day. Under this scenario the cost of capturing the 50,000 fish per day would be less, their quality higher and processors could operate tenders and plants more efficiently than is possible with periodic 7-hour openings with 600 boats.

These are simple examples and clearly many people in the fishery can imagine much more complicated scenarios of changing abundance and different levels of effort required. However, the difference between trying to regulate effort levels under a derby-style fishery and under a harvest share system is profound. Eliminating the race for fish through some form of harvest share could provide those in the industry the ability to spread the harvesting over time, decrease harvesting costs and improve quality. There would likely be little, if any, wealth captured by trying to spread out harvesting across time in a derby-style fishery.

7.1.2.1 Potential Wealth from Spreading Harvesting Across Time

The potential wealth that could be generated by slowing down the harvest in Bristol Bay is very difficult to estimate. This difficulty arises from the uncertainty as to just how managers and a group of innovative fishers might actually manage fishing effort to stabilize harvest across time.

There is also some uncertainty about the savings at the processing level. As noted earlier, attempting to spread the harvest over time in the current limited-access, derby-style fishery will likely produce little new wealth. Eliminating the race for fish will likely capture wealth from several sources, including from spreading harvesting over time.

Processors have indicated that spreading out the harvest among days and across the season would significantly reduce costs and contribute to improved quality. Improvements in quality are discussed in a later section. If the harvest of salmon were timed so as smooth out the peak-period harvests, processors indicate they might be able to reduce variable processing and overhead costs by 10 percent each year. Using the assumptions in the status quo processing model, we estimate that floating processors could cut expenditures by $1.3 million, while shore-based plants could reduce costs by $3.4 million. Overall, we estimate that $4.8 million in processing cost savings could be realized by spreading harvest out over the season. If processors passed 33 percent of these cost savings on to harvesters then total ex-vessel revenue would increase by $1.6 million or 1.8¢ per pound. Even if it is assumed that harvest vessel fuel costs increase by 20 percent, because of the extra fishing involved in the early and late parts of the season, the fleet is estimated to realize a net increase in revenue of over $1.0 million.

7.1.3 Alternative Harvesting Methods

Although gillnets are a very effective harvesting tool for catching salmon in Bristol Bay, other harvesting methods offer at least the *potential* to lower harvesting costs while producing a better quality product. The most often discussed ideas we heard over the course of the study were to explore whether fish traps and seine vessels could reduce harvesting costs and increase quality in some areas and at some stages of the fishery. Nobody we spoke with believed that these tools could entirely replace the current large, mobile and effective gillnet fleet. Traps were tried in Bristol Bay during the first few decades of the fishery and achieved limited success[33]. Many people thought that a combination of gears (seines outside, gillnets in closer and possibly some trapping near river mouths) might reduce overall harvesting costs and increase the quality of the harvest.

The biggest limitation or constraint to implementing alternative harvest methods is deciding on what grounds to assign permission to who may use the various new gears. It appears difficult or at least problematic to assign rights to use alternative gears to a subset of permit holders within the current limited-entry system. With alternative gears operated from a fishing vessel, it might be possible to create a separate user group, kind of like the set and driftnet groups, and assign the new group an allocation (% of the harvest) in the district management plan. Such a plan would certainly create additional management costs and increase the complexity of management. Assigning permission to individuals to operate a fish trap under the current system would be even more problematic than permission to use alternative gear from a boat. Sites for fish traps are few and highly variable in their productivity and deciding how to grant permission to different individuals or groups without actually assigning a share of the harvest would be difficult. These problems ultimately stem from the presence of a race for fish and therefore, alternative gears are likely best explored in the context of assigning a harvest share to individuals or groups.

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[33] Fewer than two dozen traps ever operated in the Bay, and only two traps remained when the White Act took effect in 1924. The swift currents and large tides of Bristol Bay posed problems for traps, which would get plugged with large pulses of sockeye, only to be left high and dry twice a day.

A harvest share system facilitates the exploration of alternative harvest methods because it can eliminate the competition among user groups, allow for relatively simple mechanisms for the introduction of more efficient gear, and simplify the distribution of benefits from more efficient harvesting. For example, if 200 permit holders would like to take their harvest share with 15 seine boats or one fish trap, it is relatively straightforward to set up a business arrangement (e.g., a cooperative) whereby each is compensated for participation in the group effort with the more efficient gear. Contrast this with a situation where the race for fish continued to exist, and the problem becomes clear. Assume that 1,900 permit holders were entitled to use more efficient gear under the limited access, derby-style fishery. Clearly 1,900 seine boats would cost more than what it cost to operate the existing gillnet fleet. Suppose, in this situation, the fish could be captured by 500 efficient vessels using newer, more efficient gear. How might the fishery go from 1,900 to 500 vessels and how should those who don't want to invest in more efficient gear be treated? Most can imagine the benefits of beating the competition to the fish if only 200 vessels were operating in Egegik during the peak of a good return – there would be a huge reward. What if someone wanted to continue using their less efficient gear, how much fishing time or how many fish should they be entitled to catch?

In summary, there *are* ways of engineering the use of more efficient gear while keeping the race for fish in place, but they get complicated quite quickly, and would require considerable effort and expense to administer. Unless the new gear was made mandatory across the entire fishery, it would be difficult to fairly accommodate those who prefer to use existing gear. In addition, as long as the race for fish exists, harvesters will spend much of their resources and innovation on beating the competitors to the fish (e.g., continued innovation on methods of fishing on the district fishing boundaries) instead of entirely on ways of *lowering* their costs. More efficient gears require some consolidation of the fleet and harvest shares offer a relatively simple mechanism to consolidate while removing the wasteful incentive caused by the race for fish.

7.1.3.1 Potential Wealth from Alternative Harvesting Methods

Until alternative methods are tried, it is difficult to estimate with much precision what wealth may be created. This is because there are many factors that affect costs and the degree to which quality is improved will really only be figured out by experimentation. However, by knowing the current costs in the fishery, we can establish some bounds or upper limits to the wealth created by more efficient harvesting methods.

It is clear that gillnets and setnets operating *under the race for fish* can damage fish and result in poor average quality and they may not be necessarily the most cost-effective harvesting method to catch salmon migrating near shore and into rivers. Many believe that it is the conditions of the race for fish that produces low quality product from gillnets. Others believe that the Bristol Bay fishery should switch to seine gear. Some go a step further and believe that an ideal system would scrap gillnets for seines or traps or weirs. Whether such radical changes in gear such as traps would become part of a restructuring plan or not, it is useful to think about traps or weirs to get an *upper limit* on what wealth might be created by the Bristol Bay resource under completely free rein to choose alternative harvesting methods.

Suppose, hypothetically, that either traps or weirs were allowed in Bristol Bay and that, once amortized over the life of the trap, the per-unit harvesting costs were very low, say 5 cents per pound. Suppose further that there were innovative new handling procedures could be utilized with the trap to transfer and transport the harvest efficiently to processors at higher quality than current gillnet based average quality. This would conceivably eliminate tendering, which is a significant expense (particularly as a proportion of current low prices). If removing this expense could be achieved in addition to maintaining a high proportion of grade one quality fish, it is conceivable that 20 cents per pound could be added to current ex-vessel values. So, as an upper bound measure, the highest wealth produced by alternative gear might conceivably yield, under current market and run size conditions, something on the order of an ex-vessel price of 60 cents net of harvesting costs that could be earned by the harvesting sector (45 cent ex-vessel price minus 5 cents harvesting plus 20 cent increase in price). At harvest levels of 14 million fish annually (85 million pounds), this would translate into net income of $51 million to the harvesting sector alone. Obviously this represents the outer limit for alternative harvest methods – it assumes that nearly all costs associated with harvesting and tendering could be eliminated and improvements in fish quality would yield 20 cents per pound more than the current 45 cents. This hypothetical example does highlight the *potential* wealth available if very efficient harvesting and tendering methods could be developed. Other options of alternative gear that use floating vessels and retain many of the characteristics of the current gillnet fleet, would fall somewhere between the current wealth $3.8 million and $51 million, since they would entail *greater harvesting and tendering* costs than the example above. In talking with experts in the fishery, many estimated that the use of alternative gears could reasonably cut 35-50% of the current harvesting and tendering costs in the Bay.

Many people we spoke with argued that only through experiments using alternative gears could anyone really begin to quantify the cost savings and the ability to improve quality. We concur, and think that the benefits of alternative harvesting methods should first be explored by experimentation at a smaller scale (e.g., single district) before conclusions are drawn on the potential benefits across the entire Bay.

7.1.3.1.1 Quantitative Estimates of Savings from Alternative Harvest Methods Assuming Status Quo Returns and Prices

Examples of alternative gears include the following:

- Purse Seines
- Multi-vessel purse seines
- Live capture and net pen storage
- Fish traps

Whether these alternative fishing methods would prove to be more efficient at harvesting, or whether they would improve the quality of raw-fish is unknown. It is possible that regulations encouraging experimentation on a limited scale could be developed. These experiments could test the feasibility of these alternative methods. Until such tests are undertaken, estimates of potential efficiency gains are speculative at best. It is certain however that any new fish harvesting methodology would have to be less costly than are likely to occur in a post-buyback fishery with existing gears. Recall that after a government-funded buyback fishery with 1,000 remaining driftnet permits it was estimated that total costs in the drift gillnet fishery would be $21.1 million per year (or approximately $0.26 per pound on a harvest of 13 million fish). If new, more efficient, fishing methods were developed, they would have to cost less than this amount. If we assume that new fishing methods reduced the total harvest cost by 10 percent then $2.1 million in additional net revenues could be generated. Table 19 shows potential cost savings and the net revenues that might be attainable with new fishing methods based on 2001 run size and prices over a range of cost savings. The table assumes a post-buyback fishery with 1,000 vessels as the starting point.

Table 19. Potential Savings and Net Revenue Attainable with New Fishing Methods

Cost savings percentage	10 percent	25 percent	33 percent $ Millions	50 percent	75 percent
Cost savings with New Methods	2.1	5.3	7.0	10.6	15.8
Net Revenue with Government-Funded Buyback	11.9	15.1	16.8	20.4	25.7
Net Revenue with Industry-Funded Buyback	8.6	11.7	13.4	17.0	22.3
Net Revenue with Joint-Funded Buyback	10.2	13.4	15.1	18.7	24.0

Note: Assumes a post-buyback fishery starting with 1,000 vessels that cost $43.9 million.

7.1.4 Improve Product Quality

Far and away the most common input we received from harvesters and processors was that the quality of the catch had to improve from its current state and the industry must better market the final product (Appendix B). A higher quality harvest from Bristol Bay would clearly be worth more than a low-quality harvest regardless of whether any more money was spent to market the harvest and Bristol Bay has a track record of producing modest and low-quality harvest. Understanding the causes of the low-quality harvest is important for understanding whether there is new wealth available from efforts to improve quality.

Bristol Bay fish are generally high quality when they are alive and still in the water[34]. Assuming there is that there is little that can be done about the inherent quality of the fish, the key question in terms of improving quality becomes whether fish quality is lost during the stages where the fish goes from the water to the customer and whether these effects could be reduced or avoided in a restructured fishery.

Most of the low-quality harvest over the years from Bristol Bay can, ultimately, be attributed to the biological characteristics of the salmon return. This is not to say that nothing can be done to improve quality in the Bay, but that to understand whether restructuring the fishery can raise quality, it is critical to acknowledge and take into account the following. The Bay is home to the most abundant *and compressed* sockeye salmon run in the world. Many millions of fish return to the Bay over a very short period – 65% or more of the harvest is taken in a two-week period – and this has created a sophisticated fishery management system and an industry that can handle large volumes over short periods.[35] The Bay-wide harvest levels routinely exceed 2 million fish per day at the peak of the fishery. The compressed harvest, combined with an historically reasonable market for canned or modest-quality salmon has, in the past, created a very simple mechanism whereby it has been more worthwhile to produce a low quality product. Carefully handling fish requires time and, under a management system where there is a race for fish, it has clearly been more beneficial in the past for harvesters to trade quality off against volume.

[34] We encountered some debate on the point about whether Bristol Bay sockeye were *inherently* inferior to salmon from river systems outside the region. This debate is too difficult to sort out because inherent quality is, ultimately, in the "taste of the beholder," as well as subject to influences of marketing campaigns. For many people, much of the inherent quality of salmon can be attributed to oil content, with fish of high-oil content being more desirable than those of low-oil content. Limited data on this characteristic (10 fish from each area) suggests Bristol Bay sockeye harvested in the terminal districts are, on average, of similar fat content (~5%) to those in other fisheries of Alaska (Kodiak, Cook Inlet) but about half the levels from sockeye captured in the high-profile Copper River fishery. Source: Unpublished Data provided to the BBSFRS study team, October 2002, by Chuck Crapo, University of Alaska Marine Advisory Program.

[35] Minard, R.E., and C.P. Meacham. 1987. Sockeye salmon (*Oncorhynchus nerka*) management in Bristol Bay, Alaska. P. 336-342. *In* H.D. Smith, L. Margolis, and C.C. Wood [ed.] Sockeye salmon (*Oncorhynchus nerka*) population biology and future management. Canadian Special Publication of Fisheries and Aquatic Sciences 96.

To illustrate the trade off between quantity and quality that harvesters and processors face each season, consider the following hypothetical example derived from input from fishers and processors. First, harvesters and processors consider their markets. Then, taking into account the tendering and processing systems developed to handle large quantities of fish in short periods, processors figure they can pay fishers 50 cents a pound for, on average, modest-quality fish. They might pay more for high quality fish, but unfortunately, it is difficult to distinguish or grade the catch from individual fishers when they are offloaded at the tender and hence difficult for them to reward the individual fisher who delivers high quality fish. So, the processor agrees to pay top-quality harvesters an end-of-the-season bonus if the quality of the pack is higher than the modest quality they expect. To produce a high quality fish, the fisher must slow down during the fishery, buy ice or a refrigerated sea water system, limit the capacity of their vessel by carrying ice or an RSW system, and possibly bleed each fish as it comes onboard. The fisher figures that doing these things to produce a high quality fish in the derby-style fishery will reduce his or her harvest by about 40% or more compared with aggressively fishing (e.g., "round hauling") and ignoring quality. So, assuming the best-case scenario (40% reduction in volume for significantly improving quality) the fisher who can land 100,000 lbs in a season faces a simple choice: catch 100,000 lbs at $0.50/lb ($50,000) or 60,000 lbs at $0.55 or $0.60/lb ($33-36,000). Granted this is a simple example, but the point is important – a high volume fishery operating *under the race for fish* will tend to produce modest-quality fish as long as a market for modest-quality fish exists.

Are there ways to improve the quality of the harvest to create new wealth from the Bristol Bay fishery? Almost everyone we spoke with believes the answer is yes. But how best can quality be improved – mandatory chilling regulations, shorter and more frequent openings, more tenders, shorter nets, larger crews, bigger boats? When it came to how to improve quality, ideas varied considerably. Many of the possible actions or regulations will clearly increase *costs* for fishers and processors, but how much they will improve the quality, and ultimately, the price paid for the harvest? Some answered yes, others "maybe," and yet others "no." Even if the actions were to increase the price paid, would it more than offset the additional cost, or more specifically, would there be a net return for investments to improve quality? These are all difficult questions to answer without first experimenting with activities to improve quality.

7.1.4.1 Potential Wealth from Improved Quality Assuming Status Quo Returns and Prices

Both harvesters and processors can work to improve raw fish quality. Two primary ways to improve raw fish quality are apparent within the existing drift and set gillnet fisheries: 1) develop infrastructure that can regularly and efficiently provide ice to harvesting operations, and 2) spread harvests out away from peak periods.

A discussion of the costs and benefits of a fishery-wide ice infrastructure program is included in Appendix F. In general, the discussion in the appendix focuses on ice infrastructure in a pre-buyback fishery and concludes that while there are certainly benefits of an icing program, there are also costs. Costs include upgrading of vessels to handle slush-ice delivery, development of ice making and ice distribution infrastructure. A full feasibility study with specific alternatives for ice making and distribution would be required to determine if the benefits outweigh costs, particularly if it is required in regulation that all salmon deliveries are iced.

In a post-buyback fishery, the costs of ice infrastructure and ice distribution would be reduced, while the potential benefit would remain approximately the same. Infrastructure and distribution costs would be reduced because fewer vessels would need to be equipped with slush-ice bags. It is estimated that equipping vessels to use slush ice will require about $2,000 per vessel. If the buyback results in 1,000 vessels - 566 fewer than participated in 2001 - then cost savings for the fleet as a whole could exceed $1.0 million. Similarly if one third fewer vessels need to obtain ice each trip, then it stands to reason that the ice distribution system could be reduced even if the overall ice making capacity remains unchanged.

The benefits of developing ice infrastructure or of otherwise improving the quality - for example, by spreading out the harvest and reducing the peak-period glut - can be estimated by changing the mix of frozen #1s and lower grade salmon that are currently processed as frozen headed and gutted product.[36] In an optimistic case for shore-based processors, the total percentage of salmon going to canning operations would remain constant, but no low-grade salmon would be frozen or filleted. The status quo shore-based processor model assumes that 39 percent of deliveries are canned, 37 percent are frozen #1s, 18 percent are frozen #2s and lower, and 6 percent are filleted. If quality improved, then 39 percent would continue to be canned, while frozen #1s might increase to 46 percent and fillets might increase to 15 percent. The percent of number #1s processed by floating processors is estimated to increase from the status quo assumption of 43 percent to 62 percent if quality improved. These quality improvements are estimated to increase net revenue for shore-based plants by $2.8 million if 2001 runs and prices are assumed. For floating processors, revenues are projected to increase by $1.3 million. Overall, revenues to processors would increase by just over $4.1 million.

Whether this would translate to increases in ex-vessel revenues for harvesters is an open question. Processors have indicated that the 5¢ per pound premium that has traditionally been paid to harvesters that deliver iced fished is based more on tradition than on the extra profitability that accrues to processors. The model results suggest there may be some validity to this statement. For shore-based processors the increased revenue from improved quality averages just 4.2¢ per pound of fish purchased—for floating processors the increase averages out to 5.7¢ per pound purchased. If processors paid a full 5¢ premium in order to get higher quality fish, then the model projects that almost all of the additional revenue they would earn from the higher quality would have been passed on to harvesters.

The status quo study of processors indicates that they have historically paid about 50 percent of their wholesale revenues to harvesters. Using this assumption rather than assuming a straight 5¢ premium, we estimated that harvesters could realize an increase of approximately $2.1 million in ex-vessel revenues (half of the increase realized by processors). This translates into an average increase in ex-vessel revenue of 2.3¢ per pound over all salmon delivered in 2001.

7.1.5 Market the Harvest More/Better

Doing a benefit/cost analysis and determining the net value of a marketing program for Bristol Bay sockeye salmon is well beyond the scope of this project. However, what is relevant to this project is that a restructured fishery may make a marketing program more worthwhile than under conditions of the *status quo* fishery. Fishers, processors and marketing experts asserted that without significant improvements to the quality of the harvest from Bristol Bay it was just not worthwhile to invest in marketing programs. Most of these people also reminded us of an important point – the additional wealth possible from *improving the quality* of the harvest alone would likely be greater than any additional gains made from better marketing. Customers will pay a premium for high-quality fish, regardless of whether there has been a marketing campaign to promote it and this premium will likely be bigger than a marketing-induced premium.

[36] Shore-based processors have indicated that they would be reluctant to eliminate their canning operations, stating that in the current market for canned salmon is more profitable than frozen salmon. Even if frozen products prices were to increase to higher levels, they would continue canning operations in order to retain market share.

7.1.5.1 Potential Wealth from Investments in Marketing

Experts in the processing and marketing business were unanimous over the assertion that without substantial improvements to the quality of the Bristol Bay fish, little net gain (i.e., wealth) could be achieved from marketing campaigns. Those experts also believed that the quality of the harvest needed to be raised before expensive marketing campaigns should even be considered for Bristol Bay. Nonetheless, if quality can be improved it is likely that a marketing program can have significant benefit.

A marketing program that promotes the quality and wildness of Bristol Bay salmon has the potential to significantly improve product prices currently received by processors, particularly for frozen and filleted products. While it may be tempting to recommend a marketing program immediately, it is important to reiterate, that the improvements in quality and product flow are necessary precursors to a successful marketing campaign. There are no guarantees regarding the size of price increases, however, it is conceivable that a 5 percent increase could be realized. A 5 percent increase in frozen product prices for floating processors would result in over $1.5 million more revenue based on 2001 prices and returns. For shore-based plants a 5 percent increase in frozen product prices would increase revenues by over $2.7 million. Overall, nearly $4.1 million in additional revenue could be generated if the marketing program succeeds in increasing frozen product prices by 5 percent. If it is assumed that processors will pass on 50 percent of the increase to harvesters, then the ex-vessel revenues could increase by $2.1 million or 2.2¢ per pound.

7.1.6 Reduce or Eliminate the Race for Fish

This source of wealth is unique among all of those discussed earlier because it captures wealth from several sources all at once, including all of those described above. By the expression "eliminating the race for fish" we are referring to taking away the incentives for fishers to compete against their fellow fishers to capture fish. Under the current limited-access derby-style fishery, each fisher is only granted permission to participate in the fishery and not assured any specific share of the harvest. As a result, there is competition among fishers to race to be the first to catch the fish. Those that slow down to improve quality can be expected to catch fewer fish than if they ignored quality. As described earlier, this race for fish in Bristol Bay and elsewhere creates perverse incentives where everyone racing for the fish dissipates much of the value of the harvest, leaving little or no net income. These incentives dissipate substantial wealth by creating high harvesting costs and a low quality product.

As an alternative, a management system could allocate a **share** or specific percentage of the **harvest** to each permit holder rather than just a permit granting permission to fish and compete with others. With an allocation guaranteeing a fraction of the annual harvest, fishers can turn their attention to reducing costs, maximizing value and ultimately net income rather than the quantity of fish they land. There are many constraints or limitations to this working to create new wealth in a salmon fishery, and especially one like the Bristol Bay fishery. Eliminating the race for fish represents the most radical form of restructuring we examined. At least in theory, it represents the greatest wealth generating potential of all options because it could realize gains from all other sources we examined.

7.1.6.1 Potential Wealth from Eliminating the Race for Fish

It is reasonable to assume that by eliminating the race for fish, some or all of the potential sources of wealth discussed earlier might be captured. To reiterate, these sources of new wealth were from:

- Reducing excess fishing capacity.
- Spreading out harvesting across time.

- Developing alternative harvesting methods.
- Improving product quality.
- Marketing the harvest more/better.

A fishery operating under a harvest share system would face tremendous incentives to quickly and efficiently consolidate fishing capacity. With some assurances as to the percentage of the annual harvest available to harvesters, the harvest could be spread across time more easily and to a greater extent than under the traditional derby-style fishery. With forms of guaranteed access, harvesters could be free to explore alternative harvesting methods without threatening others' share of the harvest. Without the race for fish, harvesters would be able to find the balance between quality and quantity that maximized the net return from the harvest. Finally, with a good quality product, marketing programs would be more feasible than with the quality available in the *status quo* fishery.

Accurately estimating how much wealth all this might create becomes almost impossible. However, we can make rough estimates and use a range to illustrate our uncertainty. We assumed a likely scenario if the race for fish were eliminated by introducing a harvest share system in the Bristol Bay salmon fishery would be the formation of 5 to 10 harvesting-processing cooperatives. In this scenario, each permit holder would be entitled to harvest a portion of the annual harvest. The portion could be either equal to all other permit holders or could be based on the permit holder's historical catch history (or a combination of the two). Permit holders would be free to associate or join a cooperative operating in the fishery and bring their harvest share to the cooperative. The cooperative would be permitted to operate in any of the fishing districts and would decide before the season how to allocate its shares among the districts. If permit holders representing 20% of the harvest were to join "Cooperative A," the cooperative could be assigned 20% of the harvest in each district or trade among other cooperatives to access a larger portion than 20% in a one district. Once the fishery began, managers would work with 2 or 3 cooperatives in each district to harvest the required number of fish to meet escapement goals while maximizing the value of the harvest through low harvesting costs, spreading the harvest across time and achieving high-quality harvest.

How much new wealth might be captured in such a scenario? As discussed earlier in Section 4 (Economist's Perspective), once innovation can be more directly focused on optimizing quality and minimizing costs, significant gains could be made that are difficult to predict beforehand. However, it is helpful to estimate the gains to get a sense of the approximate magnitude of improvement. First, harvesting costs could be decreased from the levels seen in the status quo fishery. Knowledgeable harvesters and processors we spoke with suggested that under the scenario described above, combined harvesting and tendering savings of 10 to 20 cents per pound would be possible. Improvements to fish quality (and associated marketing campaigns) could add a net gain of another 20 to 30 cents per pound in today's markets. At harvest levels of 14 million fish per year, these represent 30 to 50 cents more per pound of new wealth on 85 million pounds. This would translate into an improvement of **$26-42 million** more wealth annually from the fishery than is currently available. A less optimistic view of the potential savings might be to only assume savings in harvesting and tendering and increases in quality that total 20 cents per pound. Even with this conservative or pessimistic view of the improvements, the savings would be $17 million annually.

7.2 A Map of the Landscape of Wealth

Estimates of new wealth from different restructuring actions (assuming the current fishery generates $3.8 million annually) are presented in Table 20.

Table 20. Estimated New Wealth Available Annually From the Bristol Bay Salmon Harvest Under Different Restructuring Actions

Restructuring Action	Expected Increase in Wealth (Millions $)
Reduce Excess Capacity (1,000 Drift permits remaining)	
Buyback funded by Government	6.0
Buyback 50:50 funding, Government: Fishers	4.3
Fisher financed buyback	2.6
Spread Harvesting Across Time	4.0
Alternative Harvesting with 33% reduction in costs	7.0
Alternative Harvesting with 50% reduction in costs	10.6
Improve Product Quality	4.1
Market the Harvest Better	4.1
Eliminate the Race for Fish	17 to 42

To put the magnitude of these improvements into perspective, at harvests of 14 million fish (or ~85 million pounds), the effect of a $5 million increase in new wealth would represent an increase in net income of about 6 cents per pound; a $15 million increase would be about 18 cents per pound and $40 million would represent 47 cents a pound.

The landscape of wealth indicates:

1. Reducing the capacity of the fleet has significant positive benefits, even if done under the current limited-access, derby-style fishery.
2. Improvements to fish quality and increased marketing of the harvest could create similar wealth as significantly reducing the size of the fleet.
3. There is a potentially large but uncertain amount of wealth available to capture through the use of alternative harvesting methods and by eliminating the race for fish.

8 Analysis of Specific Ways to Capture Wealth in the Bristol Bay Salmon Fishery

The discussion in the previous section was somewhat theoretical and general. This section examines the specifics of what might be done in the Bay fishery to capture new wealth and some of the implications of pursuing these sources of wealth. Consistent with the previous section, we have organized the analysis of actions into the following framework:

1. Reduce Fishing Capacity
    a. Internally financed permit reduction – non-governmental buyback program
    b. Conduct an outside-funded or long-term fisher-funded permit buyback
    c. Consolidation of the fleet without out-of-pocket expenses
2. Spread harvesting across time
3. Alternative harvesting methods
4. Improving product quality
5. Marketing the harvest better
6. Eliminating the race for fish (assign shares of to harvest to participants)

8.1 Reduce Fishing Capacity

8.1.1 Internally Financed Permit Reduction – Non-Governmental Buyback Program

Permit buybacks are based on the idea that reducing the number of participants, and the level of effort applied by those participants, may reduce operating costs and increase revenue for the remaining permit holders. In a non-governmental buyback, private entities would have to negotiate a permit non-use contract with a permit holder and provide the funds necessary to reach a negotiated fee agreement. The agreement would require that the permit not be fished and would expire or could be directly forfeited to the State of Alaska. In this way, the permit is permanently retired and effort is reduced. The necessary funds would come either from private resources or private capital finance obtained by the private entity wishing to eliminate a permit. Thus, this type of permit buyback is financed by individual fishers or fishing entities. However, the benefits of this form of effort reduction would accrue to all remaining permits holders. There may be little incentive for permit holders to bear the cost of this form of effort reduction when the potential benefits accrue to all remaining permit holders, rather than singularly to the person bearing the cost.

8.1.1.1 Possible Variations

Several different types of private entities could enter into a contractual agreement of this type. One example would be one permit holder entering into a contract with another permit holder to purchase forfeiture through inactivity by the second permit holder. In such cases, the purchasing permit holder would not gain any ownership interest in the second permit. Alternatively, a processing company could enter into contractual agreements to buy termination of permits from permit holders. It may also be possible for a non-governmental organization to be formed by private entities in order to purchase permit termination. An example might be permit holders who enter some form of cooperative in order to fund permit termination purchases. Since the transaction does not involve the transfer of permit ownership and the contract is essentially private, it appears that any form of private entity could enter into this type of contract with permit holders.

8.1.1.2 Biological and Management Implications

Reduction of effort may make it easier to limit harvests during openings. This may be especially true in low-run years. However, in large-run years, management may be confounded by not having enough effort in place to meet harvest goals. Effort reduction via a permit buyback could also cause problems with escapement management if a lot of permits were removed and the majority of the remaining permit holders chose to fish in one district. The 48-hour limit on permit registration transfer could limit effort redistribution in such cases potentially affecting escapement management. As a result, it may be necessary for management to adjust to the new effort levels within the season and change the timing of openings and the number of fishing days to reach harvest targets. Presumably, managers would be able to do this using the current district registration system.

8.1.1.3 Quality Implications

Effort reduction does not necessarily eliminate the race for fish; it just reduces the number in the race. The remaining participants will still be focused on maximizing revenue, as discussed in Section 7.1.4. To maximize revenue they can either maximize volume for a given price or try to improve prices via improved quality but with potentially reduced volume. The tradeoff for fishers is whether revenue is greater with the greatest volume and a static ex-vessel price absent quality premiums or with reduced volume and quality premiums on price. Fishers will improve quality only to the point that the benefits of the quality premiums offset the lost revenue of reduced volume.

In theory, if total available harvest does not change, less effort on the water should translate into greater catch per unit of effort. If this were the case, fishers could take advantage of a greater catch per unit effort (CPUE) by slowing their fishing activities in order to try to improve quality. In concept, they could catch the same amount as they did prior to effort reduction but with improved quality. If this improved quality translated into higher ex-vessel prices their revenue would increase and compensate for slowing their pace of fishing. Alternatively, they could simply take advantage of greater CPUE by increasing volume in a given fishing period. The implications for improved quality, therefore, depend heavily on how much effort is removed, whether the pace of fishing is slowed, and the volume versus price tradeoff in total revenue.

8.1.1.4 Implications for Innovation

The potential for innovation with effort reduction options depends on how the effort reduction affects the pace of fishing. If the pace is slowed, it creates the possibility for innovations in processing and on-board handling of fish. However, if the race for fish is still present pervasive innovation may not be likely. Effort reduction via a permit buyback reduces the number of participants in the fishery and therefore could promote the formation of cooperatives because it tends to be easier to form and manage a smaller group.

8.1.1.5 Economic Implications

If enough permits are removed (more than are currently idle) and total harvest remains constant average harvest per vessel will increase. Assuming prices are constant an increase in average harvest per vessel will increase average revenue per vessel.

On the cost side, reduction in the number of permits has the potential to reduce total fleet operating costs simply because fewer boats would be operating. In addition, effort reduction can eliminate some of the costs associated with crowding. However, operating costs for remaining vessels may actually increase if fishing time is increased due to less effort in the fishery. If crowding is a significant problem, the net effect on total fleet operating cost should be a net reduction. Another consideration is the cost of the buyback and how it will affect fishers. If permits are retired by contractual agreement between one permit holder and another the remaining buyer will have to incur the cost of the purchase including ongoing debt finance.

Cost reductions and revenue increases may translate into improved profitability of the remaining permit holders. Improved profitability will have the direct effect of increasing net income for permit holders and their crew. Increased net income generally provides positive impacts on the communities where fishers live. Thus, a buyback has the potential to improve the net economic value of the fishery, and this would likely increase the value of the remaining permits, which may ultimately limit the number of permits purchased.

8.1.1.6 Social Implications

A permit buyback could result in residents of the Bristol Bay region and other parts of Alaska selling their permits to outside interests. It is possible that outside interests may have greater access to capital and may be better informed regarding this type of contractual arrangement. Local residents facing difficult economic times resulting from the fishery crisis may find the buyback appealing in the short term and may not be as economically diversified as outsiders. Local residents may not be able to hold out as long as outsiders and there is the potential that a disproportionate number of resident permits might be bought out.

If disproportionate numbers of resident permits were retired, local communities might suffer from reduced local income. This could also affect local crew who may have difficulty finding positions on the boats of non-residents. Since fishing income is an important element of the local economies of Bristol Bay communities, the potential for income erosion represents a serious long-term concern.

8.1.2 Conduct an Government-Funded or Long-Term Fisher-Funded Permit Buyback

These options differ from the previously discussed capacity-reduction option in that the funding would come either from government appropriations or loans and could involve an industry-wide tax on remaining participants.

8.1.2.1 Governmental Permit Buybacks

In a governmental permit buyback, permits would be purchased by the government in a low-bid auction and permanently retired thereby reducing effort. The number of permits retired would depend on how much funding was made available and on the bids received. In a low-bid auction, the lowest bids would be accepted until all available funds had been used.

8.1.2.2 Possible Variations

There are several variations of how a governmental permit buyback might work. They differ primarily by the government entity involved and the financing method used.

State-funded permit Buyback – In a state-funded permit buyback, the State of Alaska would provide the necessary funding, via legislative appropriation. Presumably, the Alaska Commercial Fisheries Entry Commission would be tasked with conducting the buyback auction and retiring permits that were bought out.

State First Right of Refusal – An alternative to an auction buyback program would be for the State to be granted the first rights to purchase a permit offered for transfer at the fair market value and retire it.

This would require a change in state law to give the state this right and would require legislative appropriations to fund the purchase of permits at fair market value.

Federally Funded Permit Buyback – It is possible that Federal disaster monies could be made available to fund a permit buyback. For example, disaster funds made available under the Inter-jurisdictional Fisheries Act were used in Washington State to fund two rounds of buybacks of salmon permits (1995, 1996 &1997). Disaster funds made available under the Magnuson-Stevens Act were also used in Washington State to fund another round of buybacks.

Loan-financed Permit Buyback – Another financing alternative is a loan-financed buyback. The loan could conceivably be provided by the State of Alaska. Alternatively, the federal "fishing capacity reduction" programs (Magnuson-Stevens Act section 312) could provide a capacity reduction loan. Under a loan-financed buyback, a tax would be imposed on the fishery to pay for loan finance. The tax rate charged would depend on the size of the loan.

8.1.2.3 Biological and Management Implications

Biological and management implications with a government-funded buyback should not differ substantially from the implications of a privately funded buyback as discussed in Section 8.1.1.2.

8.1.2.4 Quality Implications

Quality implications with a government-funded buyback should not differ substantially from the implications of a privately funded buyback discussed in Section 8.1.1.3.

8.1.2.5 Implications for Innovation

Since funding of effort reduction programs comes from external sources with this option, more private funding may be available for innovation.

8.1.2.6 Economic Implications

The economic implications of this option are similar to those in Section 8.1.1.5. However, there are some unique differences on the cost side associated with the possible financing variations associated with this option. The use of disaster assistance funds for a buyback provides greater benefit to the remaining permit holders in that it does not impose a cost burden in the form of taxes. The funds are spent to buy permits and when the money is used the auction is closed and the permits that remain will benefit from increased revenue potential, possibly reduced costs, and likely enhanced asset value of their permits. These benefits would accrue to those remaining without cost. A fundamental difference with a loan financed buyback is that it spreads the costs of permit buyback among all remaining fishermen via a tax. This would impose some cost for the buyback on all remaining participants. The amount of the tax would depend on the amount of the loan and the ex-vessel value of the fishery.

8.1.2.7 Social Implications

The social implications with a government-funded buyback should not differ substantially from the implications of a privately funded buyback as discussed in Section 8.1.1.6. These options do differ from previously discussed fleet consolidation methods in that the funding needed to accomplish these options would come either from government appropriations or loans and could involve an industry-wide tax on the remaining participants.

8.1.3 Consolidate the Fleet Without Out-of-pocket Expenses

8.1.3.1 Exclusive Group Registration (A-B permits)

This option is designed to reduce the level of effort used in any opening by half and, in theory could be accomplished with no out-of-pocket expenses. This could be done by assigning a letter to each permit (e.g., A and B). The group letter would designate each opening and each group would take turns fishing, so that they fished every other opening. Thus, only half of the available effort would be used during each opening.

Exclusive group registration is a form of effort reduction that eliminates some of the negative aspects of excess effort. However, unlike a buyback, exclusive group registration does not eliminate permits. Rather, it restricts their use to specific openings and reduces the amount of effort used during each opening. Whether this option would actually benefit the fishery depends on how it is implemented and on the relationship between effort level and harvestable surplus. The simplest assumption is that this option would simply cut fishing time for each group in half. With half as much fishing time available, harvesters would attempt to catch as much fish as possible to maximize revenue, which could worsen the race for fish and lead to increased capitalization. However, the net impact on harvesters would depend on whether the fleet can harvest the available surplus of fish using half as much effort. If so, there may be significant operating cost savings without an erosion of revenue and additional capitalization might not prove economical. However, if fishers find it difficult to maintain harvest levels with half as much fishing time available their revenue may decline and, depending on the severity of revenue reductions, could potentially offset cost savings. Of course, if harvesters cannot harvest the same amount of fish with half as much effort, managers may lengthen openings to compensate, which would erode some of the operational cost savings.

8.1.3.1.1 Possible Variations

A possible variation on this option that could provide added effort reduction features and improved revenue potential would be to allow ownership of up to 2 permits. In other words, a person could own an A and B permit and fish all the openings. This is similar to permit stacking except that persons who own only one permit would be restricted to fishing one set of openings. This variation could combine the benefits of effort reduction in each opening with fleet consolidation. Also, note that A-B permits and permit stacking options could be a follow on action to a government-funded buyback.

8.1.3.1.2 Biological and Management Implications

This option would affect the amount of effort that is utilized during each opening. In order to meet escapement targets, managers would have to monitor harvest levels to see how the change in effort affects harvests per opening. Fishery managers would then have to adjust the length of openings to meet harvest targets with less available effort. In large-run years, this could lead to exceeding escapement goals.

With A-B group registration, fisheries managers may have the added burden of ensuring that each group has access to equal or at least similar, quantities of fish. If the A group openings, for example, coincidentally occur when the greatest quantity of fish arrive the A group could catch a significantly greater amount of fish than the B group. This circumstance, while potentially balancing out over the season or between seasons, could create conflicts between groups over equal access to the fish. Fishers in the B group could demand more fishing time in compensation. However, it would be difficult to assess whether increased harvests by one group were the result of more fish being available, or, to a greater ability to catch fish (e.g., experience, equipment) by fishers in that group.

Managers could be put in a difficult position of trying to achieve some kind of harvest balance between the two groups.

8.1.3.1.3 Quality Implications

Exclusive group registration could provide potential for quality improvements. The potential for such improvements depends on whether the effort reduction means that openings are lengthened. If openings are not lengthened, the effort reduction cuts fishing time per permit holder in half and would likely worsen the race for fish aspects of the fishery. Quality improvements are not likely if that is the result. However, if effort reduction means that more time is necessary (longer openings) to harvest the available surplus, some quality improvements due to better handling, bleeding, and chilling may be possible.

8.1.3.1.4 Implications for Innovation

Similar to potential quality improvements, innovation potential with A-B group registration depends on whether the effort reduction means that openings are lengthened. If this is not the case, the worsened race for fish would make innovations in harvesting and processing unlikely. However, if the effort reduction means that more time is allowed, it creates the possibility for innovations.

8.1.3.1.5 Economic Implications

Fundamental to this option is the idea that the reduction in effort may reduce costs associated with crowding. It may also reduce operating costs by reducing operating time. However, unless reduced crowding significantly improves catch per unit of effort then a 50% reduction in fishing time could drastically reduce average revenue for some vessels. This is likely to occur for older, less capable vessels so the impacts on the revenue side may be disproportionately felt and may offset cost savings for some vessels.

Thus, while this option may significantly reduce operating costs and reduce crowding via reduced effort applied at any given time, it also has the potential to reduce revenue. It is not clear that the net change would be positive.

A-B group registration has the potential to reduce costs associated with enforcement. Cost of monitoring and compliance may also be reduced. These reductions would result simply from having half as many vessels to keep track of during any given opening. There would also be potentially fewer fish tickets and fewer data observations to keep track of.

8.1.3.1.6 Social Implications

If exclusive group registration results in significantly less fishing time, some vessels may not reap as much benefit as others in terms of improved CPUE brought about by reduced crowding. Such vessels are likely to be the older, slower, and less capable vessels. The tendency is that such vessels are often locally owned and operated. Thus, if exclusive group registration has negative effects on revenue, these vessels could be affected more than the newer and more capable vessels in the fleet and this could be felt disproportionately by local operators with associated impacts to local communities.

8.1.3.2 Permit Stacking

The permit stacking concept, in simple terms, means that more than one permit could be used on a vessel and is similar in many ways to the A-B license option. It too can be a means of consolidating the fleet without out-of-pocket expenses and could be a follow-up option to a government-funded buyback. If two permits were allowed per vessel, permit holders would either be allowed to purchase a second permit or two permit holders could fish one vessel in cooperation. In this way, permit stacking reduces the number of vessels actively fishing. However, the permit is not permanently removed from the fishery and could conceivably be sold or a partnership dissolved at some later time if fishery conditions improve. Thus, permit stacking is a fisher financed non-permanent reduction in fishing effort.

In the simplest case of permit stacking, each permit would retain the amount of gear it was allowed to fish when operated separately. Thus, two permits stacked on a vessel would be able to use twice as much gear as that vessel could have used before. However, many variations in the amount of gear allowed are possible.

8.1.3.2.1 Possible Variations

Permit stacking can accommodate many variations on the actual amount of gear used on vessels with stacked permits. These variations represent what is sometimes referred to as a "sliding gear scale." The sliding gear scale could also be considered as a separate restructuring option but it is most intuitively described within the context of permit stacking. The following are a few of the possible variations.

- Cut the number of shackles per permit to 2, but allow the 3 to 4 shackles per boat.
- Cut the length of a shackle from 50 fathoms to 25 fathoms, and keep the maximum number per permit to 3, but allow vessels to fish 6 shackles (2 permits).
- Cut the length of a shackle to 25 fathoms, but change the maximum number per permit to 6. Allow 2 permits worth of gear per vessels as long as the at least one permit is owned by a crewmember on board—the second permit can be leased or owned, but the leaseholder or owner must also be on board.
- Same as above, but the number of shackles per permit is set by ADF&G based on the pre-season forecast.

Permit stacking could also be accomplished by redefining the amount of gear assigned to each permit and by relaxing how the permits can be stacked. For example, the amount of gear assigned to each permit could be cut from 3 shackles of 50 fathoms each to 1 shackle of 50 fathoms. At the same time, transferability restrictions could be eased to allow leasing of permits on an annual basis. A vessel would be allowed to use up to 4 shackles of gear by leasing (stacking) permits with the requirement that at least one permit must be owned outright by a person on board the vessel. This permit stacking method would have the effect of reducing the amount of allowable gear on the water to 33 percent of the pre-implementation amount possible and would allow consolidation of the fleet via leasing.

Fractional permits offer yet another possible variation on permit stacking. To fractionalize permits, a shackle of gear might be redefined as 30 fathoms. Every permit would allow 5 shackles. Each shackle would be permanently assigned to one of the five Bristol Bay Districts. In effect, each permit would be divided permanently into five pieces. Transferability restrictions would be relaxed to allow leasing to individual persons that originally held a permit. A total fractional permit limit could be set. Further restrictions on having permit holders of leased permits on board the vessel could also be used. Fishers could either fish the amount of gear they are allowed in a district or lease additional fractional permits for that district to consolidate their effort within a district. Permit holders wanting to fish in Egegik could lease their non-Egegik fractions to other permit holders and lease Egegik fractions from other permit holders. Depending on the amount of gear stacking allowed, permit holders could lease enough fractions to be able to fish in more than one district.

Fractional permit stacking could consolidate the fleet as vessels incorporate permits into their portfolio. In the end it would be presumed that there would be an optimum number of vessels in each district. The allowance to have more than 5 shackles would encourage further consolidation. It would also be possible to vary the shackle length and/or number to allow increased or decreased gear usage depending on run size.

To compensate permit holders for lost fishing power and/or to facilitate leasing transfers these variations could be combined with grant and/or loan finance options. Each permit holder could be provided a $10,000 grant ($20 million total) from state and/or federal government and would also be allowed access to a revolving loan fund of up to $20 million from State or Federal government sources for the purchase or lease of permits. The grant to all fishers could be used for any purpose, but for many it could be used to pay back existing loans on boats and permits, or to purchase or lease additional permits.

8.1.3.2.2 Biological and Management Implications

Depending on how permit stacking is implemented and the amount of gear allowed, it could result in a reduction of effort either in the number of vessels, amount of gear, or both. This may make it easier to limit harvests during openings, especially in low-run years. However, in large-run years, management for escapement goals may be difficult by not having enough effort to take the available harvest. Effort reduction via a permit stacking could also cause problems with escapement management if a lot of permits were removed and the majority of the remaining permit holders chose to fish in one district. The 48-hour limit on permit registration transfer could limit effort redistribution in such cases potentially affecting escapement management. As a result, it may be necessary for management to adjust to the new effort levels within the season and change the timing of openings and the number of fishing days to reach harvest targets. Presumably, managers would be able to do this using the current district registration system.

8.1.3.2.3 Quality Implications

Effort reduction via permit stacking does not necessarily eliminate the race for fish; it just reduces the number in the race. The remaining participants will still be focused on maximizing revenue, which is simply price of fish multiplied by quantity. To maximize revenue they can either maximize volume for a given price or try to improve prices via improved quality but with potentially reduced volume. The tradeoff for fishers is whether revenue is greater with the greatest volume and a static ex-vessel price absent quality premiums or with reduced volume and quality premiums on price. Fishers will improve quality only to the point that the benefits of the quality premiums offset the lost revenue of reduced volume.

In theory, if total available harvest does not change, less effort on the water should translate into greater CPUE. If this is the case, fishers could take advantage of a greater CPUE by slowing their fishing activities in order to try to improve quality. In concept, they could catch the same amount as they did prior to effort reduction but with improved quality. If this improved quality translates into improve ex-vessel prices their revenue will increase and will compensate for slowing their pace of fishing. Alternatively, they could simply take advantage of greater CPUE by increasing volume in a given fishing period. The implications for improved quality, therefore, depend heavily on how much effort is removed, whether the pace of fishing is slowed, and the volume versus price tradeoff in total revenue.

8.1.3.2.4 Implications for Innovation

Innovation potential with permit stacking depends on whether the effort reduction means that openings are lengthened. If this is not the case, the worsened race for fish would make innovations in harvesting and processing unlikely. However, if the effort reduction means that more time is allowed, it creates the possibility for innovations.

8.1.3.2.5 Economic Implications

The concept behind this alternative is that it will reduce the number of vessels operating in the fishery. The reduction in effort will reduce crowding and eliminate operating costs for the idled vessels. Another factor on the cost side is that the "extra" vessel could be sold and that would reduce fixed costs of maintenance as well as finance costs. Thus, a partnership of this type may offer significant cost savings. However, savings in operating costs assumes that the vessel that is used is not fished twice as long and this is where the adjustment of gear is critical.

The increase in gear would enhance the ability of the two permit holders to catch more fish with one boat. If that enhancement results in catching the same amount as they caught with two boats in a similar amount of time as each fished previously then their total revenue would be the same (assuming no price change) but their operating costs could decrease resulting in greater net revenue. However, it is likely that limits on vessel size may require that they fish longer than each did previously to catch the same amount of fish.

Even if gear per vessel is doubled under a permit stacking system, vessel limits may make it difficult to achieve the harvest of two vessels with one vessel with twice the gear. A further complication is that not all vessels would necessarily be stacking permits in this way so there is no guarantee that openings would be extended to allow them more time to catch the same amount of fish.

8.1.3.2.6 Social Implications

There is the potential that a permit stacking could result in local residents of the Bristol Bay region and other parts of Alaska selling out to outside interests. It is possible that outside interests may have greater access to capital and may be savvier regarding the potential benefits they might gain by stacking permits. Local residents facing difficult economic times resulting from the fishery crisis may find the buyback appealing in the short term and may not be as economically diversified as outsiders. Local residents may not be able to hold out as long as outsiders and there is the potential that a disproportionate number of resident permits might be bought out.

If resident permits were retired, local communities might suffer from reduced local income. This could also affect local crew who may have difficulty finding positions on the boats of non-residents. Since fishing income is an important element of the local economies of Bristol Bay communities, the potential for income erosion represents a serious long-term concern. In follow-up work to this study, we hope to quantify impacts on communities of preferred restructuring options.

8.1.3.3 Potential Drawbacks to Permit Buyback Programs

Over the course of the study we often encountered the opinion from people in the industry that permit buyback programs were risky and would take valuable resources away from improving the fishery and instead provide a funded way out for those no longer interested in fishing. Although we do not necessarily subscribe to these opinions, we do see some potential drawbacks to permit buyback programs. Four potential drawbacks to a permit buyback program are:

1. Return to pre-buyback conditions over time ("backslide").
2. Take resources away from other investment opportunities in the fishery.
3. A buyback program may delay implementing "necessary" actions.
4. Permits may be put back into the fishery in the future.

8.1.3.3.1 The Potential for Backslide to Pre-Buyback Conditions

A permit buyback program (or any other restructuring option) implemented without eliminating the race for fish conditions in the fishery may create only short-term gains – within a decade or two, the net wealth in the fishery may be the same as pre-buyback conditions. As was seen in Bristol Bay in the 1980s, whenever there is new wealth in a derby-style fishery, it will pay for individuals to invest in their fishing operation to beat the competition to the fish. In the 1980s, fishers were rewarded handsomely by investing in boats and fishing operations that were larger, faster, and more sophisticated, largely at the expense of those who did not invest in their boats and fishing operations. Most of the additional expense of all the new boats and equipment was not really necessary as we know that up to 25 million fish had been harvested with fewer pre-1970s boats. A permit buyback program that create new wealth in the fishery will also create similar conditions to what existed in the 1980s when runs and fish prices climbed to create new wealth in the fishery.

Economists refer to the process of building faster, more sophisticated, and more efficient fishing gear as "capital stuffing." Even though the overall length of the boat may be limited to 32 feet, capital improvements can be "stuffed" onto the boat that might be less efficient than just building a bigger boat. However, in the race for fish conditions, it still pays to stuff capital because it allows the operator to increase their share of the available harvest (relative to other permit holders).

There is good reason to believe that new wealth created by a permit buyback program in Bristol Bay would create conditions that would encourage new investment by some participants. Imagine the following scenarios: a pre-season forecasted harvest of 25 million fish, only 1,000 driftnet permits in the fishery, and an expected price of 70 cents a pound. The permit holders who had been considering upgrading to a faster, bigger, and more powerful boat will certainly see a strong incentive to upgrade – doing so would significantly increase their share of a valuable catch. Over 10 or 15 seasons, the cost of these new investments will tend to offset or cancel out the gains initially made by the permit buyback. Again, this "backslide" to the wealth similar to the pre-restructured state of the fishery will occur to some extent with all options that fall short of eliminating the race for fish and its incentive to win the race for fish. An example of the potential backsliding effect was presented in Figure 20 in Section 7.1.1.2.

8.1.3.3.2 Take Resources Away from Other Investment Opportunities

A buyback program in Bristol Bay will likely require a considerable outlay of funds. Given that the funds would be spent on those leaving the fishery, they will not be available to invest in the fishery on other restructuring activities in infrastructure. If the program is entirely funded by government, it is really up to those leaving the fishery to decide whether they are willing to leave for the purchase price of the permit. If the permit buyback program is funded entirely or in part by permit holders the decision of whether to spend the money on a buyback is up to those remaining in the fishery.

An example may best illustrate the trade off that must be made by a fisher-funded buyback. Realistic scenarios for a buyback might be to purchase 800 driftnet permits for $50,000 each or 1,000 permits for $40,000 each. The permits would cost $40 million to purchase. Further assume the government would grant half of this amount (some people argue that is an optimistic scenario). With a long-term, "low" interest loan (6.67%, i.e., 2% over yield on Treasury Bonds with same maturity) over on the remaining $20 million, under the 800-permit buyback each fisher would have to pay $2,098 per year for 20 years and under the 1,000-permit buyback, each fisher would have to pay $1,708 per year for 20 years. The total amount remaining permit holders would have to pay over the term of the loan would be $42,000 and $34,000, respectively. Each permit holder remaining in a post-buyback fishery would have to weigh the value of their investment and compare it to other investments in the fishery or outside the fishery. In 2002, about 600 driftnet permits holders chose not to fish and the thought of paying them to do something they are already doing seemed an odd investment for many people we spoke with.

8.1.3.3.3 A Buyback Program Might Delay "Necessary" Action

There is no question that a buyback program would create some new wealth in the fishery and help those both leaving and those remaining in the fishery. Some have argued that this modest influx of wealth will delay necessary (and more radical) action to restructure the fishery. This view is one expressed by those who see eliminating the race for fish as the only long-term solution to creating a sustainable and profitable fishery in Bristol Bay. This view also sees that modest improvements to the income from the fishery will not be a long-term solution and to delay radical action will put the industry in a position where it can't recover. Furthermore, proponents of more radical changes to the fishery argue that the current political will and economic incentives that are now present may not be there in the future. Trying to implement fundamental and possibly expensive changes to the fishery will be impossible if there isn't the political will and/or public support. This view can be thought of as the "strike-when-the-iron-is-hot" philosophy.

8.1.3.3.4 Permits Might be Put Back into the Fishery in the Future

If economic conditions in a post-buyback fishery dramatically improve, there is a very real risk that individuals outside the fishery would challenge the level of limited entry as too exclusive under the Alaska constitution and demand more permits be issued and sold for the fishery. The limited-entry statutes are in direct conflict with the Constitution's "no exclusive access" clause and courts have to carefully interpret each challenge (Appendix G). If there were 1,000 driftnet permits left in the fishery and conditions changed so that average incomes increased dramatically, the courts would likely be compelled to allow additional permits to enter the fishery, thereby defeating the purpose of a large investment in buying permits.

In summary, there are numerous ways of reducing the size of the fishing fleet. Most have been tried in salmon fisheries elsewhere and all could probably be implemented in some form in Bristol Bay. Some methods require external financing (permit buybacks) and others can be done without out-of-pocket expense (permit stacking, A-B licenses). A fishery in Bristol Bay under these fleet consolidation options would operate similar to the way it does today.

8.2 Spread out harvesting across time

As discussed earlier, there may be significant benefits to moving away from short and intense fishing periods to longer, less-intense fishing periods. Benefits would come from better use of capital, crew, and processing facilities. In addition, there could be potential improvements to the quality of the harvest under a slowed-down fishery. Significant reductions in the number of permit holders would help to extend fishing periods and make more economical use of harvesting and processing equipment. However, there may still be times when managers, particularly early in the season, must delay opening a fishery because of the uncertainty over how many fish might be taken.

How could this be achieved under the current management system? If managers were able to control the level of harvest in these openings by specifying a "quota" or total catch limit for the fishing period, they may be willing to open the fishery more often and spread the harvest out over time. Currently managers can only restrict fishing to specific time and areas and cannot specify catch limits. To change that would require a regulatory change to provide managers the ability to limit participation in a given fishing period and limit the amount that individual vessels could harvest during a period.

Although managers in the Bay often taken into consideration harvesting and processing capacity when making management decisions, an explicit goal of spreading harvesting across time involves making this consideration an explicit responsibility. Since shortly after statehood, managers' primary objective has been to meet escapement goals. To spread harvesting across time would require giving managers additional tools to meet new objectives, which include optimizing the use of harvesting and processing equipment, maintaining high quality of harvest, AND meeting escapement goals. In a system that has managed salmon stocks for "maximum sustained yield" of weight or "biomass" of fish, adding other management objectives may seem difficult to envisage for many people.

8.3 Alternative Harvesting Methods

Implementing alternative harvesting methods under the current management system would be difficult. The biggest limitation or constraint to implementing alternative harvest methods is deciding on what grounds to assign permission to those who may use the new gear. It would be difficult or at least problematic to assign rights to use alternative gears to a subset of permit holders within the current limited-entry system. With alternative gears operated from a fishing vessel, it might be possible to create a separate user group, sort of like the set and driftnet groups, and assign the new group an allocation (% of the harvest) in the district management plan. Assigning rights or permission to operate a fish trap under the current system would be even more problematic than permission to use alternative gear from a boat. Deciding how and to whom to grant permission to different individuals or groups for fish trap sites without actually assigning a share of the harvest would be difficult. These problems ultimately stem from the presence of a race for fish and therefore, alternative gears are likely best explored in the context of assigning a harvest share to individuals or groups.

In contrast to the limited-access, derby-style fishery, one operated under a harvest share system would facilitate the exploration of alternative harvest methods because it can eliminate the competition among user groups, allow for relatively simple mechanisms for the introduction of more efficient gear, and simplify the distribution of benefits from more efficient harvesting.

There *are* ways of engineering the use of more efficient gear while keeping the race for fish in place, but they get complicated quite quickly, they would likely require considerable effort and expense to administer. Unless the new gear was made mandatory across the entire fishery, it would be difficult to fairly accommodate those who prefer to use existing gear.

8.4 Improve Product Quality

Currently, Bristol Bay produces, on average, produces moderate quality product because it hasn't paid to produce a higher quality product in the past. Current quality levels can be attributed to a large volume of fish landed in a short period of time in the fishery and because it has simply been more worthwhile for fishers to land a large volume of modest-quality fish than it has been to land a much lower volume of high-quality fish. When prices where high, producing modest-quality fish produced good incomes. As the market place changed, the market for modest-quality fish reached a level where fishers can barely cover their operating costs. This adjustment to the equation has forced many to search for ways of improving the quality of the harvest.

There are two fundamentally different approaches or options for improving product quality of the Bristol Bay catch. The first is to mandate through legislating quality standards, fishing practices and processing procedures that produce the highest quality product. The second approach is to put in place a system that creates incentives for the industry to maximize the *net* return from improvements to product quality. It is beyond the scope of this project to design quality standards for the Bristol Bay salmon fishery. Instead, we want to point outs some strengths and weaknesses of different options for improving quality. As discussed earlier, debate over how to encourage improvements to quality comes down to a philosophical debate of which is a better approach:

1. Top-down, centralized management of the harvesting and processing business, or
2. Bottom-up, incentive-driven innovation.

A problem with the first approach is that it is difficult for something as rigid as legislation to find the balance between volume and quality that maximizes the economic return to those in the industry. The solution is not to produce the absolute highest quality product possible. Instead, the solution is to produce the best net return from investments in improvements to quality. In Bristol Bay, catching all the fish at the peak of the run requires that individual fish simply cannot be handled as often and as carefully as in other low-volume fisheries. Investments in quality will come from additional and more careful handling procedures and could result in foregone harvest if they were continued through the peak of the run. Given the short, intense season, some investments in infrastructure to improve quality appear difficult to justify in the present market conditions and state of the industry. For example, what if mandatory icing or chilling standards for all Bristol Bay fish was to cost the industry $5 million a year, but it only increased the market value of the harvest by $4 million? In such as scenario, mandatory chilling standards would simply not benefit the industry. This example is only for illustration of the point that it may well cost more in some case to improve quality than the market will support. We did examine in a preliminary manner the value of investments in ice infrastructure in Bristol Bay and although there are potential significant positive net benefits from implementing a Bay-wide slush ice program, the exercise becomes a very complicated benefit-cost analysis because many assumptions must be made about the final product mix and premiums paid for higher quality products (Appendix F). A conclusion we drew from this preliminary analysis is that it requires considerably more work to be confident that huge investments in chilling infrastructure to improve quality are worthwhile in Bristol Bay.

In the end, it may well be worthwhile to vary the quality of the product produced across the season. For example, ice fish at the beginning and end of the run and put fish from the peak of the run in cans. Legislation of quality standards could be designed to accommodate this by specifying periods of time or volume levels when chilling was mandatory, but administration and enforcement would become complicated.

Creating bottom-up, incentive-driven innovation to improve quality relies on harvesters and processors to decide the level of quality improvement that will be worthwhile given the dynamics of the salmon runs, the cost of doing business in the Bay, and other realities of operating. The level of quality will be produced that will provide the greatest *net* return to them. If it pays to produce high-quality fillets from bled and chilled fish early in the season, put fish in a can at the peak of the run, and then custom smoked fillets at the end of the run, then the industry will find ways to do it. However, as we have discussed on several occasions earlier in this report, the race for fish puts in place an incentive that, all other factors equal, tends to favor volume over quality. Eliminating the race for fish would provide this bottom-up incentive-driven approach to improving quality.

8.4.1 Marketing the Harvest Better

In many food sales situations marketing is an effective way to boost prices. Companies, countries and regions believe it works and spend extremely large amounts of money on market research, strategic plans and promotions. Norway alone is reported to spend approximately $40 million per year promoting farmed salmon. Year after year Norway and others use marketing to spur sales - evidence that *in the right conditions* marketing salmon probably generates more than it costs.

Although strictly speaking marketing is not a restructuring option – it is discussed here because it and improved quality are a major factor in the revenue building aspects of restructuring efforts. Marketing is also important to discuss here because fishery participants consider it and quality as an important part of a solution. Input at the town meetings, from letters, e-mails and from the mail-in forms mentioned marketing and quality more often than any other issue as a solution to economic issues affecting Bay salmon fishery. It is not the subject of this Study, however, to examine past or future marketing campaigns. Marketing issues presented here pertain to the general role of marketing, what must change in order to justify increased investments in marketing, and how it all relates to restructuring. It is beyond the scope of our analysis to answer the question: How much money should be spent to market Bristol Bay salmon and what should such a program look like?

8.4.2 Marketing Basics

Marketing programs attempt to increase the price of a product by shaping or leading the decision to buy. They try to persuade buyers that one product is superior to a competing item, and thus deserves a higher price. Marketing is most effective when competing products are similar. Under those situations, marketing campaigns set up implied comparisons (or product differentiation) to emphasize merits of the product. Marketing builds on a product's features. The more apparent the merits, the easier it is to convince buyers to prefer one product instead of another. In other words it's important that a product's features support the marketing message. Marketing cannot say one thing and the features imply another.

A key marketing feature in all products is quality. Consequently, it is an important part of every product's marketing message—especially so in food marketing. Quality includes a variety of factors—some obvious; some less so. When all of those factors reinforce the overall message, it can be very effective. If one factor is noticeably weak, it damages the product's overall impression. The quality message must be supported by the buyers' observation.

The most influential marketing messages are those that are readily confirmed by the customer. In marketing Bristol Bay sockeye, less tangible features such as the health benefits to consumers are often overshadowed by farmed salmon's more obvious characteristics of freshness or unblemished meat. Further, as noted above, the various elements of quality should reinforce each other; good taste should accompany good appearance. It is hard, for example, to convince buyers to pay a good price for a bruised apple even though it is still healthy to eat.

Finally, it is important to carefully identify the reasons for depressed prices before embarking on an expensive marketing campaign. Marketing is notoriously expensive and its results are hard to measure. As a consequence, marketing alone may not be the most cost-effective path to higher prices if there are other reasons for low prices. Marketing, for example, cannot fully compensate for low prices due to poor quality or an oversupplied marketplace. Unless low prices can be traced to low awareness of a product's features, marketing may prove to be an expensive undertaking with uncertain results.

8.4.3 Marketing Bristol Bay Salmon

Participants in the Bay salmon fishery recognize the current quality deficiencies of Bristol Bay salmon. Comments about quality and marketing were the majority of public comments received by the study. Many of the comments contained numerous examples about how poorly sockeye are now handled.

Clearly they felt quality was a problem and a barrier to more effective marketing and higher prices. We concur.

Farmed salmon now sets the standard for visible quality. Alaska still holds the high ground on the more subjective features of health benefits and flavor. But, as noted above when visible and subjective features are presented side by side, many buyers will opt for the product with better visual appeal over bruised fish that may offer more health benefits. The Alaska Seafood Marketing Institute promotes pretty fish but the Bristol Bay fisheries often deliver a visibly poor product, effectively undoing many of the promotional benefits.

The average quality of frozen headed-and-gutted sockeye from Bristol Bay is low. Informally, processors report that just 35-60% of their frozen pack is #1 grade. The frozen pack is roughly 50 % of the total harvest; the other half is canned. Many would say that most of the fish being canned would, if frozen, be #2 or #3 grade. For the sake of argument, assume that all canned fish are #2s. Therefore, if the entire harvest was frozen it is likely that 70-85% would be #2 or #3 grade. One reason for this is that fewer than 15% of harvesters can or chose to chill their fish. This and other shortcuts are necessarily taken for the sake of speed and volume mandated by both the run dynamics and the derby-style fishery.

While it is possible to market today's products in such a way that might create a minor price improvement the question remains, is increased marketing of Bristol Bay salmon among the most important next steps to be taken to improve fishery economics? Will improved marketing of today's Bristol Bay salmon generate more net wealth than investments in other options? And is marketing alone the best step toward rebuilding the economic health of the Bay fishery?

The short answer to these questions is no. One key reason is due to a worldwide oversupply of salmon and the ability of farmers to quickly capitalize on dips in supply or increased demand. However, marketing, and more specifically improved quality, can make Bristol Bay salmon more competitive even in an oversupplied market. A consistent level of quality will enable marketers of Bristol Bay sockeye to obtain a premium price based on the attractive differentiation of being wild, natural and sustainable. Quality standards are rising, pulled upward by carefully handled, farmed salmon. But quality issues in the Bay are more than skin deep; too many fish have severe bruises, limited shelf life and gaping. Impaired quality impairs marketing effectiveness and wastes marketing dollars. Boosting quality is a necessary first step to increasing fishery revenues.

8.4.4 Quality First

Roughly 40-65% of frozen Bay sockeye from recent annual harvests are #2 or #3 grade. Such fish are rarely the subject of marketing and are often known as "price takers." After filleting, even #1 headed-and-gutted salmon from the Bay have an unacceptably high percentage of bruises, gaping and other visual defects related to poor handling practices. It would be prudent to increase quality to increase the percentage of fish potentially benefiting from marketing before increasing expenditures marketing. Bristol Bay will not see price increases based on good intentions for future improvement. The market rewards actual features, not unsupported promises and marketing will not bridge the quality gap between Bay fish and the competition.

Once quality is raised, improved marketing can increase revenues with the doubly potent message of good visible quality PLUS health benefits, environmental-friendliness and superior taste. Once Bay salmon improve to this point, their visual and qualitative features can align and support one another in what could be an effective message.

Marketing, quality, and restructuring are intertwined issues. Quality improvements should logically precede investments in marketing. Marketing success depends in large part on a product having attributes that are competitive with other similar products. Further, each of a product's attributes must support and validate the others. As it now is, the marketing strengths of meat color and naturalness of Bristol Bay sockeye are diminished by the high incidence of bruising, gaping and high bacterial loads. Until these quality issues are addressed either through restructuring or by regulations the full revenue potential of the Bristol Bay salmon resource will not be realized.

8.5 Reduce or Eliminate the Race for Fish – Assign Harvest Shares to Permit Holders

Eliminating or dramatically reducing the race for fish could be achieved by allocating a share of the harvest to individuals or groups of individuals in the fishery. The reasoning is that by guaranteeing a harvest share, participants no longer have a powerful incentive to beat other harvesters to the fish. Instead, harvesters and processors can slow down and optimize fish quality and the use of equipment.

A harvest share system in a fishery allocates a certain fixed percentage of the total available harvest to eligible participants. Participants can include harvesters, co-ops, harvest sectors, communities or processors. The share assigned to participants may be based on past catch or processing history, past participation level, or simply split equally among all participants. In addition, special set asides of harvest share can be made for communities or special groups. A harvest share system would not entitle participants to a fixed *amount* of harvest (number of fish or pounds of fish) each year because the salmon returns vary among years and the accuracy of pre-season forecasts is too low to allow setting of catch quota prior to the start of the season. Instead, participants would be allocated a fixed percentage of available harvest and the harvest would have to be determined during the season.

The issue of assigning harvest shares to permit holders in salmon and other fisheries is contentious and somewhat complicated to design. A related (but different) form of fishery allocation, the individual fishing quota (IFQ), has been subject to a national moratorium and has recently been reviewed at length[37] and strongly contested by some as a panacea for solving problems of our national fisheries[38]. It is beyond the scope of this effort to delve into an extensive academic analysis of the pros, cons and limitations of harvest share systems. Before a harvest share system could be considered and designed for the Bristol Bay fishery, a careful and probably lengthy analysis and public consultation process would be required.

Having said that, we will proceed with a preliminary look at a harvest-share system as an option for Bristol Bay because it offers the *potential* to capture significant foregone wealth and was suggested by some knowledgeable people in the fishery as the *only* way to make the fishery profitable and sustainable in the long run. Adding to this optimism over harvest shares has been a recent, and by many accounts, successful example of a harvest share system implemented in an Alaska salmon fishery (Chignik). It would be premature and beyond the scope of this report to describe in *detail* any specific version of what a harvest share system for Bristol Bay should look like – we think the industry would be much more capable of designing such a system than we are. Instead, we highlight some possibilities, limitations and implications of a harvest share system for Bristol Bay.

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[37] Sharing the Fish: Toward a National Policy on Individual Fishing Quotas. 1999. National Academy Press, Washington, DC.

[38] Macinko, S., and D.W. Bromley. 2002. Who Owns America's Fisheries? Island Press Publication Services, Available online at www.islandpress.org

8.5.1 Basis for Assigning Harvest Shares

One of the most contentious issues regarding a harvest share system is how to allocate the share of the total harvest to participants. At least three choices are available to base the share allocation:

1. Each permit holder receives an equal share.
2. Shares are based on permit holders' past catch history.
3. Based on a combination of equal-share and catch-history weighting.

There are compelling arguments for each of these approaches. Proponents of equal shares see all limited-entry permits as equal and individual permits do not carry more value or "access" to the fishery than other permits. They argue that each permit allows one to operate in the fishery, so why should one permit provide a smaller share than any other, just because the current owner has not fished as hard or has not invested as heavily in equipment to increase their share of the annual harvest in the past. Some argued that they deliberately did not overcapitalize their vessels on purpose and any system other than equal share punishes them for being rational about their investments in the fishery. Proponents of allocation based on catch history see a wide variation in how much different permit holders have invested in the fishery and believe that a person who has invested heavily in the fishery and spends a large portion of their time working in the fishery should be provided a greater share than others who do not. Proponents of the combination method see validity in both arguments and take a practical approach to resolving the dispute.

8.5.2 Processor Shares

Another controversial aspect of the option of assigning harvest shares is whether processors should be assigned "processor shares." Like harvest shares, processor shares would guarantee particular shares of the harvest be sold to individual processing companies. For example, a processor that historically processed 10 percent of the Bristol Bay harvest might be guaranteed 10 percent of the annual volume from the fishery. Harvesters see this as an infringement on what they believe should be a right to sell their fish to whomever they chose. The argument for assigning processor shares parallels that made for assigning harvest shares to current permit holders. Like harvesters, processors who operate in Bristol Bay have invested substantial time and resources in the fishery. Most processing companies maintain extensive shore-based facilities that cannot easily be moved to other fisheries. A legitimate worry they have under a harvest share system is that once harvesters (through cooperatives) control large segments of the harvest, processors may be "left in the cold," with little or no fish to process. In such situations, their facilities and substantial investments become "stranded."

This situation occurred in Chignik in 2002 with a single cooperative operating in the fishery that controlled 65 percent of the harvest and a group of harvester with access to the remainder of the catch through the competitive fishery. The harvester cooperative in Chignik bargained pre-season with two large processors and eventually sold fish to only one (and sold fish to a processor outside of the region). The other processor incurred costs of gearing up a plant that eventually processed little or no fish.

Another argument for processing shares can be found in the sablefish and halibut fisheries. In 1995 these fisheries changes from a race-for-fish management regime to an Individual Fishing Quota (IFQ) system that provided harvesting shares to catcher vessels with a history in the fishery. Since implementation, the program has generally been viewed as very successful from the harvester's perspective, but many processors and communities have not been as pleased. Processors in communities that do not have good access to air transportation appear to have lost relative shares of the fishery, while processors and communities with better air infrastructure have gained shares. In some communities processing of sablefish and halibut has gone from very important to almost non-existent. The lack of halibut and sablefish processing can create cumulative effects as well. Some processors believe that the reason salmon processing in the City of Yakutat has fallen off, is a result of the decline of sablefish and halibut processing that has occurred since implementation of IFQs.

Like the issue of whether harvest shares should be based on equal share versus catch history, the issue of processor shares has valid points on both sides of the issue. Designing a system that would work for Bristol Bay is probably best done by having all parties get together and working out a solution through a negotiated process.

8.5.3 Community Shares

In addition to harvesters and processors, communities in the Bristol Bay region have a tremendous amount invested and at stake in the fishery. To protect those investments and not be "left in the cold" by harvesting or processing cooperatives in the future, it is conceivable that under a harvest share system communities would argue for an allocation of harvest and/or processing shares. Community harvest shares in Bristol Bay might be similar to the Bering Sea groundfish quotas allocated to Western Alaska communities through the Community Development Quota (CDQ) Program.[39] Alternatively, community shares might be modeled after the Crab rationalization program, which was initially approved by the North Pacific Fishery Management Council in 2002. Although the program is not yet finalized, protections would link processing activities to communities in which the historical processing activity occurred.

8.5.4 Setting Allowable Harvest

Determining the allowable catch that harvesters may take with a harvest share is difficult in the salmon fishery. Salmon stocks are most productive when managed to meet escapement goal ranges and, given that pre-season forecasts of returns are inaccurate[40], managers do not know what the allowable harvest is until well into the fishing season. The problem is confounded further because salmon die after they spawn – mistakes of too few fish harvested in a season cannot be reversed by "catching up" the following year. This is in contrast to long-lived fish species such as halibut and sablefish, where there is little loss if the entire quota is not caught in a given season; the quota can be increased the following year. Some see the difficulty of setting harvest levels for a harvest share system with salmon fisheries as an insurmountable problem. Others, including managers of the Bristol Bay salmon fishery, believe it may be possible to set period-specific allowable harvests with the highly compressed run. The current management system in Bristol Bay relies on frequent exchange of information on catches and catch rate between managers, fishers and processors. With these and timely escapement information, managers can quickly update run-size predictions and determine allowable harvest levels by date. With precaution and in-season adjustments, managers may be able to set allowable catch targets for 3- to 7-day periods (shorter periods during the peak of the run).

Through talking with those very knowledgeable about the information-gathering and decision-making system used to manage the Bristol Bay fishery, we are convinced that it is worthwhile to at least explore the idea of a harvest share system further. Although it would probably never be possible to

[39] The Community Development Quota Program. (1999) A book summarizing a review of the CDQ program prepared by the National Research Council. National Academy Press. Washington, DC. 215p.

[40] State-of-the-art forecasting methods routinely produce pre-season forecasts for Bristol Bay systems of ½ to 2 times the actual returns (Adkinson and Peterman 1999), thereby precluding any ***pre-season*** setting of allowable harvest under a harvest share system. Adkinson, M.D., and R.M. Peterman. 1999. Predictability of Bristol Bay, Alaska, sockeye salmon returns one to four years in the future. North American Journal of Fisheries Management 20:69-80.

know with great certainty how many fish could be taken for the year in the first few days of the season, sufficient information would likely be available to allow catch allocations to be made weekly or every few days, thereby eliminating many of the detrimental aspects of the race for fish. Once the attention of fishers, processors and managers were focused on making such as system work, it would evolve and be refined quickly.

8.5.5 Possible Variations

Unlike other restructuring options discussed in this report, the possible variations of a harvest share system in Bristol Bay are almost limitless. However, there are a few important aspects to consider when considering such a system for a fishery like Bristol Bay. To review, key sources of potential wealth that harvest shares offer come from: reducing the fleet, spreading harvest over time, exploring alternative harvesting methods, improving quality and eliminating the race for fish. Whether and to what degree harvest shares can be amalgamated will influence whether it is possible to capture these sources of wealth.

8.5.5.1 Simple Harvest Share, no Cooperatives

Perhaps the simplest form of a harvest share system would be to attempt to manage the fishery with about 2,900 individual fishing operations, each entitled to about 0.035% (1/2,900) of the available harvest. (This was one suggestion put forth to the study team.) Apparently simple at first glance, it would probably the most difficult harvest share system to manage. Such a system provides no mechanism to consolidate the fishing fleet, would be difficult to administer and enforce, and would do little to eliminate the race for fish. If the harvest shares could not be amalgamated and fished by groups or cooperatives, little or no consolidation of the fleet could occur. With 2,900 fishing operations, individual operators would still face strong incentives to catch land their fish quickly in case they encountered problems (mechanical, weather, bad luck) and were unable to meet their period-specific catch quota, thereby doing little to slow the race for fish. Some operators might specialize in catching large volumes of fish and just be sure to offload their catch to others who were less successful during a given period. Overshooting harvest allocations might be a common and difficult problem to avoid and enforce in such situations. With most of the potential benefits from a harvest share system expected from consolidating the fleet and reducing or eliminating the race for fish, implementing a harvest share without cooperative harvesting operations would likely provide little or no net benefit over the status quo and be difficult to administer and enforce.

8.5.5.2 Harvest Shares and Simple Harvesting Cooperatives

The next simplest form of a harvest share system would be to allow permit holders to form simple harvesting cooperatives. Regulations might be implemented that allow two or three harvesting cooperatives to operate in each fishing district. Permit holders could join one of these cooperatives and bring their share to the cooperative. Others may be eligible to remain in the competitive fishery. Managers would then manage each fishing district to meet the allocation split among the cooperatives and competitive fishery, similar to the way they manage for allocation between the set and driftnet groups now. This would be similar to the way the Chignik co-op operated in 2002. In Bristol Bay, a harvest share would be somewhat more complicated than in Chignik because there are multiple districts and a much greater number of permit holders in the Bay (2,900 versus 105). Several systems could be developed to deal with how harvest shares are handled among districts. For example, if 300 permit holders joined a coop and were entitled to 10% of the harvest in the Bay, they could chose to catch 10% of the fish in each district or they could fish in one district and trade their catch allocations for other districts with other cooperatives.

There are numerous ways a system could be designed with simple harvesting cooperatives but the important point is that the presence of cooperatives will allow the system to capture the several sources of wealth mentioned above. With only two or three cooperatives operating in each district it will be possible to significantly consolidate the fishing effort, allow exploration of alternative harvesting methods, spread the harvest over time, and improve product quality. Most importantly, a few cooperatives in each district could significantly reduce or eliminate the race for fish. With an allocation of a sufficient portion of the catch, harvesting cooperatives would have the resources and "economies of scale" to exploit these sources of wealth. Processors dealing with co-ops could negotiate for large amounts of fish and, with additional certainty of volumes, could strike pre-season deals with buyers for tightly specified (value-added) products. Knowing volumes ahead of time may allow processors to employ just the right amount of capacity to handle the catch and costs associated with excess capacity could be reduced. In addition, management of the fishery would be much more tractable than trying to administer and manage 2,900 harvest-share operations.

8.5.5.3 Harvest Share with Integrated Cooperatives

Simple harvesting cooperatives could take advantage of several ways to reduce harvesting costs and improve product quality. They could also reduce processing costs by slowing the pace of deliveries and generally improving coordination with processors. However, greater savings might be possible if cooperatives were more fully integrated operations and included processing and marketing aspects of the business. A pre-season indication of what level of harvest share a cooperative could expect would increase the efficiency of business and marketing planning.

The extreme version of a harvest share system would be to permit a single Bay-wide integrated cooperative to further reduce overall harvesting and processing costs and facilitate business and marketing planning. This option is at the opposite end of the spectrum from the option of 2,900 harvest shares and no cooperatives. Such a scenario would also lie at the upper end of the potential for innovation to create substantial wealth from the fishery. However, it would likely not be politically feasible given the diversity of participants in the fishery.

8.5.6 Other Issues with a Harvest Share System

As pointed out earlier, the harvest share system is contentious and there are numerous significant issues. Some of these other issues include:

- Protecting access to the fishery for those who chose to remain in the competitive fishery.
- Absentee ownership of harvest shares (i.e., do harvest share owners need to be present on the fishing grounds to "enable" their shares).
- Limits on concentration of shares and numbers of cooperatives.
- Distribution of benefits from cooperatives.

These are design issues that are beyond the scope of this report and are things that would need to be worked out by those in the industry should they consider exploring harvests shares as an option for Bristol Bay. Although *designing* a harvest share option may appear complicated, a fully functioning one may be much simpler than the current fishery and generate substantially more income to participants. Therefore, it seems foolish to eliminate the option of harvest shares at this stage of discussion.

8.6 Investments in Infrastructure

An analysis of infrastructure options, found in Appendix F, provides an initial assessment of potential costs and benefits of three types of infrastructure option that have been considered important to the Bristol Bay Salmon fishery:

- Ice Infrastructure
- Air transportation infrastructure
- Land-based transportation infrastructure

In general, the assessment finds that while the improvements to infrastructure have the potential to significantly improve benefits and wealth generation from the salmon fisheries in Bristol Bay, the costs of the proposed developments far exceed the benefits that would accrue to the fishery alone. It should be noted however, that air- and land-based transportation infrastructure improvements will generate significant benefits outside of the fishing industry, and therefore may merit further study.

8.6.1 Ice Infrastructure

Slush icing could have a significant effect on the quality of Bristol Bay salmon. Preliminary indications from the 2002 BBEDC ice project are that the proportion of number one grade fish may double from about 30 percent to as much as 70 percent with slush ice techniques. This could allow for a significant increase in the amount of fish that are suitable for processing into fillet form and could generate an estimated $1.3 million in premiums for harvest vessels based on 2002 harvests and prices. If it is assumed that ice production and storage must be sufficient to meet peak demand during 2001, then daily production of ice in Bristol Bay would need to be at least 850 tons, and there would need to be storage capacity of 1,250 tons. In addition to production and storage, the ice would need to be distributed across the relatively large Bristol Bay region. Costs of developing ice-making, storage, and delivery systems are not available at this time, but are expected to significant. Finally, many of the vessels and set-net operators in the bay do not currently have the necessary equipment to keep fish in ice if the ice were available. Outfitting the operators is expected to cost at least $2,000 per operator for up to 1,300 vessels or $2.6 million.

8.6.2 Air Transportation Infrastructure

Existing air facilities in Dillingham and King Salmon are adequate for both jet aircraft and other large cargo aircraft and are served with regularly scheduled freight service. The Egegik runway extension completed in 2002 allows large cargo aircraft, such as DC-6s, to serve that community.

Backhaul freight capacity is currently underutilized. In addition, “flagstop” capacity could be added on the five-day-a-week return trip from Bethel that at least three carriers currently fly. Charter service could also be added if salmon market prices improved enough to offset the added cost. Direct transport from Bristol Bay to lower 48 markets or overseas could be supported with available facilities at King Salmon. However, the high cost of fuel in Bristol Bay and the high cost of charter service (i.e., no backhaul) make this option expensive.

8.6.3 Land-based Transportation Infrastructure

Roads from Chignik to Port Heiden and around Bristol Bay to Dillingham via Naknek and Igiugig and another road from Igiugig east along Lake Iliamna over the Alaska Range to Williamsport on Cook Inlet have been proposed. Initial studies of costs and benefits were included in the Southwest Alaska Transportation Plan. The preliminary estimate of the total cost for all of these roads is $915 million.

For the fishery itself, the roads would reduce freight costs, reduce fuel costs, fishing and processing crew transportation costs, and generally make it less expensive to do business in Bristol Bay. In addition, development of these roads will enhance development of mineral and natural gas industries and could improve possibilities for tourism. The roads will also reduce local transportation costs and will enable regional coordination of services.

8.7 Summary—Promising Options to Restructure the Bristol Bay Salmon Fishery

In light of the preceding analyses, it is clear that the biggest source of new wealth in the Bristol Bay fishery would come from **reducing harvesting costs**, followed by increasing revenues through improving product quality and increasing marketing efforts. It is also clear that there are few restructuring options that actually put in place the changes necessary for those in the industry to capture them. For example, improving quality and/or spreading out harvesting over time can only be tackled by getting at the source of the leakage of wealth – too many boats competing against each other during limited fishing periods. Reducing the number of permits and getting managers more involved in the fishery are options that can capture some of the wealth from these sources. Assigning shares of the harvest may eliminate the race for fish and allow participants to capture wealth that is lost from a variety of sources.

These options can be viewed as nested with respect to each other and the sources of wealth they may capture.

Reduce excess capacity
Spread out harvesting — Permit reduction/consolidation
Alternative fishing methods
Improve quality — Assign Shares
Market better — Increase Role of Management
Eliminate the race for fish

We conclude that mining potential wealth in the Bristol Bay fishery can be accomplished by doing one or more of the following:

1. Reduce fishing capacity by permit reduction and consolidation.
2. Increasing the objectives for managers.
3. Assign harvest shares to participants.

8.7.1 Permit Reduction and Consolidation

Permit reduction involves a permit buyback program and permit consolidation involves actions such as stacking or A-B licensing programs. Such changes to the fishery lower harvesting costs by effectively reducing the number of participants and gear and spreading harvesting across time. They might also make it a little easier to experiment with alternative fishing gear and methods. Product quality could be expected to improve with less gear and temporally dispersed harvesting activities. However, the race for fish would still exist and we would expect harvesting costs to gradually increase over time with this incentive present.

8.7.2 Increasing the Objectives for Managers

Increasing the role of managers in the fishery involves placing additional responsibility on managers to reduce harvesting and processing costs and improve product quality when regulating the fishery. This would involve actions such as managers working more closely with harvesters and processors to set fishing periods to maximize *net income* to participants rather than to simply catch the number of fish needed to meet escapement goals. Through regulation and setting additional objectives, managers would be required to pay more attention to harvesting costs, markets and quality. This option could slow the race for fish somewhat, although it would be difficult to completely eliminate the incentive for individual harvesters to maximize their share of the harvest at the expense of reduced quality and higher harvesting costs.

8.7.3 Assign Harvest Shares to Participants

Assigning shares of the harvest to harvesters, processors and/or communities would radically change the structure of the fishery by guaranteeing participants a share of the harvest rather than just a right to participate in a competitive fishery. A harvest share system puts in place a powerful incentive for participants in the fishery to reduce harvesting and processing costs, improve quality, and invest in marketing programs. Management of the fishery would also change, with managers possibly spending more of their time determining the allowable harvest for a given period, rather than the setting and modifying of fishing periods on an hourly basis as currently occurs.

8.8 Legal Issues Affecting Restructuring

The federal fisheries system that has been developed by Congress during the past decade was established with far fewer constitutional and statutory impediments than faced with a fishery under state jurisdiction. In Alaska, the management and harvest of resources such as salmon is subject to a far-reaching set of rules that, while forward thinking and laudable when written a half century ago, now serve as potential impediments to achieve the full range of the proposed restructuring options. The restructuring options described above must therefore be implemented with consideration of state constitutional proscriptions, as well as overriding federal considerations. In this section we present a brief summary of the legal aspects of the restructuring options of the restructuring options discussed in the previous section. Appendix G presents a more detailed examination of the legal issues affecting restructuring.

Of the three principal options described above, all would require legislative *[JW: is this still the case? which ones would require legislative]* or regulatory change. To the extent that modest changes to current rules are chosen, there is little risk of a subsequent legal challenge on constitutional or federal grounds. However, some of them may raise substantive legal issues, particularly whether there are overriding constitutional or federal questions impeding their use.

In summary, while there are state constitutional or federal questions that govern the full reach of implementing these three options, such rules do not seem to cause any of these options to be unworkable if they are crafted in a reasoned way. Specifically, in order to reduce fishing capacity, it is likely that permit buybacks and other reduction and consolidation concepts can be undertaken consistent with Section 8.15 of the Alaska Constitution so long as administered by the Alaska Commercial Fisheries Entry Commission (CFEC) to ensure an "optimal number" of remaining permits is established. However, as pointed out earlier, an optimal number determination by CFEC may fall short of getting down to a level of 1,000 or 1,100 driftnet permits in the fishery and therefore to reach this level would require some sort of easily reversible stacking program that would allow management to increase the number of participants should economic conditions change significantly in the future (a new "optimal" number could emerge if the economics of the fishery were to change significantly).

Regarding the second option, increasing management objectives to include reduction and improved quality, the role of the Board of Fisheries and CFEC cannot be overestimated. Alaska constitutional protection of the fish resource requires "common use" and "sustained yield," suggesting a need for maximum participation and utilization for all persons. However, the courts have given the Board broad statutory discretion within those criteria to ensure management within the "public interest" and "to promote the efficient development of the resource." While subject to legal challenge, these protections should afford the usual discretion to the board where selected management options are supported by compelling justifications.

In considering the third option, the implementation of a harvest share program or cooperative salmon fishery, CFEC oversight seems crucial, as a one-for-one transfer from limited-entry permit to harvest share seems the best way to start the program, as "optimal fishery" considerations are maximized by using the existing CFEC determinations to avoid Section 8.15 pitfalls. However, once such a harvest share program is established, continued CFEC oversight is probably necessary to ensure harvest shares are not purchased in a way to unnecessarily limit participation in the fishery by any class of individuals.

Further, it appears cooperation among permit holders is authorized both by the Alaska Legislature, which in 2002 established salmon fishery associations in HB 286, and by a superior court decision last September that approved Board of Fisheries regulations allowing for a cooperative fishery within the Chignik Salmon Purse Seine Fishery.

9 Realities of Implementing Change

Our analysis suggests that at expected run size levels and current world salmon market conditions, the Bristol Bay fishery cannot generate returns sufficient to support the full suite of current permit holders. With no further changes and continued "business-as-usual," we expect to see the financial situation of little or no net income from the fishery in the near future, with fewer vessels fishing and license prices possibly falling further. Conditions in the longer term look bleaker, with little hope for much larger annual harvests, and continued downward pressure on salmon prices due to technological change and growth in salmon aquaculture (Appendix G).

Changes to the fishery will be accompanied by uncertainty as to their effects. Uncertainty often has a way of derailing efforts to improve situations like the tough economic conditions in the Bristol Bay fishery. Faced with uncertainty, participants may spend valuable time arguing over details, lose site of the big picture, and lose a fleeting opportunity for implementing change. In this report, we have deliberately avoided presenting the reams of detailed information we uncovered and developed over the last year to avoid detracting from the main issue before the industry – what general options offer the greatest hope to improve net income from the fishery and what are some of the strengths and weaknesses of different options. This section of the report discusses some of the "political science" aspects of restructuring that may hinder positive change.

9.1 Avoiding Analysis Paralysis

There are almost an infinite number of variations and permutations of the different restructuring options. As a result, many people have maintained that "*the devil is in the details*" and nothing should be done with the fishery until all permutations of options have been analyzed carefully. This is also the "*everything*-will-have-profound-effects" point of view. While we concur that the ultimate performance of a particular option depends on how well it is engineered (and this includes addressing lots of details), focusing on the details now and believing that *everything* is important will only paralyze progress.

We have delved into the "details" over the last 12 months and in almost every case, there were ways to engineer the details to suit different "sub-objectives" stakeholders may have. What is needed at this stage is not an extensive analysis that attempts to encompass every detail, but instead a choice of the way that stakeholders want the fishery to look in the future. Once this choice has been made, the details can be worked out in a collaborative process among those in the industry.

9.2 Committing to a Vision – Incremental or Substantial Change?

Traditional fleet consolidation options like permit buybacks and permit stacking involve small departures from what the industry is accustomed to and hence are relatively easy to generate consensus over. However, small changes from the status quo may not generate very significant increases in wealth in the long run and may only prolong a slow death of the industry. The options that appear to be capable of generating sustainable increases in wealth are more radical departures from the familiar. To many current stakeholders, the outcomes of these seem uncertain and risky to attempt, and are therefore more contentious at the moment. We acknowledge this reluctance to embrace an uncertain future that promises a significantly changed lifestyle. In an important sense, however, the industry may not survive without at least entertaining some radical changes in the way business is done in this fishery. It is thus important for stakeholders to generate consensus over and commit to a **long-term** vision of a restructured industry prior to heading down one particular path or another.

A long-term vision for the Bristol Bay fishery need not be spelled out in exact detail at the moment. It is not important at this stage to predict and engineer a particular fleet with a number of vessels operating in a particular way. What is important is to build consensus and commit to a new set of “rules of the game” or institutional designs that will encourage wealth creation and innovation rather and minimize or eliminate the wasteful race for fish. We earlier pointed to the fact that innovative energies in fisheries are often channeled in different directions than they are in other industries. Unlike industries with assured access to their productive resources, fisheries operate under a system of insecure access to the resource base. The result is that innovation is channeled into wasteful short-term harvest share maximizing rather than permanent wealth generation. This is a fundamental and universal point and it deserves emphasis in any discussion of future fishery scenarios.

Unless race-for-fish incentives are reduced or eliminated, **almost all** measures taken to create new wealth will likely backslide to pre-restructured conditions in the fishery in the long run. This is not to imply that measures such as buybacks or permit stacking should not be adopted, because they will generate some gains in the short term. But it is important to understand that any short-run gains from implementing these measures alone, and then stopping, will ultimately be eroded over time as fishers once again engage to invest in more capital to capture new wealth. In the not-to-distant future, then, the industry may find itself back in the same situation as currently exists, with too much capacity and low returns from the resource. In many peoples’ view, this gives further credence to the admonition that Bristol Bay stakeholders must adopt a long-term plan that incorporates a commitment to a new philosophy of operation, rather than piecemeal changes that are only slight departures from the norm.

9.3 Eliminating the Race for Fish – Assigning Shares of the Harvest

The kinds of options that ultimately are capable of eliminating race-to-fish conditions all involve some sort of allocation of shares of the harvest to individuals or groups. This is contentious among many fishermen for various reasons. One reason is simple fear of the unknown; many are unfamiliar with how schemes such as harvest shares combined with coops or other allocation systems might operate in practice. Second, often fishermen suffer from what has been coined the “Lake Woebegone Effect” or “Highliner Illusion” in the sense that each believes that he or she is better than the average. If one believes that (or at least that it is possible), it is easy to believe that you will fare better with free and unfettered access to an unallocated resource than with a system that restricts your harvest to a specific share of the total harvest. What we know from experience, however, is that this optimistic belief in a better future is wishful thinking in a regulated, restricted-access fishery setting like Bristol Bay. The farmer with title to his own land does not have to compete with his neighbors for the productive fruits of his soil and can instead turn attention to generating value from his fixed and limited share of the resource. The fisherman without “title” must first secure his share before having the luxury to worry about doing so in a way that generates the highest net value. History shows that in a typical regulated open (or restricted) access fishery, virtually all of the effort and ingenuity is channeled into scrambling for a share of the unallocated resource, leaving little possibility for generating value from what is harvested. This is the central lesson of modern fisheries management – that essentially all of the potential to generate wealth will be wasted in competition between participants.

Given that some form of allocation is necessary to the eliminate race for fish, what specific method of achieving this is most sensible? There is no unequivocal answer to this. Around the world there are many different forms of allocations schemes in place, and each incorporates different design features tailored to the interests of the stakeholders involved with the fishery. But this is an opportunity because allocation schemes can be adapted to incorporate whatever concerns are most important to local stakeholders. If the concern is the potential for concentration of rights in the hands of few owners, then ownership caps can be established. If the concern is over absentee ownership, then requirements that rights holders be aboard vessels can be incorporated. Generally, allocation schemes can be designed to deal with most of the sideboard issues that arise in fisheries management and that are of concern to stakeholders.

Harvest share systems are contentious (roughly in proportion to their chances for wealth generation). Creating and allocating harvest shares essentially amounts to granting stakeholders a secure share of the future returns from the resource. Granting a secure share, in turn, involves creating a group of privileged users who are granted a share of the wealth to be generated by public resources. The bad news for trying to implement such schemes is that every tweak of possible allocation-scheme designs benefits some group and harms another, in a relative sense. Hence there may be seemingly endless wrangling over system design. But the good news is that while creating a class of "owners" is contentious, the long-run benefit is that it will actually generate the wealth that is the source of the contention. A side benefit for conservation is that the creation of "owners" generates the stewardship incentives that are needed to guarantee a profitable and sustainable yield from public resources precisely by giving participants a greater "ownership" stake in the resource than might exist in the limited-access, derby-style fishery.

There are broader equity implications of alternative allocation-scheme designs that will have to be addressed, if not explicitly, then at least implicitly. Since any design will benefit some group to the relative detriment of another, some political means will have to be undertaken to come to consensus in a way that appears fair and equitable. One issue that pervades Alaska's fishery politics involves "insiders" versus "outsiders." It is illegal to overtly discriminate against residents of any "outside" state in favor of Alaska residents. But various design options will, in fact, favor insiders and outsiders to different degrees. For example, in the Bristol Bay fishery, non-Alaskans on average have more investment in their vessels and take a proportionately higher fraction of the harvest. Subtle design decisions could affect this balance by either dampening or enhancing it. A scheme that simply allocated shares of the Bristol Bay allowable catch equally across all current license holders would slightly favor local Bristol Bay residents and vice versa for any scheme that allocated by historical catch or by points dependent upon vessel investments. This process would have to play itself out in a political arena, but it is important to recognize it openly and prior to advancing any particular permanent restructuring option.

9.4 Taking the First Steps

A common issue that arose in discussions with stakeholders over the last year is how to take the first steps necessary to restructure the Bristol Bay fishery. As discussed above, it is first necessary to generate consensus that a new long-term plan is needed and to commit to a new philosophy of value and wealth creation. This is not a trivial task – getting several thousand participants with a history of mistrust to come to a consensus. However, although it is difficult, it is possible. Once it is done, the business of planning the path of implementation can proceed. One approach is a cautious step-by-step approach that pauses and assesses progress before moving further. For example, one path might be to first attempt to secure outside funding to finance a buyback that can significantly reduce the size of the fleet. The advantage of this might be to ease out certain fishermen ready to retire and give them something to retire on. Another advantage would be that the remaining group would be smaller, possibly making consensus over the next steps easier to achieve. Then subsequent steps could be taken to consolidate the smaller fleet, for example, by using gear stacking or internally financed buybacks. Finally, a last step might secure gains from spatial coordination of harvesting and vertical integration by allowing the formation of co-ops. A disadvantage of this whole approach might be vulnerability to court challenge; with a smaller and more exclusive group, outsiders or some who sold out early might demand access and increase the number of limited-access permits.

Alternatively, another path might be to simply grant all current participants a share of the annual harvest immediately and then allow trading, consolidation, and cooperative ventures to form voluntarily. Opinions we have heard expressed about these two options range widely. Those who favor the step-by-step approach express some reservations about the need to make radical changes and would like to see how the first relatively easy changes work out. Those who favor the approach based on immediate allocation believe (in addition to the above disadvantages listed) that the industry does not have time to go through a lengthy process and that it needs to adopt radical changes immediately because bankruptcies may not allow making change later. We also heard the expression "people think faster (and better) when their heads are under water," suggesting that stop-gap measures that create a little wealth only delay dealing with critical issues.

9.4.1 The Role of Experimentation

We have concluded that it might be prudent to allow and even encourage experimentation to better quantify the benefits of restructuring and to provide insight into important design issues. This applies not only to experimentation over vessel design, fishing practices, and new market niches, but also over the organization of fishing over time and area. The Chignik experience offers at least two timely lessons. First, a restructured fishery that is coordinated and managed to generate value will look radically different from current configurations that developed under the race-for-fish conditions. It would have been hard to forecast exactly how the Chignik fishery was going to unfold before the season, and changes and modifications and fine tuning occurred continuously throughout the experiment. No doubt even more changes will be adopted next year and beyond if the experiment is allowed to continue. It is thus difficult to understand what form a fishery might take once the incentives are changed. Second, the kind of coordination necessary to generate real changes in the harvest-to-consumer chain for Bristol Bay salmon is within reach, if some simple institutional structures can be implemented. The Chignik experiment was a risky path to take looked at from the vantage point of no experience with anything like it. But in the end, all that was required to radically alter the economics of the fishery was the agreement to allocate part of the allowable surplus to a group, the membership of which was completely voluntary. Once the allocation decision was completed, the group had secure rights and behavior was immediately oriented toward cutting costs and increasing marketable value rather than securing a share of the fish.

It thus seems advisable that stakeholders and managers consider experimenting with alternative systems, perhaps over a "burn-in" period of a few years. Bristol Bay is unique with several productive fishing districts that could be used, at least initially, to try out different institutional mechanisms that appealed to different stakeholders. For example, some districts could be reserved for those who wished to continue with business as usual in a derby-style setting while others were set aside for different schemes designed to eliminate the race for fish. Examples of the latter might be a district with an allocation to a cooperative of fishermen who voluntarily opt in, another region with allocations to individuals who then contracted individually with different processors to deliver under fish under certain specifications, etc. Membership in any and all of these groups would be need to be completely voluntary, and these could be blended and hedged, so that fishermen who opted into one experiment could also pool with other fishermen in other experiments and share risks. The point is that it is not clear from this vantage point exactly what kind of system might best suit the Bristol Bay fishery over the long run. With modest or low returns expected over the intermediate future, there is, in an important sense, less to lose by experimenting with different systems now compared to a decade ago.

9.5 Engineering the Distribution of a Bigger Pie

Assuming a restructured fishery creates new wealth by reducing cost and/or increasing revenues, who should get that new wealth? For some options that result in a distribution of wealth similar to recent history (e.g., a permit buyback), the answer may be simple, the wealth goes to those remaining in the fishery who can catch the fish. However, even with a relatively simple buyback, who from the fishery sells their permit could have profound community impacts in the region. If a permit buyback program were to result in a preponderance of local residents selling their permits, the regional economy would be affected to a much greater extent than if non-locals sold their permits. In addition, the social fabric of the communities would be affected by an exodus of locals from the fishery. Although it is difficult to discriminate against permit holders who want to participate in a buyback based on residency, there are other ways to engineer the outcome so that local residents do not leave the fishery in droves. For example, a regional entity might offer low-interest loans to local residents to help them through tough times during the buyback period so that fewer locals are "forced" to sell out.

The distribution of new wealth from radical restructuring options like harvest share systems are more complicated than building mechanism to prevent locals from selling out of the fishery in a permit buyback. These "other issues" of harvest share systems were mentioned briefly in the previous section. We did not set out in this report to design a harvest share system, but our reason for reiterating these other issues here is to make it clear that it is possible to engineer the distribution of new wealth to meet social goals or ameliorate detrimental effects on communities of restructuring options. At this early stage of exploring restructuring options, it is important not to eliminate options because at first glance there may be inequitable outcomes. Engineering the distribution of a bigger pie is an important step in the process of restructuring a fishery and it is important to not confuse making the pie bigger with distributing the bigger pie.

10 Charting a Course for the Future: Where to go from Here?

Given the array of issues and options before the industry, what specific steps should be taken next? In order to optimize expenditure of limited resources of monetary and political capital to facilitate change, we recommend the industry not go in two or three directions at the same time. Before going forward, a few simple choices need to be made. Once people have decided on the initial path financial and political resources can be *focused* to catalyze change.

If the *status quo* option (no active restructuring) is chosen, then, by definition, no aspects of the fishery need to be changed. If a decision is made to restructure the fishery, there are three primary restructuring options available to increase net income from the fishery:

1. Reduce fishing capacity by permit reduction and consolidation.
2. Include cost reduction and improved quality as objectives for fishery managers.
3. Assign harvest shares to participants.

Each of these options would reduce harvesting and processing costs and increase revenue from the harvest (as discussed in Section 8.7). One, two, or all three could be implemented. Option 1 might be a logical first step toward implementing options 2 and 3. However, if option 3 is chosen, options 1 and 2 may not be required. A decision of whether one, two, or all three are ultimately done is not really needed at the moment, but instead a decision is needed on which one to start the process of restructuring.

10.1 Reduce Fishing Capacity

If a choice is made to restructure the fishery, the next decision will consider whether reducing the capacity of the fleet through permit buyback and stacking programs is worth the time and expense. The analysis presented in this report indicates that if a driftnet permit buyback and stacking program could bring the number of driftnet permits down near 1,000, it is likely "worth the expense" – because it offers an opportunity to improve net income from the fishery after accounting for the cost of buying permits back ($2.6 million annually). With government support, the annual improvement ranges from $4 million (50% government funded) to $6 million (100% government funded) annually. The second part of the question to address is whether a buyback is worth the time and trouble to conduct. A buyback will require a 2/3 vote of permit holders to move forward and, combined with setting up a loan program, the process would require 2 or 3 years to implement. In addition, a buyback is not a long-term solution to improving the economics of the fishery; we would expect these gains to diminish over time as the race for fish encourages remaining participants to increase costs of harvesting thereby reducing net revenue. Ultimately, whether a permit buyback program is worth the time and trouble is for the industry to decide and not the study team.

Judging from input to the study, the most effective fishing capacity reduction program would be a government-funded or partially government-funded permit buyback program followed by a limited permit stacking program. We suspect that an entirely fisher-funded program would likely be difficult to "sell" to those remaining in the fishery given what little net benefit they could expect. A first step in this process would be to identify public funding sources that could offset the costs of a buyback program. A way of justifying such expenditure of public funds might be to estimate the total State and Federal transfer payments to support the economically distressed region and compare against the amount of such payments after implementing the buyback program. A substantial buyback program would presumably reduce such transfers and could be presented as a good investment from the perspectives of State and Federal governments. More work is needed to demonstrate the return on such an investment for government entities.

To significantly increase incomes from implementing a fishing capacity reduction program, somewhere between 800 and 1,000 driftnet permits would need to be purchased (leaving about 900 to 1,100 permits in the fishery). It is likely that the CFEC optimum number study would identify a number of permits greater than this level and if so, a buyback would need to be followed by a permit stacking program to reduce the overall fleet to between 900 and 1,100 driftnet permits. The setnet fishery would have to be examined further to determine an appropriate level of reduction through a buyback.

Although somewhat difficult to estimate, the total cost of such a buyback program might range from $32 million (800 permits at $40,000 each) to $60 million (1000 permits at $50,000). Assuming 50% support from government, $16 to $30 million dollars would be required as a grant and a fisher-financed loan obtained for the same amount. Once funding had been identified, regulations could be designed similar to other buyback programs in other fisheries but taking into account the unique features of the Bay fishery.

10.2 Increase the Objectives for Managers

As discussed in Section 8.7, this option involves increasing the objectives of managers in the fishery by placing additional responsibility on them to reduce harvesting and processing costs and improve product quality when regulating the fishery. Viewed in another way, this option would bring harvesters and processors to the "management table." These three groups (managers, harvesters, and processors) would then be responsible for orchestrating the annual fishery. In theory, greater collaboration among these three groups, with managers required to take into account factors other than escapement goals, should lead to a more efficient fishery. For example, managers might be permitted or encouraged to forego some catch to escapement in order stabilize harvest levels among days and allow better use of harvesting and processing equipment if such an action were to translate into greater *net income* from the fishery.

Increasing the objectives of managers in the fishery to include reducing costs and improving quality could be achieved through the regulatory process. The Board of Fisheries would be able to design and implement management plans and objectives that allowed managers, harvester and processors to work closer together.

In practice, getting all the different participants represented at a single table and achieving a workable level of power over the process for each of them would be difficult. As discussed in Section 5, there is a tremendous amount of animosity and distrust between some people in the harvesting and processing sectors. In a dynamic and rapid fishery such as Bristol Bay, there is little time for lengthy deliberations and gaining consensus on decisions in such an environment might be elusive. However, it could be done and would likely improve incomes from the fishery.

10.3 Assign Harvest Shares

Of the three options, this option is the most controversial and will likely require the greatest amount of design work. This might best be done through a series of industry forums and workshops combined with the development of draft alternatives through repeated steps, searching for the design that best suits the fishery and its participants. The analysis and design of alternatives might include predictions of the expected improvements in income from the fishery under each scenario. The next step could be to be to conduct a harvest share experiment in one or more of the five fishing districts in Bristol Bay. Much could be learned about the feasibility of a harvest share system if such an experiment were to allow for one or two cooperatives operating along side a competitive fishery (similar to the 2002 Chignik fishery). A key would be to avoid making such a system permanent until more could be learned. In addition, voluntary participation would be critical in any experimental systems. Such experiments could be monitored and the results compared to those predicted during the design stages of the experiment. Significant errors in predictions of the effects of a harvest share system could be identified early and, if needed, corrective measures taken.

11 Conclusions

The purpose of this study was to identify and examine options to restructure the Bristol Bay salmon fishery and compare them, in terms of anticipated effects, to the option of not making changes to the fishery. If nothing is done to the structure of the fishery, the net income from the fishery will remain low and the economic hardship in the region will continue to expand. Our analysis identified several sources of wealth that are foregone under the current structure of the fishery and three restructuring options would allow participants to capture this wealth.

Furthermore, the study team concludes:

- The fishery is nearly financially insolvent. In 2001, permit holders on average earned $4,000 after operating costs, but before deducting for debt service on vessels and permits.
- There isn't enough wealth available in the fishery to support the number of participants and the average annual incomes that it once did. The outlook for future prices and harvest levels suggests this condition will likely not improve over the next 5 to 10 years.
- The *status quo* option (no active restructuring) will result in continued change and restructuring of the fishery by high-cost harvesters and processors selling out to lower cost participants. However, there is little new wealth to be captured through this process and significant long-term improvements to incomes are not likely.
- Sources of new wealth from the Bristol Bay salmon fishery include:
    - Reducing fishing capacity
    - Spreading harvesting across time
    - Exploring alternative harvesting methods
    - Improving product quality
    - Marketing the harvest better
    - Eliminating the race for fish by assigning shares of the harvest to participants
- These sources of wealth could potentially add $3 to $42 million annually to the net income from the fishery compared to the estimated $3.8 million in net income derived from the fishery in 2001. On a harvest of 14 million fish, these improvements in net income from restructuring would be on the scale of about 3.5 to 47 cents per pound.
- These sources of wealth are accessible through three restructuring options:
    4. Reduce fishing capacity by permit reduction and consolidation.
    5. Increase the objectives for managers in the fishery to include cost reduction and improved quality.
    6. Assign harvest shares to participants.
- Significantly reducing the fishing capacity below the current levels through permit buyback and/or stacking options (e.g., 900 to 1,100 driftnet permits) would capture new wealth and raise net incomes for those remaining in the fishery. However, wealth created by consolidating the fleet will largely disappear over time unless the action is soon paired with actions to reduce or eliminate the race for fish. Investments in fleet reduction by fishers and governments will not be secure if the perverse incentive to further capitalize the remaining gear is not removed or further constrained.

- Adding to the objectives of managers to take economic and market factors into account when setting fishing periods could reduce harvesting and processing costs and improve revenues by improving quality and associated benefits from marketing programs.
- Assigning shares of the harvest to participants may reduce or eliminate the race for fish and permit access to the greatest potential wealth in the fishery of all options considered.
- Alaska case law generally supports the application of these restructuring options if they are crafted in a reasoned way and are supported by compelling justifications. This, despite the fact that legal impediments imposed on the salmon fishery by Article 8 of the Alaska Constitution and the extensive case law that interprets that article are more restrictive than the groundfish regime developed by Congress for the Alaska offshore pollock fishery in the past decade.
- Investments in improving regional infrastructure have the potential to significantly improve benefits and wealth generation from the salmon fisheries in Bristol Bay. However, the costs of the proposed developments exceed the benefits that would accrue to the fishery alone. However, such infrastructure improvements will generate significant benefits outside of the fishing industry and therefore they merit further study.
- Several factors may preclude progress toward improving the fishery through restructuring, including getting bogged down in the analysis of the many details of the infinite number of variations of different restructuring options. To overcome these impediments to change, participants must first develop consensus on a long-term vision of how they want the fishery to look.

12 Recommendations

As discussed in Section 10, the choices of options before the industry are relatively simple. In light of the analysis presented in this report, we recommend fishery participants engage in a discussion and debate of what, if any, restructuring should be done. If restructuring actions are chosen, we further recommend:

- The task of designing restructuring options should be done by those most familiar with the fishery.
- One or more organizations take a lead in bringing together representatives of all groups in the fishery to design a restructuring action that all parties can support.

13 Postscript

To maintain momentum on this issue, we encourage you to submit your thoughts on the issues we have discussed in this report and others we may not have raised. We are also interested in hearing from you on the direction you would like to see the industry take with respect to restructuring. You can submit your thoughts to the study team and/or Advisory Panel using one or more of the following methods:

- Write a letter and mail it to BBSFRS, Box 1464, Dillingham, AK, 99576
- Email the study team at: bbsalmon@lgl.com
- Post a message on the public bulletin board at the project website (www.bbsalmon.com)

Getting people and ideas together to seek solutions these complex issues requires financial resources. The Bristol Bay Economic Development Corporation (BBEDC) initiated the search for a better future for the salmon fishery by funding this study. BBEDC will be actively searching for funding to carry this effort to the next stage.

Acknowledgments

We sincerely appreciate the time and effort that attendees at the public meetings and the many others who took time from their busy schedules to educate us on the realities of change in the Bristol Bay salmon fishery.

Contributors to this Research

Study Team

Michael Link, a fisheries policy analyst with LGL Alaska Research Associates, Inc., has spent two decades designing and implementing salmon research and management programs in Alaska, the Yukon and British Columbia. He has been with LGL, an international consulting firm specializing in fisheries and wildlife research and management, almost continuously since 1992. In 1999, Michael spent a year with the Alaska Department of Fish and Game as research project leader for Bristol Bay salmon. While with ADF&G, he oversaw the collection and interpretation of fishery and biological information to assist fishery managers with the in-season management of the five Bristol Bay fishing districts. Much of his professional experience has focused on designing and implementing research to assess the abundance and biological characteristics of salmon populations in support of management. He is currently the Executive Director of the Bristol Bay Science and Research Institute where he helps Bristol Bay area residents to get meaningfully involved in fisheries research and management. Michael's academic work focused on improving fisheries management by integrating knowledge of fisheries management with economics.

Marcus Hartley, of Northern Economics, Inc., is a recognized expert in providing economic analysis for decision makers in some of the world's most important fisheries. In 1999 he conducted a study to document impacts of the 1997 and 1998 Bristol Bay fishing disasters and prepared an economic recovery plan. Other recent projects include an assessment of the impacts of stellar sea lion measures on communities in Western Alaska for the Southwest Alaska Municipal Conference, and an assessment of the economic importance of commercial salmon fisheries to the communities of the Aleutians East Borough. In addition to working on the Bristol Bay Salmon Restructuring Study, Marcus is the lead economics consultant for NMFS in the development of their Programmatic Environmental Impact Statement for the North Pacific Groundfish Fisheries.

Bob Waldrop has been involved in resource allocation issues throughout his career, starting as a resource economist in Washington, DC and continuing through work with various Native groups and State and Federal agencies. He has over 25 years of hands-on experience in Alaska's seafood industry including its regulatory and policy framework. In the late 1970s, he served as a Special Assistant to Governor Hammond with responsibilities for a wide range of Natural Resource matters, including oversight of Alaska's commercial fishing issues. In 1981 he was a founder of Silver Lining Seafoods, which later became NorQuest Seafoods. At NorQuest, Bob was a member of the senior management team and involved in all aspects of business development with specific focus on developing and implementing sales and marketing strategies. In 1999, Bob retired from full-time work but remains active as a business development consultant for several national and international corporations. He is the past Board Chairman of the Alaska Seafood Marketing Association and continues to serve on its Board and Executive Committee.

James E. Wilen is a Professor of Agricultural and Resource Economics and Director, Center for Natural Resource Policy Analysis, at the University of California, Davis. Before settling at UC Davis he was at the Universities of British Columbia and Washington, where he was first exposed to North Pacific fisheries issues. His research focuses broadly on the analysis of natural resource policy questions and specifically on fisheries policy analysis. Recent work includes some in-depth analyses of limited entry programs, area licensing, transferable quota programs, and cooperative management regimes. Much of his work focuses on how different regulatory systems impact the profitability of fishing. His early work identified the slippage inherent in limited entry programs and highlighted the market quality improvements induced by rights-based systems that encourage profit-maximizing behavior and market innovation. His current work is assessing marine reserves, spatial management policies, and the implications of alternative cooperative fishing schemes. He has published numerous papers and received several prestigious research and graduate teaching awards, including: the American Agricultural Economics Association (AAEA) Quality of Research Award (1998, 2000), the Western Agricultural Economics Association Outstanding Published Research Award (1998), AAEA Distinguished Graduate Teaching Award (1998), and Supervisor-AAEA Outstanding Dissertation Award (6 times). He was elected Distinguished Fellow of the AAEA in 2001.

Jim Barnett has practiced law in Alaska since 1974, with significant involvement in many resource and public policy issues affecting the state and its key resource sectors. He is former deputy commissioner of the Alaska Department of Natural Resources and was elected to two terms on the Anchorage Assembly, representing South Anchorage. Jim is now in sole practice, and has represented BBEDC for the past seven years, negotiating and drafting the key commercial transactions for the BBEDC pollock, cod and crab partnerships. He has also participated actively in BBEDC's efforts to support salmon fishers in Bristol Bay, participating in numerous regional fisheries projects and other efforts to develop solutions to the current sockeye crisis.

Bob King worked as News Director at public radio station KDLG in Dillingham from 1978 to 1994 where he became known for his coverage of the Bristol Bay salmon fishery and other commercial fishing activity along the Alaska Peninsula and Bering Sea. In his spare time, Bob has researched the history of the Alaska fishing industry and he has written several articles on the development of the Bristol Bay salmon fishery. King served as Press Secretary to Alaska Governor Tony Knowles from 1994 to 2002. He currently lives and works in Juneau.

James L. Anderson is a professor and chair of the Department of Environmental and Natural Resource Economics at the University of Rhode Island, Kingston, RI. His research in the area of fisheries and aquacultural economics began in 1980 during his dissertation research at the University of California, Davis, on the bioeconomics of salmon ranching in the Pacific Northwest. Since that time, he has been involved with numerous research projects related to fisheries and aquaculture management, seafood marketing and trade, and seafood price forecasting. Dr. Anderson is the Editor of Marine Resource Economics and has served on the Editorial Board of the Journal of Environmental Economics and Management. He was presented with the Outstanding Ph.D. Thesis Award by the American Agricultural Economics Association in 1984, Research Scientist of the Year Award by the University of Rhode Island in 1994 and the Article of the Year Award from the Editorial Board of Agricultural and Resource Economics Review in 1995.

Jonathan King received his MS degree from the Department of Environmental and Natural Resource Economics at the University of Rhode Island in 2002. His thesis analyzed the short- and long-term property tax effects of conservation easements in Vermont. Prior to joining J.L Anderson Associates, Mr. King specialized in the assessing the economic effects of pollution on recreational fisheries. In April 2003, Mr. King will join the staff of Northern Economics in Anchorage.

Advisory Panel

Robin Samuelsen, President and CEO of the Bristol Bay Economic Development Corporation (BBEDC), was born and raised in Dillingham and has been a Bristol Bay salmon fisher for over 30 years. Robin served on the Alaska Board of Fisheries for three years and the North Pacific Fishery Management council for nine years. He also is a sitting member of the Alaska Legislative Salmon Industry Task Force and a U.S. advisor to the North Pacific Anadromous Fish Commission. As President of BBEDC, Robin oversees a community development quota (CDQ) organization representing 17 villages in the Bristol Bay Region.

Hazel Nelson is Vice President of BBEDC, President of Becharof Corporation, and was recently appointed as a member of the North Pacific Fishery Management Council. In partnership with her family, Hazel has operated both set and driftnet operations in the Bristol Bay salmon fishery since 1975.

Hattie Albecker is Secretary of BBEDC, Vice President of Ugashik Traditional Village Council, and acts as the tribal environmental coordinator for Ugashik Village. Hattie has setnet fished in Bristol Bay for 40 years and has been an owner/operator of a setnet site since 1980.

Ted Angasan, lives in South Naknek and has served on the BBEDC Executive Committee since 1996. He has owned and operated a Bristol Bay drift gillnet operation since long before limited entry.

Robert Heyano is Treasurer of BBEDC. He started commercial fishing on the family owned setnet site in the early 1960s. He has owned and operated his own Bristol Bay driftnet operation since 1972 and seined herring in Togiak since 1979. Robert has served almost continuously on the Nushagak Advisory Committee since the early 1980s.

Moses Tuyakuk, Sr., has fished the waters of Bristol Bay for over 50 years and skippered a Bristol Bay driftnet vessel for the last 32 years. He is heavily involved with the Manokotak Village and school. Moses has served BBEDC since it began in 1992.

Moses Kritz lives in Togiak and has served on the BBEDC Executive Committee since 1997. He is the Mayor of the City of Togiak and President of the Togiak Natives LTD Corporation. Moses has fished Bristol Bay salmon and herring for decades.

Gunnar Knapp, Ph.D., has been an Economics Professor with the University of Alaska Anchorage's Institute of Social and Economic Research (ISER) since 1981. He has been studying Alaska salmon markets and management since 1991. He is presently working on a study of the 2002 Chignik salmon fishery, in which the Board of Fisheries allocated 70% of the fishery to a cooperative which was formed by 77 Chignik permit holders, while allocating the remaining 30% of the harvest to 23 permit holders who chose to continue to fish independently.

Jeff Regnart is a regional management coordinator for the Alaska Department of Fish and Game. Jeff's current responsibilities include supervision of ADF&G fishery managers in Bristol Bay, Prince William Sound and Upper Cook Inlet. Prior to this position, Jeff lived in King Salmon and was the Naknek-Kvichak District manager from 1991-1998. He managed the fishery during a period that saw over 200 million salmon caught in the Bay.

Bruce Twomley spent the first 10 years of his career suing the state and federal governments as a lawyer with Alaska Legal Services. He was one of the lawyers for village high school students in the Molly Hootch case. In 1982, Governor Hammond appointed Bruce to the Commercial Fisheries Entry Commission (CFEC) and the four succeeding governors have re-appointed Bruce to Chair of the Commission.

Norm Van Vactor has worked in the commercial fishing industry in Bristol Bay for 27 years. His early years were as a tenderman and subsequently as a Cannery Manager. In 1998 he became the Bristol Bay Operations Manager for Peter Pan Seafoods and presently serves in that capacity. For 5 months of the year during the periods covering the Togiak Herring and the Bristol Bay sockeye fisheries, Norm resides in Dillingham. For the balance of each year he is works out of Peter Pan's corporate office in Seattle.