

Economic Analysis of the Chuitna Watershed & Cook Inlet

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Prepared by: Ted L. Helvoigt, Ph.D.
Tobias Schwoerer, M.S.
Diane Charlton

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ECONorthwest
ECONOMICS • FINANCE • PLANNING
99 W. Tenth, Suite 400
Eugene, OR 97401
(541) 687-0051

EXECUTIVE SUMMARY

In May 2009, Cook Inletkeeper engaged ECONorthwest to quantify some of the economic benefits Alaskans derive from Cook Inlet and the Chuitna River watershed as they exist today. The information provided in this report is intended to assist citizens and decision makers understand the magnitude of the economic value Alaskans currently enjoy and would place at risk from short- and long-term negative impacts associated with large-scale extractive development – such as the proposed Chuitna Coal Strip Mine.

The results of the economic analysis demonstrate that Alaskans – especially those living in the Cook Inlet region – enjoy a large and sustainable flow of economic benefits from Cook Inlet, and to a lesser degree the Chuitna River. Coal strip mining in Upper Cook Inlet – though likely rewarding a select few over a short period of time – may adversely and severely affect many over a much longer timer horizon.

Among the findings summarized in this report are the following:

Sport Fishing

Sport fishing contributes greatly to the regional economy through spending on travel, equipment and supplies, by creating jobs, and by generating federal, state and local tax revenues.

In 2007, 1.2 million angler days were recorded in the Cook Inlet region. Forty percent of the angler days were by nonresidents, demonstrating the value of the Cook Inlet region for recreational angling extends far beyond the State of Alaska.

Direct expenditures for sport fishing in Cook Inlet in 2007 totaled more than \$730 million. Considering both direct expenditures and indirect impacts – the ripple effect of dollars coursing through a region’s economy – the Alaska Department of Fish and Game estimate that sport fishing was responsible for an estimated \$828 million in economic output, \$279 million in regional income, and about 8,000 jobs in Cook Inlet.

Commercial Fishing

Alaska is the nation’s top producer of seafood, accounting for more than 60 percent of seafood production and nearly 40 percent of its value. In 2007, the Alaska seafood industry produced \$3.6 billion in total wholesale value. This preeminent position is due in no small part to the emphasis Alaskans place on protecting marine habitats and the river systems that flow into them. The seafood fishing and processing industry is Alaska’s largest employer, responsible for more than 78,000 direct, indirect, and induced jobs.

The salmon fishery has traditionally been the largest employer of all Alaskan fisheries. Salmon are not only a primary component of the fishing industry, but are also strongly linked to the culture and even identity of Alaska. In 2007,

salmon fisheries employed almost 52 percent of those working in Alaska's fishing industry.

Salmon harvested from Cook Inlet had an estimated wholesale value of over \$61 million, a total economic impact of nearly \$100 million, and employed more than 1,000 people in 2007.

Alaska's fisheries are among the most productive in the world. As natural seafood habitats in much of the world decline, the importance of Alaska's habitats will increase. Alaska is the world's top producer of wild, high-value salmon, producing almost 80 percent of the world supply of wild king, sockeye and silver salmon.

Non-use values

Many of those who do not consume salmon or participate in commercial or sport fishing in Cook Inlet still benefit from the existence of salmon.

Based on applying research findings from Pacific Northwest rivers to salmon escapement counts for rivers and streams in the Upper Cook Inlet area, we estimate Alaska's annual marginal non-use willingness to pay for a Upper Cook Inlet salmon to be \$3.98 and the total annual non-use economic benefit of the entire Upper Cook Inlet salmon fishery to be approximately \$280 million per year, aggregated across Alaska's total population.

We consider the reasonableness of these estimates based on comparison to Alaska's population, annual (market-based) economic output, and personal income:

- Alaska's 2008 population was about 680,000 – thus, we estimate the per capita non-use value of the Northern Cook Inlet salmon fishery to Alaskans to be \$412.
- In 2007, Alaska's all industry Gross State Product was \$44.5 billion – thus, we estimate the total non-use value of the Northern Cook Inlet salmon fishery to be equal to 0.6 percent of Alaska's total (market-based) economic output.
- In 2007, total personal income was \$27.3 billion – thus, we estimate the total non-use value of the Northern Cook Inlet salmon fishery to be equal to 1.0 percent of Alaska's total personal income.

Subsistence Harvests

The local residents of Tyonek and Beluga rely heavily upon wild food resources for sustenance. About one-half of the residents of Tyonek and Beluga estimate that the majority of the meat, fish and birds they consume annually are obtained from wild sources.

During the 2005–06 study year, the community of Tyonek harvested more than 43,000 pounds of wild resources, averaging 664 pounds per household and 217 pounds per person. Salmon constituted 70 percent of Tyonek's harvest.

During the study year, wild resource harvests by Belgua residents averaged 539 pounds per household, or 204 pounds per person.

Economic Growth & Resource Protection

The Cook Inlet region has experienced strong economic growth while protecting its natural resources. Maintaining healthy ecosystems has helped spur economic and population growth in the region over the past decades.

The Cook Inlet is the primary economic center of Alaska and home to more than half the state's residents.

The tourism sector has experienced a greater rate of growth than any other sector in the region (and in the state) over the past couple decades.

The belief that economic growth is mainly achieved by investing in resource extraction on public lands fails to recognize that conservation lands have helped spur economic and population growth in the region over past decades.

INTRODUCTION

The Cook Inlet watershed covers 47,000 square miles in Southcentral Alaska. Snowmelt from Mount McKinley, the Chugach Mountains, and the Aleutian Range flows into the rivers that feed the Inlet. Cook Inlet is the most densely populated and the fastest growing region in Alaska, and the state's hub for commerce. Yet, it also hosts diverse ecosystems including the alpine tundra of the Denali wilderness, the coastal rainforests of southern Kenai Peninsula, and the wetlands of the Susitna, Kenai and Matanuska river deltas. The area surrounding Cook Inlet is home to brown and black bears, moose, caribou, migratory birds, wolves, humpback, beluga and killer whales, sea otters, sea lions, and all five species of North American wild Pacific salmon. The watershed contains seven state critical habitat areas. The marine environment in Cook Inlet has been noted by scientists as one of the most productive ecosystems in the world, and it is also one of the most productive fisheries in Alaska. Commercial fishermen harvest salmon, scallops, halibut, cod and several other species of fish in Cook Inlet, supporting a key sector in Alaska's economy. Sportfishing in Cook Inlet is another key component of the local economy. In 2007, for example, the sportfishing industry in Cook Inlet supported over 8,000 jobs, generated more than \$800 million in economic output, and contributed \$55 million in state and local taxes.¹ In short, Cook Inlet's unique ecosystems, diverse fish and wildlife habitats, and its fishing economies all depend on clean water and healthy fish habitat.

Among the rivers that feed into Cook Inlet is the Chuitna River (also known as the "Chuit"), which begins at the base of the Alaska Range in Southwest Alaska and runs 37 miles before draining into upper Cook Inlet. There are two small communities located on the western shore of Cook Inlet near the mouth of the Chuitna: Tyonek, a Dena'ina Athabascan community, and Beluga. These communities are accessible only by air, boat, all-terrain vehicle, or snowmobile. The local residents rely heavily upon the region's natural resources for subsistence and personal use hunting, fishing and gathering. The Chuitna is also a popular site for sportfishing, especially for king salmon, silver salmon and rainbow trout. Most anglers fish along the lower six miles of the river and near the confluence of Lone Creek. The Chuitna watershed also provides important habitat for moose, brown and black bears, mink, beaver, spruce hen, ptarmigan, eagles, ducks, geese, swans and other waterfowl.²

In 2007, the national nonprofit organization American Rivers designated the Chuitna as one of America's 10 Most Endangered Rivers due to the threat posed by the proposed Chuitna Coal Project, a surface coal mining and export

¹ Alaska Department of Fish and Game, Division of Sport Fish. 2009. *Economic Impacts and Contributions of Sportfishing in Alaska, Summary Report 2007*. January.

² Wilderness Visions, Inc. *Beluga, Alaska*. Retrieved February 12, 2009, from http://www.raybulson.com/Wilderness_Visions/Beluga,_AK.html.

development located in the Beluga coal field within the Chuitna River watershed.

A mixture of private and public lands border the Chuitna. Tyonek Native Corporation (TNC) is the primary owner of land on the south side of the river, along with some Native allotments. The Kenai Peninsula Borough and other private entities own most of the land on the north side of the river's mouth. Cook Inlet Region, Inc. owns the uplands on both sides of the river. Alaska Mental Health Trust Authority and the State of Alaska, Department of Natural Resources own different parcels of land near the head of the river.³

Figure 1 and Figure 2 show the geographic relationship between the Chuitna, Cook Inlet, and the communities of Anchorage and Mat-Su region.

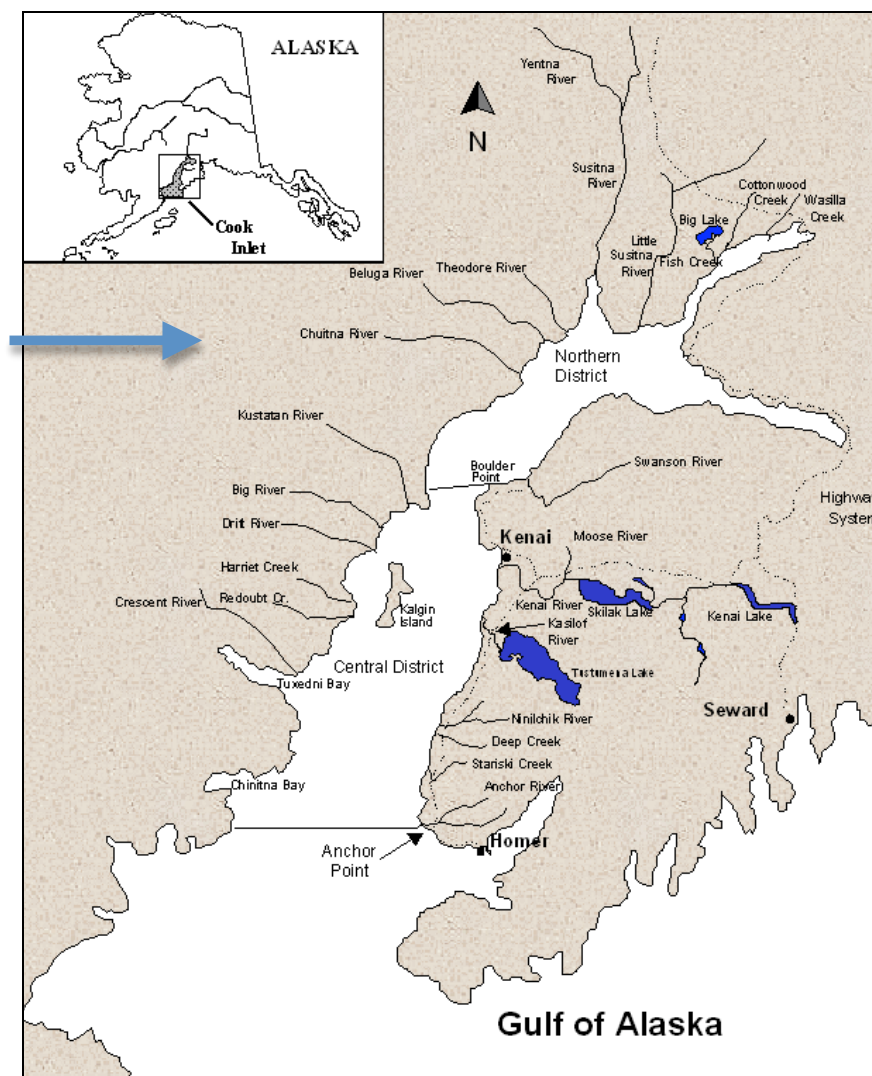
Figure 1. The Chuitna River in Reference to Cook Inlet, Anchorage, and the Mat-Su Valley (Chuitna System in Red)



Source: ECONorthwest, based on National Geographic Topo software package

³ State of Alaska, Department of Natural Resources, Division of Mining, Land and Water. 2008. *Report on Use and Navigability of the Chuitna*. April 4. Retrieved September 29, 2009, from http://www.sf.adfg.state.ak.us/Static/legal_access/PDFs/ChuitnaReport_4-4-08.pdf

Figure 2. The Chuitna River in Relation to Cook Inlet and the State of Alaska



Source: Fishery Manuscript No. 07-06, Review of Salmon Escapement Goals in Upper Cook Inlet, Alaska, 2007, Fair, L., R. Clark, and J. Hasbrouck, November 2007.

Environmental damages that harm fish and game populations and habitats, can adversely affect commercial, sport, and subsistence harvests and the tourism industry, which are important economic engines for the Alaskan economy. Policymakers should therefore consider carefully the long-term economic benefits of the Chuitna and Cook Inlet that may be adversely affected by strip mining associated with the Chuitna Coal Project before approving its construction.

Economic Benefits Associated with Cook Inlet and the Chuitna River

Cook Inlet and the Chuitna provide a myriad of economic benefits to the region's residents and to people in other parts of Alaska and the nation. To fully account

for the economic benefits of these natural resources, one must consider the value of all the direct and indirect economic benefits the Chuitna watershed and the Inlet provide to society. Direct benefits can be sub-divided into market-based and non-market based activities. Examples of each include:

Market Based Activities: Commercial fishing, sport fishing and hunting, logging, commercial lodges, sightseeing tours, flight services and other commercial-based activities that rely directly on the watershed.

Non-market Based Activities: Subsistence hunting, fishing, and gathering, clean water, clean air, cultural amenities, scenic values, and other ecosystem goods and services.

Where established markets exist, we can interpret market prices as a measure of the economic benefit of actions that protect or increase the supply of the good. We note, however, that factors such as externalities (e.g., when prices do not include pollution impacts) or government intervention (e.g., subsidies) distort market prices.

Measuring the economic significance of benefits for which markets do not exist is more challenging. Economists have developed techniques that can approximate the economic values of some of these benefits. These techniques have been tested and improved over the decades, with results and methods vetted through publication in academic journals and presentations at scholarly conferences.⁴ The fact that non-market based activities do not have a market price does not diminish their economic value. On the contrary, environmental goods and services with no market price often represent large economic benefits to society and often have larger *relative* values to lower income groups since these groups typically rely on natural resources out of necessity rather than as luxuries.⁵ It is important to consider the non-market values of natural resources so they are accounted for and understood by policy makers.

Indirect economic values are also difficult to quantify, but are often greater than market based activities for a variety of goods and services. Indirect economic values can take several different forms: option value, which is the value of saving a good for use at another time; bequest value, the value of saving a good for

⁴ For more information on the methods of measuring economic benefits that are not traded in markets, see The National Research Council. 2004. *Valuing Ecosystem Services: Toward Better Environmental Decision-Making*. Committee on Assessing and Valuing the Services of Aquatic and Related Terrestrial Ecosystems, National research Council; Millennium Ecosystem Assessment. 2005. *Ecosystems and Human Well-Being*; and Barbier, E.B., et al. 1997. *Economic Valuation of Wetlands*. Ramsar Convention Bureau, Department of Environmental Economics and Environmental Management, University of York, Institute of Hydrology, IUCN-The World Conservation Union.

⁵ Hökby, S. and T. Söderqvist. 2001. *Elasticities of Demand and Willingness to Pay for environmental Services in Sweden*. Prepared for the 11th Annual Conference of the European Association of Environmental and Resource Economists. Retrieved February 12, 2009, from http://www.google.com/url?sa=U&start=1&q=http://www.beijer.kva.se/PDF/58422893_artdisc137.pdf&ei=JY6UScL9Ilr2sAPc4fWxBw&usq=AFQjCNHvoC9x7JNVOMI5YihRVN1tFSn2ww.

future generations; altruistic value, the value of saving a good for others to use now; and existence value, the value of saving a good for the sake of its existence.⁶

The purposes of this study are to quantify and/or discuss some of the economic benefits derived by Alaskans from Cook Inlet and the Chuitna River as they exist today, to help citizens and decisionmakers understand how short- and long-term impacts from coal strip mining may affect the flow of economic benefits. The remainder of this report is comprised of the following sections:

- A. Market Based Economic Values
 - 1. Commercial Fishery
 - 2. Sport Salmon Fishing
- B. Non-use Economic Values
- C. Subsistence Fishing, Hunting, and Gathering
- D. Economic Growth and Natural Resource Protection
- E. Ecosystem Functions, Goods, and Services
- F. Summary of Findings

⁶ Schuhmann, P.W. and K.A. Schwabe. 2002. "Fundamentals of Economic Principles and Wildlife Management." In L. Clark, J. Hone, J.A. Shivik, R.A. Watkins, K.C. VerCauteren, and J.K. Yoder, eds., *Human Conflicts with Wildlife: Economic Considerations. Proceedings of the Third NWRC Special Symposium*. Fort Collins, CO: National Wildlife Research Center. Retrieved September 29, 2009, from <http://www.aphis.usda.gov/ws/nwrc/symposia/economics/>.

A. MARKET-BASED ECONOMIC VALUES

Many goods and services produced from the Chuitna and Cook Inlet watersheds are traded in formal markets, making their economic value easier to calculate. Economists typically measure the economic value of a good or service in terms of what a person, group, or firm, which does not have it, is willing to give up to acquire it. It is not necessary to measure value in monetary terms, but doing so generally simplifies the measurement. If money is used as the unit of measurement, then the value of a good or service is the amount the person, group, or firm is willing to pay for it.

When a good or service is traded in a fully-functioning, competitive market, the price at which it is traded provides a good representation of both what the seller requires as compensation to relinquish it and what the buyer is willing to pay to acquire it. Thus, the market price a fisherman receives for a fish traded in a competitive market probably provides a reasonable representation of the fishery's value both to the fisherman and to the overall economy.

We can begin evaluating the value of Cook Inlet and the Chuitna River watershed by examining the market value of the commercial and sport fishing industries and the revenue that fishing brings into Alaska through Cook Inlet.

1. Commercial Fishery

Alaska is the nation's top producer of seafood in terms of volume and value. In 2007, Alaska accounted for more than 60 percent of all seafood produced in the U.S. in terms of volume and nearly 40 percent in terms of value.⁷ Eight of the top 20 seafood ports in the U.S. are located in Alaska, including Homer (13th), located in Cook Inlet; Kodiak (3rd); Naknek-King Salmon (7th); Seward (9th); and Cordova (11th), located in the Southcentral region of Alaska. The strength of Alaska's commercial fishery is due to the strong demand Alaskan's place on protection of the state's marine habitats and the river systems that flow into them. The importance of environmental protection and a science-based approach to fishery management is summed up in a recent report prepared by Northern Economics:⁸

The seafood industry in Alaska is dependent on a healthy marine ecosystem and access to sustainable stocks of fish and shellfish. Management is science-driven and conservation comes first. Alaska's fishery management systems are held up as examples to fisheries around the world. The Pew Ocean Commission, as well as the United States Commission on Oceans Policy found that Alaska's fisheries are some of the best managed fisheries in the country, citing the role of science in setting catch limits, efforts to control bycatch and protect habitat.

⁷ Northern Economics, Inc. 2009. *The Seafood Industry in Alaska's Economy*. Marine Conservation Alliance, At-Sea Processors Association and Pacific Seafood Processors Association. January.

⁸ IBID

National Geographic (Bourne 2003) identified Alaska as one of the three best managed fisheries in the world.

The Seafood Industry Alaska's Economy
Northern Economics, January 2009

Alaska's commercial fishery harvested an estimated \$1.5 billion in ex-vessel value in 2007, and with the value-added of the state's seafood processors, the total wholesale value of the 2007 harvest was \$3.6 billion.⁹ Alaska's exports of seafood to international destinations were \$2 billion in 2007 and represented over half the state's total value of exports. In 2008, Alaska Governor Sarah Palin, noted that the commercial fishing industry (including harvesting and processing) is one of the largest private-sector employers in Alaska, and the industry accounts for more than 50 percent of basic private-sector employment in many of the state's coastal communities.¹⁰

In fact, according to Northern Economics' 2009 report, the seafood fishing and processing industry employed more people in 2007 than any other industry.¹¹ Northern Economics estimates that the commercial fishery and processors were responsible for an additional \$2.2 billion in indirect and induced economic output and more than 78,000 direct, indirect, and induced jobs. The report does not breakout Cook Inlet as a distinct region. Rather, Cook Inlet is contained within two of the report's designated regions: Southcentral and Kodiak. These two regions are responsible for 30 percent of the \$2.11 billion wholesale value of the *shore based* seafood industry, as well as about 28 percent of shore-side processing and harvesting employees.

The salmon fishery has traditionally been the largest employer of all Alaskan fisheries and as the Department of Fish and Game stated, "Alaska's economy, culture, and even identity will continue to be shaped by salmon because of the importance, size and history of its salmon fisheries."¹² In 2007, salmon fisheries

⁹Alaska Department of Labor and Workforce Development. 2008. *Alaska Economic Trends*. November. Retrieved September 28, 2009, from <http://labor.state.ak.us/trends/home.htm>.

"Ex-vessel value" is the value of harvested, but unprocessed fish and shellfish at the point of being transferred from the harvesting vessel.

¹⁰ Alaska Department of Labor and Workforce Development. 2008. *Alaska Economic Trends*. November. Retrieved September 28, 2009, from <http://labor.state.ak.us/trends/home.htm>.

¹¹ Northern Economics, Inc. 2009. *The Seafood Industry in Alaska's Economy*. Marine Conservation Alliance, At-Sea Processors Association and Pacific Seafood Processors Association. January.

The retail and wholesale trade sector employed just a few hundred fewer workers than the seafood industry in 2007.

¹² Woodby, D., D. Carlile, S. Siddeek, et al. 2005. *Commercial Fisheries of Alaska*. Special Publication No. 05-09. Alaska Department of Fish and Game. June.

employed almost 52 percent of those working for Alaska's fishing industry.¹³ The Alaskan salmon fishery focuses on five species: kings, sockeye, pinks, chum, and silvers. Prices vary for different salmon species and with fluctuations in the world market. Over 200 million salmon were harvested in Alaska in 2007 with an estimated ex-vessel value of over \$416 million.

The seafood industry has a strong presence in many of Alaska's coastal communities, including Cook Inlet communities. Table 1 reports the harvest of salmon separately for the state of Alaska and Cook Inlet. For 2007, the salmon harvest from Cook Inlet had an ex-vessel value of over \$24 million, or approximately 6 percent of the total value of salmon harvested in Alaska (\$400 million).

Table 1. 2007 Commercial Salmon Harvests and Ex-vessel Values in Alaska and Cook Inlet

Region	Average Weight	Average Ex-Vessel Price Per Lb.	Number of Fish	Lbs. of Fish	Estimated Ex-Vessel Value
All Alaska	4.4	\$0.44	213,012,000	948,121,000	\$416,769,000
Cook Inlet	5.9	\$0.93	4,410,000	26,180,000	\$24,258,000

Sources: ECONorthwest analysis, based on data from Alaska Department of Fish and Game, Division of Commercial Fisheries. 2007. *Alaska Commercial Salmon Harvests and Ex-vessel Values*. Retrieved September 29, 2009, from <http://www.cf.adfg.state.ak.us/geninfo/finfish/salmon/catchval/blusheet/07exvesl.php>; and Northern Economics, Inc. 2009. *The Seafood Industry in Alaska's Economy*. Marine Conservation Alliance, At-Sea Processors Association and Pacific Seafood Processors Association. January.

Table 2 reports additional detail of the economic value of commercial salmon harvest in more detail, including wholesale value, total economic impact, estimated number of persons employed by the commercial salmon fishing industry, and payments to labor that are attributable to the commercial salmon harvest industry in Alaska and Cook Inlet. The salmon harvest in Cook Inlet had a total economic impact of almost \$100 million and employed over 1,000 people. These data demonstrate the considerable impact that commercial salmon fishing has on the regional economy. Actions that may harm commercial salmon harvests in Cook Inlet could potentially have large-scale consequences.

¹³ Windisch-Cole, B. and Warren, J. 2008. "Employment in Alaska's Fisheries." *Alaska Economic Trends*. November.

Table 2. 2007 Estimated Wholesale Value and Economic Impacts from Commercial Salmon Harvest in Alaska and Cook Inlet

Region	Estimated Wholesale Value	Estimated Total Economic Impact	Employment (Harvest & Processing)	Payments to Labor
All Alaska	\$1,055,111,392	\$1,694,572,842	20,459	\$302,290,867
Cook Inlet	\$61,412,658	\$98,632,451	1,191	\$17,594,811

Sources: ECONorthwest analysis, based on data from Alaska Department of Fish and Game, Division of Commercial Fisheries. 2007. *Alaska Commercial Salmon Harvests and Ex-vessel Values*. Retrieved September 29, 2009, from <http://www.cf.adfg.state.ak.us/geninfo/finfish/salmon/catchval/blusheet/07exvesl.php>; and Northern Economics, Inc. 2009. *The Seafood Industry in Alaska's Economy*. Marine Conservation Alliance, At-Sea Processors Association and Pacific Seafood Processors Association. January.

Alaska's fisheries are among the most productive in the world. As natural seafood habitats in much of the world decline, the importance of Alaska's natural seafood habitats will increase. Alaska is the top producer of wild, high-value salmon, producing almost 80 percent of the world supply of wild king (also known as Chinook), sockeye (also known as red) and silver (also known as coho).¹⁴ The United States Commission on Ocean Policy acclaimed Alaskan fisheries, drawing attention to the role of science in setting catch limits, efforts to control bycatch, and protect habitat. National Geographic listed Alaska among the three best-managed and most sustainable fisheries in the world. To maintain Alaska's reputation for supporting sustainable, well-managed fisheries, however, the state must continue to protect its fisheries.

2. Sport Fishing

The sport-fishing value of a Cook Inlet salmon is a function of the pleasure derived from the fishing experience, its value as a source of food, and the economic contributions that sport fishing brings to the surrounding region. Sport fishing contributes to the economy through spending on travel, equipment and supplies, and by generating jobs. The expenditures from sport fishing also bring in federal, state, and local tax revenues, which in turn can be used to protect natural fishing resources and, thus, promote economic growth.

Data collected by the Alaska Department of Fish and Game, indicate that sport fishing has large economic impacts for Cook Inlet and the State of Alaska. Alaska Department of Fish and Game reports that in 2007, 190,644 Alaska residents and 284,890 nonresidents bought fishing licenses. The expenditures from sport fishing in 2007 generated \$246 million in tax revenues, \$545 million in income, and created 15,879 jobs statewide. The economic output, or the value of all goods and services produced by businesses from anglers' expenditures was over \$1.6 billion. These figures demonstrate the magnitude of the impacts of sport fishing in the Alaskan economy.

¹⁴ Northern Economics, Inc. 2009. *The Seafood Industry in Alaska's Economy*. Marine Conservation Alliance, At-Sea Processors Association and Pacific Seafood Processors Association. January.

Due to its popularity as a fishing destination, the Department of Fish and Game reported sport fishing in the Cook Inlet subregion separately from the larger southcentral region of Alaska. Cook Inlet is a valuable area for sport fishing in Alaska. Table 3 shows the estimated angler days by water type in Cook Inlet, reported in 2007, separated by guided and unguided trips. On average, nonresident anglers reported that they spent \$376.11 per day on trip-related purchases to fish in Cook Inlet in 2007.¹⁵

If we assume that the average per-day, trip-related expenditures represent the minimum amount that sport anglers value a day of fishing in Cook Inlet, we can estimate the value of sport fishing in 2007 to anglers who visited Cook Inlet. This would imply that sport fishing in Cook Inlet was valued at a minimum of \$467 million. The actual value to sport anglers is likely much greater, since many of the anglers who reported expenses in 2007 likely received a high consumer surplus from their fishing experience (i.e., the anglers received greater benefits from a day of fishing than the expenses they paid).

Table 3. Angler Days by Water Type and Guided/Unguided, and Residency, Cook Inlet, 2007

Water Type	Guided / Unguided	Resident	Non-Resident	Total
Freshwater	Guided	40,699	98,859	139,558
	Unguided	580,559	274,836	855,395
	Total	621,258	373,695	994,953
Saltwater	Guided	23,450	69,694	93,144
	Unguided	116,513	38,488	155,001
	Total	139,963	108,182	248,145
Total	Guided	64,149	168,553	232,702
	Unguided	697,072	313,324	1,010,396
	Total	761,221	481,877	1,243,098

Source: Alaska Department of Fish and Game, Division of Sport Fish. 2009. *Economic Impacts and Contributions of Sportfishing in Alaska, Summary Report 2007*. January.

Table 4 shows the direct expenditures for sport fishing in Cook Inlet in 2007, which totaled more than \$730 million. Trip expenditures refer to all items related to traveling, including consumable goods and services, food, lodging, fuel or transportation, groceries, bait, and derby tickets. Package trip spending refers to travel packages purchased by nonresidents. Real estate includes all construction and maintenance of real estate used primarily for sport fishing.

¹⁵ Alaska Department of Fish and Game, Division of Sport Fish. 2009. *Economic Impacts and Contributions of Sportfishing in Alaska, Summary Report 2007*. January.

Table 4. Spending for Sport Fishing by Residency and Expenditure Category, Cook Inlet, 2007

Category of Spending	Resident	Non-Resident	Total
Trip (non-package)	\$123,295,328	\$157,465,551	\$280,760,879
Package Trips	\$0	\$23,774,541	\$23,774,541
Equipment	\$291,710,774	\$21,952,076	\$313,662,850
Real Estate	\$42,932,362	\$71,838,343	\$114,770,705
Total	\$457,938,464	\$275,030,511	\$732,968,975

Source: Alaska Department of Fish and Game, Division of Sport Fish. 2009. *Economic Impacts and Contributions of Sportfishing in Alaska, Summary Report 2007*. January.

When anglers purchase fishing supplies or other related expenses, the money they spend does not stop there, but rather circulates in the local, regional, national, and international economies, fueling additional economic activity. When outfitters, hotels, and other businesses receive dollars directly from visitors, they, in turn, spend some of those dollars on employee salaries and goods and services at other local businesses. The employees and businesses then do the same, producing a ripple effect of dollars moving through the local economy. This is referred to as the multiplier effect. Alaska Department of Fish and Game used the IMPLAN economic model to calculate the total jobs, tax revenues, and other economic contributions of sport fishing to Cook Inlet, including both direct and multiplier effects. Table 5 summarizes these data. Of course, some money spent on fishing trips in Cook Inlet either does not come into the regional economy of Cook Inlet at all or quickly passes out of the economy without providing much impact. The IMPLAN analysis accounts for this phenomenon and adjusts accordingly. The results imply that sport fishing in Cook Inlet produces approximately \$828 million in economic output, \$279 million in regional income, and over 8,000 jobs.

Table 5. Economic Contributions of Spending for Sportfishing, Cook Inlet, 2007

Economic Effect	Economic Impact	Resident	Non-Resident	Total
Direct Effects	Output	\$246,005,477	\$242,415,467	\$488,420,944
	Income	\$84,239,661	\$87,274,061	\$171,513,722
	Jobs	2,699	2,583	5,282
Multiplier Effects	Output	\$167,282,135	\$172,186,759	\$339,468,894
	Income	\$52,410,475	\$54,850,355	\$107,260,830
	Jobs	1,311	1,463	2,774
Total Effects	Output	\$413,287,612	\$414,602,226	\$827,889,838
	Income	\$136,650,136	\$142,124,416	\$278,774,552
	Jobs	4,010	4,046	8,056

Source: Alaska Department of Fish and Game, Division of Sport Fish. 2009. *Economic Impacts and Contributions of Sportfishing in Alaska, Summary Report 2007*. January.

Sport fishing contributes to the Alaskan economy, not only through direct spending and the multiplier effect, but also through federal, state and local tax

revenues. The total tax revenues attributed to sport fishing expenditures in Cook Inlet in 2007, shown in Table 6, were nearly \$193 million dollars.

Table 6. Tax Revenues Generated in Cook Inlet from the Economic Contributions of Sportfishing, 2007

Tax	State and Local Tax Revenues	Federal Tax Revenues	Total Tax Revenues
Trip (non-package)	\$29,503,041	\$27,641,197	\$57,144,238
Package Trip	\$1,748,741	\$2,070,565	\$3,819,306
Equipment & Real Estate	\$24,029,588	\$107,549,388	\$131,578,976
Total Tax Revenue	\$55,281,370	\$137,261,150	\$192,542,520

Source: Alaska Department of Fish and Game, Division of Sport Fish. 2009. *Economic Impacts and Contributions of Sportfishing in Alaska, Summary Report 2007*. January.

In 2007, 1.2 million angler days were recorded in the Cook Inlet region. Of those days, 60 percent (761,221 days) were by Alaskan residents and 40 percent (481,877 days) were by nonresidents.¹⁶ The high number of fishing days taken by non-Alaskan residents demonstrates the value of the Cook Inlet region to recreational fishing and its unique nature among other fishing regions around the world.

¹⁶ Northern Economics, Inc. 2009. *The Seafood Industry in Alaska's Economy*. Marine Conservation Alliance, At-Sea Processors Association and Pacific Seafood Processors Association. January.

B. NON-USE ECONOMIC VALUES

Even those who do not consume salmon or participate in the commercial or sport fishing industries in Cook Inlet may benefit from their existence. In fact, the non-use value of an environmental resource is often far greater than its commercial or sport value. Economists refer to these benefits, which one derives from a good or service without using it, as the non-use benefit. The non-use value of a good or service can take several different forms: option value, which is the value of saving a good for use at another time; bequest value, the value of saving a good for future generations; altruistic value, the value of saving a good for others to use now; and existence value, the value of saving a good for the sake of its existence.¹⁷ In this report, we look at the non-use value of salmon in Cook Inlet since there is evidence that salmon will be affected by the proposed Chuitna Coal Project.

Loomis estimated the marginal non-use value of salmon and steelhead on the Lower Snake River to residents of Oregon, Washington, and California.¹⁸ The results of the analysis indicate that, as one would expect, the marginal value (i.e., the value of the next additional salmon) goes down as the total population of salmon goes up. At very low populations, (e.g. fewer than 5,000 total fish) the marginal value of an additional fish is more than \$1 million. This immense per-fish value embodies the scarcity associated with a small fish population and society's desire to preserve the species for current and future generations.

Based on the results of the survey analysis and through the incorporation of information from other surveys, Loomis developed a marginal Willingness to Pay (WTP) benefit function, which provides estimates of the marginal value of a fish based on the size of the underlying population. He then demonstrated that as the underlying population increases, the marginal value that society places on increasing the population by one fish decreases. For example, we estimate the average annual salmon escapement for Northern Cook Inlet rivers and streams to be 2,119,358, based on escapement counts conducted by the Alaska

¹⁷ Schuhmann, P.W. and K.A. Schwabe. 2002. "Fundamentals of Economic Principles and Wildlife Management." In L. Clark, J. Hone, J.A. Shivik, R.A. Watkins, K.C. VerCauteren, and J.K. Yoder, eds., *Human Conflicts with Wildlife: Economic Considerations. Proceedings of the Third NWRC Special Symposium*. Fort Collins, CO: National Wildlife Research Center. Retrieved September 29, 2009, from <http://www.aphis.usda.gov/ws/nwrc/symposia/economics/>.

¹⁸ Loomis, J., 1999, "Recreation and Passive Use Values From Removing the Dams on the Lower Snake River to Increase Salmon," U.S. Department of the Army, Corps of Engineers, Walla Walla District. March. Retrieved September 29, 2009, from http://www.nww.usace.army.mil/lsr/REPORTS/rec_passive/pass_rec.pdf

Loomis reviewed and augmented survey data from three other studies, which asked households in the Pacific Northwest and California how much they were willing to pay for a specified increase in the number of either salmon or salmon and steelhead on a given river as a result of dam removal. None of the fish in these studies were endangered which is an important consideration when relating the results of these studies to other rivers since individuals will likely place greater existence value on an endangered species than on a non-endangered species.

Department of Fish and Game. Applying Loomis's WTP benefit function calibrated for Alaska, we estimate the marginal non-use value of one additional fish to be \$3.98. However, based on a higher estimate of the total salmon escapement for Northern Cook Inlet rivers and streams of 2.2 million fish, the marginal value of an additional fish drops to \$3.78.

We apply Loomis' findings to Cook Inlet, calibrating Loomis's WTP benefit function to six alternative salmon populations applicable to Northern Cook Inlet (see first column of Table 7) and to Alaska's estimated 2008 (human) population of 677,183.¹⁹ In doing so, we assume that the form of Loomis's WTP benefit function is a reasonable estimate for Alaskans. We examine the reasonableness of this assumption below. Table 7 shows the estimated annual marginal, average, and total non-use values of Northern Cook Inlet salmon. Assuming the sum of the Fish and Game escapement counts for the area's rivers and streams are a good estimate of the salmon population, we estimate Alaska's annual marginal non-use WTP for a Northern Cook Inlet salmon to be \$3.98, the average WTP to be \$132, and the total annual non-use WTP of the entire Northern Cook Inlet salmon fishery to be approximately \$280 million.

Table 7. Annual Non-Use Value of Northern Cook Inlet Salmon, 2007 Dollars*

Assumed Northern Cook Inlet Salmon Escapement	Marginal Non-use Value of a Cook Inlet Salmon	Average Non-use Value of a Cook Inlet Salmon	Total Non-use Value of Northern Cook Inlet Salmon Population
2,050,000	\$4.17	\$136	\$279,714,427
2,100,000	\$4.03	\$133	\$279,916,104
2,119,358*	\$3.98	\$132	\$279,989,320
2,150,000	\$3.91	\$130	\$280,111,368
2,200,000	\$3.78	\$127	\$280,300,565
2,250,000	\$3.67	\$125	\$280,484,013

Source: ECONorthwest analysis of results from Loomis, J. 1999. *Recreation and Passive Use Values From Removing the Dams on the Lower Snake River to Increase Salmon*. U.S. Department of the Army, Corps of Engineers, Walla Walla District. March. Retrieved September 29, 2009, from http://www.nww.usace.army.mil/lsl/REPORTS/rec_passive/pass_rec.pdf; with data from the Pacific Fishery Management Council. 2009. *Review of Ocean Salmon Fisheries*. February 14. Retrieved September 29, 2009, from <http://www.pcouncil.org/salmon/salsafe.html>; and Fair, L.F., R.A. Clark, and J.J. Hasbrouck. 2007. *Review of Salmon Escapement Goals in Upper Cook Inlet, Alaska, 2007*. Alaska Department of Fish and Game, Divisions of Sport Fish and Commercial Fisheries. Fishery Manuscript No. 07-06. Table 2. Retrieved September 29, 2009, from, <http://www.sf.adfg.state.ak.us/FedAidPDFs/fms07-06.pdf>

* Estimated average annual escapement based on observed counts reported in Fair, L.F., R.A. Clark, and J.J. Hasbrouck. 2007. *Review of Salmon Escapement Goals in Upper Cook Inlet, Alaska, 2007*. Alaska Department of Fish and Game, Divisions of Sport Fish and Commercial Fisheries. Fishery Manuscript No. 07-06. Table 2. Retrieved September 29, 2009, from, <http://www.sf.adfg.state.ak.us/FedAidPDFs/fms07-06.pdf>

But are these estimates reasonable? At first glance, these numbers appear to be very large. However, consider that these estimates are aggregated across the

¹⁹ Population estimate based on Alaska Department of Labor and Workforce Development population estimates.

entire population of Alaska – nearly 680,000 people in 2008. Although there is not a direct market test to affirm the reasonableness of these estimates, a standard approach for examining the reasonableness of WTP estimates is to compare the estimated total non-use value of the resource (all salmon populations of Northern Cook Inlet) to one or more aggregate economic measures for the relevant geography – the State of Alaska.

In 2007 Alaska's all industry GSP was \$44.5 billion and total personal income was \$27.3 billion.²⁰ Thus, the total annual non-use value of all Northern Cook Inlet salmon populations (\$280 million) represents only 0.6 percent of the value of the state's entire economic output and only 1.0 percent of the state's total income. Given the scale of the salmon population of Northern Cook Inlet and its proximity to well over half the state's residents, it appears that the estimated annual non-use value is not only reasonable, it is also quite conservative.

²⁰ GSP and personal income data for 2008 are not yet available through the U.S. Bureau of Economic Analysis.

C. SUBSISTENCE FISHING, HUNTING, AND GATHERING

Many Alaskans rely on our fisheries for subsistence, which has been elemental to Alaska Natives and their cultures for thousands of years. It also has become a way of life for many non-Natives in Alaska. Fish comprise 60 percent of subsistence foods taken each year and 95 percent of rural households consume subsistence-caught fish. More than just a food source, this tradition allows a love of fishing to be passed from one generation to the next.

Former Alaska Governor, Sarah Palin²¹

Lower income/lower wealth households tend to rely more heavily upon environmental goods and services than higher income/higher wealth households. Goods and services provided by the natural environment are a necessity, rather than a luxury for the lower income groups. Furthermore, traditional methods of assessing the value of non-market based economic goods and services, such as asking the users how much they are willing to pay for a good or service, may not accurately portray the value to lower income groups since a dollar has greater relative value to an individual with lower income than it does to an individual with higher income.²² This is especially apparent in rural Alaska, where the vast majority of households engage in some level of subsistence hunting, fishing, and gathering.

As part of their recently completed analysis of geographic differences in the cost of living in Alaska, the McDowell Group asked nearly 2,500 Alaska households what percent of their household food supply is obtained from hunting, fishing, gardening, and berry picking.²³ They found that, on average, 22 percent of the food supply of an Alaska household came from these activities, however there was significant variation between communities. For example, Anchorage, Fairbanks, Juneau, and Ketchikan households reported relatively low rates of hunting, fishing, gathering, and gardening (13 percent to 15 percent on average). Comparatively, the primarily Native communities of Goodnews Bay, Anvik, Emmonak, and Saint Mary's reported rates of between 55 percent and 88 percent. Other rural, but primarily non-Native communities, such as Elfin Cove and Tenakee Springs also reported that a large proportion of their household food supply came from hunting, fishing, gathering, and gardening activities.

²¹ Alaska Department of Labor and Workforce Development. 2008. *Alaska Economic Trends*. November. Retrieved September 29, 2009, from <http://labor.state.ak.us/trends/home.htm>

²² Høkbj. S. and T. Söderqvist. 2001. *Elasticities of Demand and Willingness to Pay for environmental Services in Sweden*. Prepared for the 11th Annual Conference of the European Association of Environmental and Resource Economists.

²³ McDowell Group. 2009. *Alaska Geographic Differential Study 2008*. State of Alaska, Department of Administration. April 30. Retrieved September 29, 2009, from <http://doa.alaska.gov/GDS/home.html>

Households from the communities of Tyonek and Beluga (situated near the mouth of the Chuitna) are not identifiable from the McDowell Group Survey. However, both communities rely heavily on subsistence fishing, hunting and trapping for survival. In 2007, the Alaska Department of Fish and Game performed household surveys to gather information about the local harvest practices and use of renewable resources during the 2005–06 study year.²⁴ Some of their findings are summarized below.

1. Tyonek

The village of Tyonek is the home of the Tubughna or the “beach people” and its isolation from other parts of Alaska prevents visitation of large numbers of non-locals, unfamiliar with the local customs. The village contains a store, community center, and a school with surrounding single-family dwellings. The Native Village of Tyonek (NVT) council oversees the water and sewage systems, and maintains the roads. Private companies oversee the electric and phone systems. There are no roads connecting Tyonek to a state highway, but there is a network of gravel roads throughout the village, jointly maintained by Tyonek Native Corporation (TNC) and the oil and gas companies, and there is a bridge across the Chuitna which connects Tyonek to the village of Beluga. The most common way to enter Tyonek is by airplane, using the village’s lighted gravel runway.

Of an estimated 52 households in Tyonek, 79 percent of household members held cash-earning jobs in 2005–06. Cash employment includes commercial fishing and wage-labor employment and provided \$23,944 per household and \$7,815 per person during the study year. Other income sources, which include the Alaska Permanent Fund dividend, pensions and retirement, social security, and corporation dividends, provided an average income of \$7,409 per household and \$2,418 per person. Total per capita income was \$10,233 and per household income was \$31,353. Of this income, the average estimated food expenditures for a Tyonek household was \$6,764 per year, or 20 percent of the average annual income.

In addition to cash employment, local residents also rely heavily upon wild resources for sustenance. About one-half of the residents estimated that the majority of the meat, fish and birds they consume annually are obtained from wild sources. Of Tyonek’s households, 11 percent indicated that all of their meat, fish, and birds were supplied from wild sources. During the 2005–06 study year, the community of Tyonek harvested more than 43,000 pounds of wild resources, averaging 664 pounds per household and 217 pounds per person.

Salmon constituted 70 percent of Tyonek’s harvest in 2005–06. King salmon were the primary species harvested, totaling 24,104 pounds (2,104 fish). Silvers and

²⁴ Stanek, R.T., D.L. Holen, and C. Wassillie. 2007. *Harvest and Uses of Wild Resources in Tyonek and Beluga, Alaska, 2005–2006*. Alaska Department of Fish and Game, Division of Subsistence. Technical Paper No. 321. Retrieved September 29, 2009, from <http://www.subsistence.adfg.state.ak.us/TechPap/TP321.pdf>

sockeye were also important species. Tyonek residents fished for salmon on the beach from Granit Point north to near the mouth of the Chuitna, and on the Chuitna, the McArthur River, and the Chakachatna River.

2. Beluga

The community of Beluga is significantly smaller than Tyonek and more dispersed. Actual population estimates vary depending on the time of year, but typical estimates are between 20 and 30 people. During the time of the study, most Beluga residents were non-Alaska native. In 2006, Beluga had a store, a gas station, a private contract mail drop, and a private gravel airstrip for planes.

Like the village of Tyonek, Beluga also depends on the harvest of wild resources. During the study year, 100 percent of Beluga households used, attempted to harvest, and harvested at least one type of fish, wildlife, or wild plant resource. Fortynine percent of households estimated that the majority of their annual meat, fish, and bird supply came from wild sources and 14 percent of the households estimated that between 26 percent and 50 percent of it came from wild resources.

During the 2005-06 study year, wild resource harvests by Beluga residents averaged 539 pounds per household or 204 pounds per person.

D. ECONOMIC GROWTH AND NATURAL RESOURCE PROTECTION

Traditionally it was assumed that lands protected from resource extraction, residential and commercial development, and other forms of direct economic action provide little or no economic benefits to local communities. This assumption relied on the notion that economic value is necessarily a function of resource extraction or other forms of direct commercial use. There is growing evidence, however, to suggest conservation-oriented uses of public lands and regulations limiting exploitation of privately owned lands, rather than commodity production and residential sprawl, may actually provide greater benefits to local economies. Recent research has demonstrated that, by protecting public lands and enhancing recreational opportunities in and around them, regional economies benefit and even expand. For example, economists at Oregon State University demonstrated that protecting natural areas benefits local economies in the Pacific Northwest in two ways.²⁵ First, regions with higher proportions of land conserved to protect biodiversity exhibit higher rates of employment growth. Second, empirical evidence suggests that the same regions also experience higher rates of net migration. That is, more people move into the region than leave. The authors also found that regions that were unable to diversify their local economies and relied heavily on resource extraction experienced lower or even negative rates of employment growth and net migration.

Although this research was conducted in Oregon, Washington, and northern California, the findings are relevant and applicable to Alaska. Even more so than the (contiguous) Pacific Northwest, Alaska possess a bounty of natural resources that can, through protection and careful stewardship, serve as the foundation for the state's continued economic prosperity. Although exploitation of a particular resource may indeed provide substantial short-term economic benefits for a few, it is often at the long-term economic expense of the many. The assumption that "high-paying" mining jobs will solve the actual or perceived economic shortcoming facing a region is contradicted by the reality experienced in places, such as the Kellogg, Idaho, Butte and Anaconda, Montana, and Lead, South Dakota.²⁶ Not only do these towns now exist in the "bust" period of the boom and bust cycle, mining has left a legacy of massive environmental degradation. Each of the towns listed above are now dealing with superfund clean-ups among the largest in U.S. history.

²⁵ Kerkvliet, J., Plantinga, A.J., Eichman, H., Hunt, G.L., "Did the Northwest Forest Plan Impact Rural Counties More than Urban Counties?" in R. Rosenberger (Comp.) *Western Regional Research Publication: W-1133. Benefits and Costs of Resource Policies Affecting Public and Private Land, Twentieth Interim Report*, 317-355, Corvallis, OR.

²⁶ Power, T.M., *Lost Landscapes and Failed Economies: The Search for a Value of Place*, 1996, Island Press.

Similar studies elsewhere in the U.S. substantiate these results and confirm that, especially in the West, natural amenities explain the trajectory that regional economies have followed in terms of population and economic growth. For instance, a U.S. Department of Agriculture study found that the existence of amenity features, such as a temperate climate, varied topography, and a strong presence of water areas, can explain population growth in rural counties in the last quarter of the twentieth century.²⁷ Other research confirms that, along with factors such as access to air travel and the availability of an educated workforce, designations that permanently protect public land play a decisive role in determining whether a Western rural county will experience economic growth.²⁸ Another recent study looked at the socioeconomic impacts of recreation and tourism on the quality-of-life of residents.²⁹ The authors found that recreation and tourism have a positive impact on communities, employment, and wages, and contribute to the reduction of poverty and to the improvement of education and health. The study also concluded that, on average, even though housing costs increase in these regions, the gains in income offset such cost increases.

Research, such as the studies referenced above, confirms an economic reality that many regions experience today, namely that natural amenities and recreation foster sound economic growth and can create an economic buffer that protects them from the extremes of boom-and-bust cycles associated with natural-resource extraction. The healthy ecosystem of Cook Inlet not only supports a strong commercial fishing industry, but also an even more economically important tourism-based sport-fishing industry. The economic returns of a healthy Cook Inlet are substantial today and will likely be even greater in future as clean water and air and healthy stocks of wild salmon become ever more scarce on a global basis.

The Cook Inlet region has experienced strong economic growth while protecting its natural resources.³⁰ This region contains five major conservation areas (Kenai National Wildlife Refuge, Kenai Fjords National Park and Preserve, Kachemak Bay State Park and State Wilderness Park, and Denali State Park) and seven state critical habitat areas.

²⁷ McGranahan, D.A. 1999. Natural Amenities Drive Rural Population Change. Agricultural Economic Report No. 781. Washington, DC: U.S. Department of Agriculture, Economic Research Service, Food and Rural Economics Division. September. Retrieved September 29, 2009, from <http://www.ers.usda.gov/Publications/AER781/>.

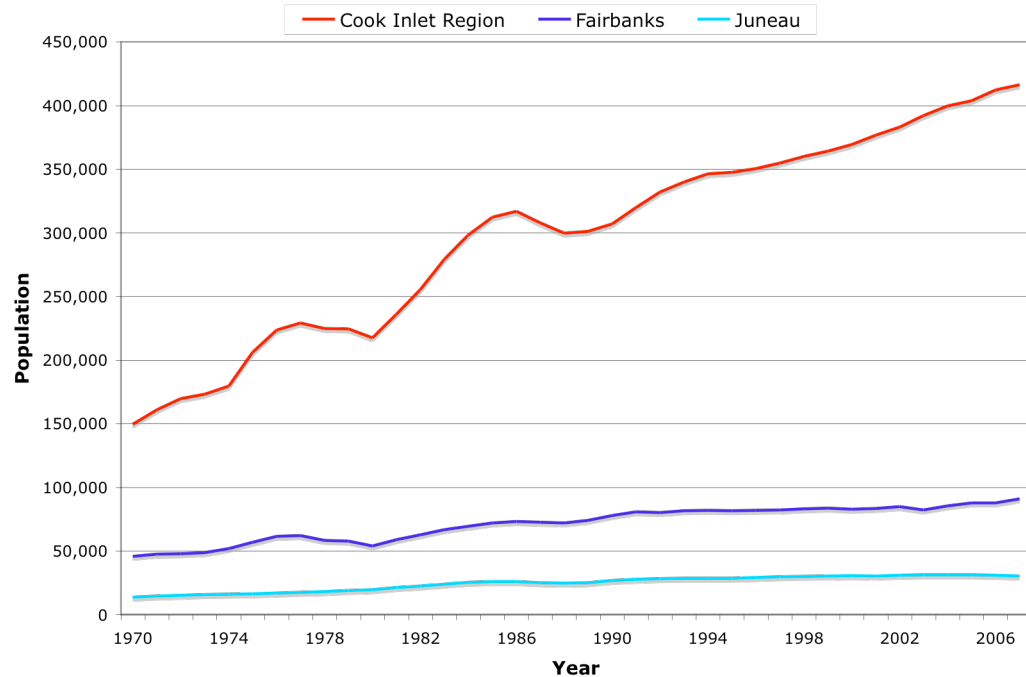
²⁸ Rasker, R. 2006. "An Exploration Into the Economic Impact of Industrial Development Versus Conservation on Western Public Lands." *Society and Natural Resources*, 19(3): 191-207.

²⁹ Brown, D.M., R. Reeder. 2005. "Rural Areas Benefit from Recreation and Tourism Development." *Amber Waves*, 3(4): 28-33.

³⁰ We define the Cook Inlet region as encompassing three Census Areas: the Municipality of Anchorage, the Matanuska-Susitna Borough, and the Kenai Peninsula Borough.

The Cook Inlet is the primary economic center for Alaska and the home more than half the state's residents. Most of the population and economic activity is concentrated in the urban areas of the Anchorage Basin, in the developed portions of Palmer and Wasilla, and in the communities of the Kenai Peninsula.

Figure 3. Population Growth in Cook Inlet Region Since 1970, Comparison to Other Regions of Alaska



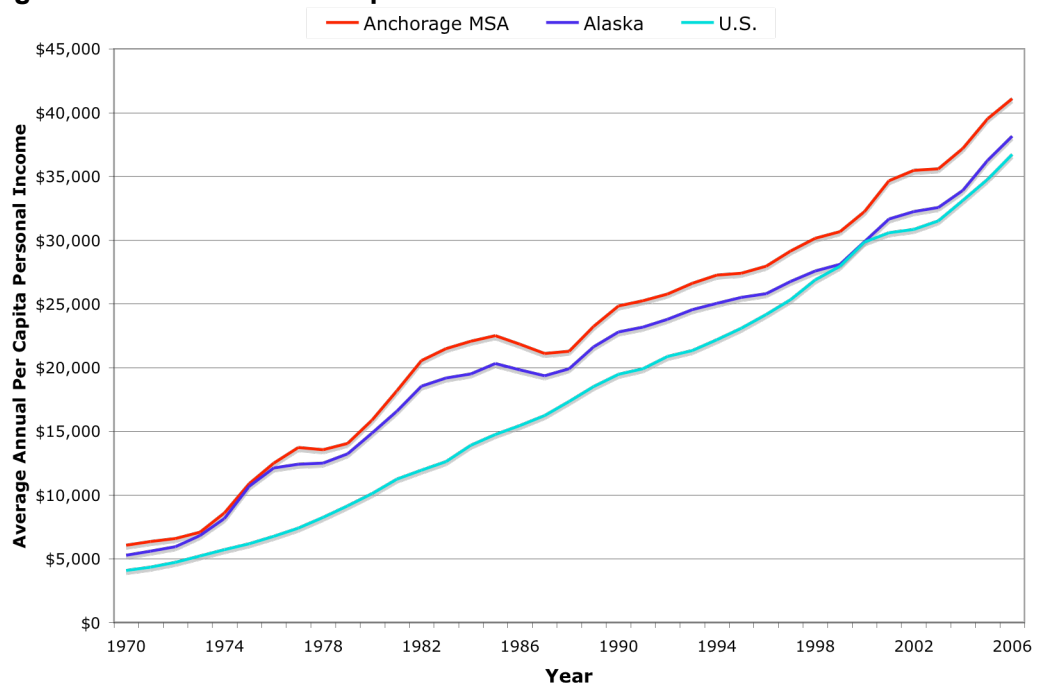
Source: ECONorthwest analysis, with data from Alaska Department of Labor and Workforce Development.

Alaska's economic and population growth has been concentrated in the Cook Inlet region. Figure 3 shows population growth in the region, and other populous regions in Alaska, since 1970. The population of the Cook Inlet region grew an average of 4.7 percent annually since 1970, the highest growth rate in the state. In comparison, Fairbanks, the second largest city in Alaska, grew 2.6 percent annually, and Alaska as a whole grew 3.3 percent annually over the same time period.

While Anchorage serves as the trade, services, and headquarters center for the state's natural resources sector, it is also the gateway to the state's tourism destinations. The Kenai Peninsula Borough is relatively diversified with oil and gas, fishing, timber, tourism, and government playing an important role in the economy. Tourism, agriculture, and service-providing industries are the main economic drivers in the Matanuska-Susitna Borough. For the region overall, the largest economic sectors in terms of employment are government, trade, leisure and hospitality, professional and business services, and health care. Until 2008, Anchorage's economy has seen 20 years of uninterrupted job growth and while growth has not been as rapid as in other parts of the U.S., the Anchorage economy has not experienced as much contraction during economic downturns.

The belief that economic growth is mainly achieved by investing in resource extraction on public lands fails to recognize that conservation lands have helped spur economic and population growth in the region over past decades. The fact that the tourism sector experiences more growth than any other sector in the region (and in the state) is evidence of the contribution of conservation lands to economic growth in Alaska. After government and trade, the leisure and hospitality sector is the third largest sector in terms of employment in the Cook Inlet region, totaling more than 20,450 jobs in 2007. The sector has experienced 14.1 percent in job growth since 2002, compared to overall employment, which grew by 8.9 percent. Businesses and residents living in the region have built a strong tourism industry around these conservation areas. Also, the protected areas of the region support a portion of one of the world's most valuable sport-fisheries, the Kenai River. The continued health of the ecosystems in the region is essential for future economic and cultural well-being derived from commercial and subsistence fisheries as well as the vibrant visitor industry existent in the region.

Figure 4. Growth in Per Capita Personal Income Since 1970



Source: ECONorthwest analysis, with data from U.S. Bureau of Economic Analysis.

The Cook Inlet region has also exhibited strong growth in income since 1970. Per capita personal income on average was 9 percent higher in the Cook Inlet region compared to per capita personal income statewide, and 37 percent higher compared to the per capita personal income in the U.S. Figure 4 shows the growth in per capita personal income since 1970 in the Anchorage MSA, the State of Alaska, and the U.S. as a whole. Although some of the population and income growth in the region can be attributed to the development of oil and natural gas reserves in Cook Inlet, those reserves have declined over time, leading to the

closing of businesses that rely on plentiful and inexpensive energy and the subsequent dislocation of workers.³¹

³¹ For example, the Agrium fertilizer plant in Nikiski closed in 2008 due to the lack of affordable natural gas feedstocks.

E. ECOSYSTEM FUNCTIONS, GOODS, AND SERVICES

In addition to providing salmon and wildlife habitat, the ecosystem surrounding the Chuitna River provides many functions, goods, and services to residents of the Cook Inlet region. Some of these are listed in Table .

Table 8. Summary of Ecosystem Functions, Goods, and Services provided by the Chuitna River

Functions	Examples of Goods and Services Produced
Regulation of water	Natural features of an ecosystem capture precipitation; filter, retain, and store water; regulate levels and timing of runoff and stream flows; and influence drainage.
Formation & retention of soil	Wetlands and biota accumulate organic matter and prevent erosion to help maintain productivity of soils.
Regulation of atmosphere & climate	Biota produce oxygen and help maintain good air quality and a favorable climate for human habitation, health, and cultivation.
Regulation of disturbances	Wetlands reduce economic flood damage by storing flood waters, reducing flood height, and slowing a flood's velocity.
Regulation of nutrients and pollution	Wetlands and riparian vegetation improve water quality by trapping pollutants before they reach streams and aquifers; natural processes improve water quality by removing pollutants from streams.
Provision of habitat	Wetlands, streams, and near-shore areas, and a variety of vegetation provide habitat for economically important wildlife.
Food production	Biota convert solar energy into plants and animals edible by humans.
Production of raw materials	Streams and biota generate materials for construction, fuel, and fodder; streams possess energy convertible to electricity.
Pollination	Insects facilitate pollination of economically important wild plants and agricultural crops.
Biological control	Birds and microorganisms control pests and diseases.
Production of genetic & medicinal resources	Genetic material in wild plants and animals provide potential basis for drugs and pharmaceuticals.
Production of ornamental resources	Products from plants and animals provide materials for handicraft, jewelry, worship, decoration, and souvenirs.
Production of aesthetic resources	Wetlands, vegetation, streams, and beaches provide basis for enjoyment of scenery from roads, housing, parks, trails, etc.
Production of recreational resources	Streams, reservoirs, beaches, vegetation, fish, waterfowl, and other wildlife provide basis for outdoor sports, eco-tourism, etc.
Production of spiritual, historic, cultural, and artistic resources	Wetlands, riparian vegetation, streams, and reservoirs serve as basis for spiritual renewal, focus of folklore, symbols of group identity, motif for advertising, etc.
Production of scientific and educational resources	Wetlands, vegetation, streams, and wildlife provide inputs for research and focus for on-site education.

Source: Adapted by ECONorthwest from De Groot, R., M. Wilson, and R. Boumans. 2002. "A Typology for the Classification, Description and Valuation of Ecosystem Functions, Goods and Services." *Ecological Economics* 41: 393-408; Kusler, J. 2003. *Assessing Functions and Values*. Institute for Wetland Science and Public Policy and the Association of Wetland Managers, Inc.; and Postel, S. and S. Carpenter. 1997. "Freshwater Ecosystem Services." in *Nature's Services: Societal Dependence on Natural Ecosystems*. Edited by G.C. Daily. Washington, D.C.: Island Press, pgs. 195-214.

The economic importance of many of the goods and services listed in Table may not be obvious as they are not bought and sold in markets. The habitat for fish

and wildlife, for instance, has no market value, but it is economically important insofar as it supports activities, such as sport hunting and fishing, wildlife watching, and gathering, and because it helps sustain species, such as the moose and bear, whose continued existence is economically important to many residents living near the Chuitna.

The nearly 150 stream miles in the Chuitna watershed provide important habitat for a variety of wildlife including rainbow trout, king, silver, chum, pink, and sockeye salmon, as well as brown and black bear and moose. The high quality of the water and habitat of the Chuitna and its tributaries results in healthy salmon populations necessary to maintain the healthy ecosystem that the region's wildlife, the residents of Tyonek and Beluga, sport anglers, and even the commercial fishing industry of Cook Inlet depend upon.

According to the National Marine Fisheries Service, the survival of Pacific Northwest salmon—and the commercial and sport fisheries they support—depends on protecting and restoring habitat diversity and migratory connections among habitats.³² Currently, the Chuitna system is largely undeveloped and its salmon runs remain healthy.

Conserving healthy salmon populations reinforces recreational, aesthetic, and other economically significant amenities in Cook Inlet. Alaska's pristine environment is a likely a key reason that—unlike the U.S. as a whole—Alaska has enjoyed more than two decades of continuous economic growth.³³ The quality of life in the Cook Inlet region, characterized largely by its natural resources, attracts new residents and businesses, drawn by the natural amenities unmatched elsewhere in the U.S. Attracting high-quality workers helps businesses in Alaska compete with firms elsewhere, thus strengthening this region's economy.

Salmon are an important good provided by the Chuitna, not only for their value to the fishing industry, as a source of food, and as an attraction to new residents and businesses, but also for their contribution to the entire ecosystem. Salmon provide a warning of wider environmental hazards; they alert us to declines in environmental quality that may endanger other species, including humans. Increased erosion and suspended sediment, which are often associated with mining operations, usually cause stream temperatures to increase. A 2002 USGS report found that concentrations of cadmium, lead and zinc were higher in Cook Inlet at the more urbanized sites and downstream from ore bodies and old coal

³² National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 2006. *Salmon Habitat*. Retrieved December 1, 2008, from <http://www.nwr.noaa.gov/Salmon-Habitat/index.cfm>.

³³ For more information on the connection between healthy ecosystems and a healthy economy see Colt, S. 2001. *The Economic Importance of Healthy Alaska Ecosystems*. University of Alaska Anchorage, Institute of Social and Economic Research.

mines.³⁴ This indicates that current and prior human actions in Cook Inlet have impacts on the water quality and the surrounding environment.

³⁴ Frenzel, S.A. 2002. *Streambed Sediments of the Cook Inlet Basin, Alaska, 1998-2000*. Water-Resources Investigations Report 02-4163. U.S. Geological Survey.

F. SUMMARY OF FINDINGS

The results of this analysis demonstrate that Alaskans – especially those living in the Cook Inlet region – enjoy a large and sustainable flow of economic benefits from Cook Inlet, and to a lesser degree, the Chuitna River. Coal strip mining in Upper Cook Inlet – though likely rewarding a select few over a short period of time – may adversely and severely affect many over a much longer timer horizon.

Sport fishing contributes greatly to the regional economy through spending on travel, equipment and supplies, by generating jobs, and by generating federal, state, and local tax revenues. Direct expenditures for sport fishing in Cook Inlet in 2007 totaled more than \$730 million. Ripple effects – the multiplier impact of dollars coursing through an economy – suggests sport fishing was responsible for an estimated \$828 million in economic output, \$279 million in regional income, and more than 8,000 jobs in Cook Inlet.

Commercial salmon harvested from Cook Inlet had an estimated wholesale value of over \$61 million, a total economic impact of nearly \$100 million, and employed more than 1,000 people in 2007. Alaska’s fisheries are among the most productive in the world. As natural seafood habitats in much of the world decline, the importance and relative value of Alaska’s habitats will increase. Alaska is the world’s top producer of wild, high-value salmon, producing almost 80 percent of the world supply of wild king, sockeye and silver salmon.

Many of those who do not consume salmon or participate in commercial or sport fishing in Cook Inlet still benefit from the existence of salmon. Based on applying research findings from Pacific Northwest rivers to salmon escapement counts for rivers and streams in the Upper Cook Inlet area, we estimate total annual non-use economic benefit of the entire Upper Cook Inlet salmon fishery to be approximately \$280 million per year, aggregated across Alaska’s total population.

The local residents of Tyonek and Beluga rely heavily upon wild food resources from the Chuitna watershed and Cook Inlet for sustenance. About one-half of the residents of Tyonek and Beluga estimate that the majority of the meat, fish and birds they consume annually are obtained from wild sources.

The Cook Inlet region has experienced strong economic growth while protecting its natural resources. Maintaining healthy ecosystems has helped spur economic and population growth in the region over the past decades. The Cook Inlet is the primary economic center of Alaska and home to more than half the state’s residents. The tourism sector has experienced a greater rate of growth than any other sector in the region (and in the state) over the past couple decades. The belief that economic growth is mainly achieved by investing in resource extraction on public lands fails to recognize that conservation lands have helped spur economic and population growth in the Cook Inlet and other regions of the West over the past decades.

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