OCTOBER 2016

Economic Impact Analysis

Southeast Alaska Transboundary Watersheds

PREPARED FOR SalmonState

PREPARED BY McDowell GROUP

Southeast Alaska Transboundary Watersheds: Economic Impact Analysis

Prepared for:

SalmonState

Prepared by:

Juneau • Anchorage

October 2016

Table of Contents

List of Tables

List of Figures

Executive Summary

Southeast Alaska's economy is highly dependent on the region's rich natural resources. Two of the region's key industries, commercial fishing and tourism/recreation, rely on healthy eco-systems to generate jobs, income, and other economic opportunities. Transboundary rivers, which originate in Canada and flow into the U.S., are important components of Southeast's economically-valuable eco-system. This economic connection between transboundary rivers and the entire Southeast Alaska economy is a critically important aspect of watershed management.

SalmonState contracted with McDowell Group, an Alaska-based research and consulting firm, to measure the economic impacts in Southeast Alaska of three transboundary watersheds: Taku, Stikine, and Unuk Rivers. The analysis also briefly considers economic contributions to Southeast Alaska from the Nass and Skeena Rivers, two river systems that also have cross-border economic impacts.

Recognizing that healthy watershed systems have value far beyond the jobs and income they support, this study of "river economics" focuses on the commercial value of the rich salmon runs supported by Southeast Alaska's three transboundary watersheds. It also considers economic impacts connected to the watersheds' scenic and recreational amenities that make all three areas popular destinations for the visitor industry and Southeast Alaska residents.

Communities closest to the watersheds benefit most directly from healthy transboundary watersheds, though the economic benefits, including business spending, labor income, and job creation, as well as a variety of tax benefits, flow through the entire region.

The perpetual nature of watershed economics is perhaps the most important benefit of Southeast Alaska's transboundary areas. Fish, wildlife, and scenic resources in the watersheds are fully renewable and have the potential to offer greater economic value as similar resources and experiences grow more scarce. With proper management, watersheds can continue to generate economic benefits for Alaskans and others far into the future.

Photo credit: James Den Uyl

Scope of Work

This analysis focuses on economic activity in Alaska associated with the Taku, Stikine, and Unuk River watersheds. The analysis measures direct, indirect, and induced economic effects. Indirect effects are associated with watershed-related business spending on goods and services. Induced effects stem from watershed-dependent household spending on goods and services. The renewable nature of watershed resources can provide on-going, perpetual economic benefits if managed appropriately. These benefits are calculated using the "present value" of future benefits. This study does not attempt to measure "existence" values or non-use values, which are sometimes used to capture intrinsic values of important natural assets, such as Southeast's transboundary rivers.

Measuring transboundary watershed-related economic activity is complex and difficult to isolate from the larger eco-system and economy that spans Southeast Alaska and Canada. Data is limited for many aspects of watershed-related commercial and recreational activity. Such limitations are present in commercial fisheries data, as run sizes for many salmon species from the rivers are not well documented and participation in specific fisheries is difficult to gauge due to fishermen moving between districts during the season. Also, unless a species is tracked through a tagging program, it is not possible to identify exactly how many harvested fish are from a particular river in the region. As a result, estimates of salmon harvests attributable to each watershed are based on best available data. While commercial fisheries other than salmon depend on the clean water produced by the region's transboundary rivers, no other seafood-related values can be directly linked with data to watersheds at this time.

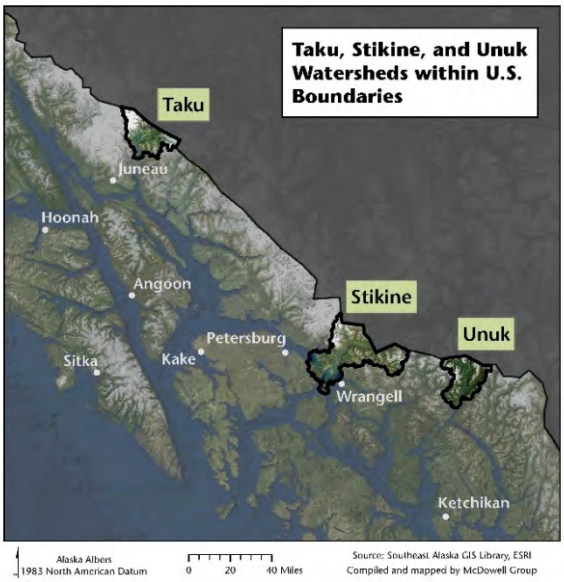
It is important to note that the nature of the renewable resources produced in these watersheds varies from year-to-year. Commercial fishing resources, in particular, are cyclical or subject to variations due to weather patterns, management changes, and other factors.

Transboundary Watersheds

The Taku, Stikine, and Unuk watersheds all originate in British Columbia and flow into Southeast Alaska.

The Taku River watershed encompasses approximately 5,000 square miles. The 100-mile long river terminates in Taku Inlet, with the lower 25 miles of the river located in the U.S.

The Stikine River drains a 20,000 square-mile area, flowing through the Stikine-LeConte Wilderness and ending in a river delta north of Wrangell. The lower 27 miles of the almost 400-mile river are located in Alaska.



The Unuk River drains approximately 1,500 square miles, flowing 80 miles to its terminus in Burroughs Bay, approximately 50 miles northeast of Ketchikan. The lower 24 miles of the river, which flow through a portion of Misty Fjords National Monument, are in Alaska.

Taku River Watershed Economic Impacts

Taku River watershed-related economic activity includes $23.2 million in annual direct spending and $32.9 million in total spending in Southeast Alaska. An average $12.8 million in annual labor income and the equivalent of 260 year-round jobs in the region are generated by activity associated with the watershed.


Photo credit: Doug Milek

Economic impacts tied to the Taku River watershed include the following:

- Fishermen receive an annual average $1.9 million in ex-vessel value for harvests of Taku River salmon.
- An average $4.2 million in first wholesale value of Taku River salmon is processed in Southeast annually.
- Taku River Chinook and coho salmon are responsible for an average $2.7 million in sport fishing-related expenditures.
- Approximately $80,000 worth of Taku River salmon is harvested annually in the personal use fishery.
- Hunting expenditures total $65,000 on average in annual spending for hunting in the watershed.
- Visitor industry activity tied to the Taku River watershed generates an estimated $16 million in visitor expenditures annually.
- The City and Borough of Juneau receives an annual average of $55,000 in tax revenue from private property in the watershed.

The Taku River watershed's annual economic impact of $32.9 million has a 30-year present value of just under $650 million, based on 3 percent discount rate.

Stikine River Watershed Economic Impacts

Commercial and recreational activity associated with the Stikine River watershed generates an estimated $12.7 million in annual spending in Southeast Alaska, including $9.3 million in direct spending. The watershed accounts for $5.7 million in annual labor income in the region and creates 117 full and part-time jobs.


Photo credit: Chelsea Tremblay

These economic impacts include the following specific benefits:

- Commercial fishermen are paid an annual average of $2.1 million in ex-vessel value for Stikine River salmon.
- Seafood processors generate an average $3.5 million in first wholesale value annually processing and packaging Stikine River salmon.

- An average $4.2 million per year is expended on sport fishing for Stikine River Chinook and coho salmon.
- An average $100,000 worth of Stikine River salmon is harvested annually in the personal use fishery.
- Hunters spend an annual average of $200,000 hunting in the watershed.
- Tours in the watershed and watershed-associated visitor industry activity in Wrangell generate an average $1.2 million in expenditures by visitors to the Stikine River.
- Private property in the watershed accounts for approximately $15,000 in tax revenue each year to the City and Borough of Wrangell.

The present value of the Stikine River's annual economic footprint of $12.7 million, measured over 30 years, is $250 million.

Unuk River Watershed Economic Impacts

The Unuk River watershed accounts for an annual average $2.5 million in total spending in Southeast Alaska, including $1.8 million in direct spending in the region. Annual average labor income attributable to the watershed totals $1.2 million and the watershed accounts for an estimated 24 full and part-time jobs.


Photo credit: Travis Rummel

Estimated annual economic impacts from the watershed include the following:

- Fishermen are paid an annual average $460,000 in ex-vessel value for Unuk River salmon harvests.
- An annual average $890,000 in first wholesale value is attributable to Unuk River salmon.
- Sport fishing for Unuk River Chinook and coho salmon generates $880,000 in sport fishing-related expenditures annually.
- Hunters spend an annual average of $13,000 on hunting activity in the watershed.
- The visitor industry generates an average annual $6,300 in visitor expenditures associated with the watershed.
- The Ketchikan Gateway Borough benefits annually from an average $11,000 in property tax revenue from Unuk River watershed private properties.

These Unuk River watershed economic benefits have a net present value of approximately $50 million, based on $2.5 million in economic activity over a 30-year period.

Nass and Skeena Rivers

The Nass and Skeena Rivers do not flow into Alaska, though they do contribute to salmon harvests in Southeast Alaska fisheries, primarily on the outer coast. The Skeena River is the second largest river in British Columbia and the second largest Chinook and sockeye salmon producer on the B.C. coast. Skeena River Chinook are harvested in southern Alaska troll and net fisheries, and sockeye are harvested in a number of Southeast gillnet

and purse seine districts. Nass River sockeye are harvested in Southeast net fisheries. The economic impact of these rivers was not thoroughly examined in this analysis though examples of contributions to the region follow:

- The District 104 purse seine fishery 10-year average Nass and Skeena River sockeye harvest totals 28,500 fish with an estimated annual $242,000 ex-vessel value and $513,000 first wholesale value.

- The District 101 Tree Point gillnet fishery 10-year average harvest of Nass sockeye totals 44,400 with an estimated annual ex-vessel value of $378,000 and first wholesale value of $800,000.

Summary of Transboundary Watershed Economic Impacts

Each watershed examined in this study is an important component of the Southeast Alaska economy, especially for the communities nearest the watershed. Combined, the Taku, Stikine, and Unuk River Watersheds account for $48 million in economic activity annually, including multiplier effects. This includes $34 million in direct spending, 400 jobs for the Southeast region, and almost $20 million in labor income.

Summary of Economic Impacts – Stikine, Taku, and Unuk River Watersheds

Economic Sector	Total Average Annual Employment	Total Labor Income	Total Economic Impact
Seafood Industry	156	$7.7 million	$12.3 million
Sportfish	62	$3.1 million	$10.1 million
Visitor Industry	174	$8.6 million	$24.7 million
All Other	7	$0.3 million	$0.9 million
Total	400	$19.6 million	$48.0 million

Note: Columns may not sum due to rounding.
Source: McDowell Group estimates.

The impact of the transboundary watersheds in Southeast Alaska also includes investments in land and resource management by State and federal agencies, and fisheries taxes, which generate revenue for communities and the state. An estimated $280,000 in annual fish taxes are attributable to the region's transboundary watersheds.

Finally, with appropriate management, Southeast Alaska's transboundary watersheds can generate economic benefits in perpetuity. One measure of that perpetual benefit, the present value of the three watersheds combined, when considering a 30-year horizon, totals just under $1 billion. The present value of benefits over the next 50 years is over $1.2 billion, for the three watersheds combined.

Introduction and Methodology

Introduction

The Southeast Alaska economy is highly dependent on the region's rich natural resources. Many of the largest industries in Southeast, particularly commercial fishing, recreation, and the visitor industry, rely on healthy eco-systems to generate jobs and income. Transboundary rivers and watersheds are important components of this eco-system. These rivers originate in Canada and flow into U.S. waters to their terminus in Southeast. Management of the health of these watersheds is complex in that decisions made upriver in Canada may impact the U.S. portions of the watersheds. Thus, the economic importance of these watersheds for Southeast Alaska is important to describe and measure to inform cross-border management decisions.

SalmonState contracted with McDowell Group, an Alaska-based research and consulting firm, to identify and measure the economic impacts of three transboundary watersheds in Southeast Alaska: the Stikine, Taku, and Unuk Rivers. This analysis assesses how economic activity related to these watersheds impacts Southeast Alaska.

Methodology

Project Scope

This study focuses on economic activity within the U.S. portions of the Stikine, Taku, and Unuk River watersheds. Watershed boundaries are defined for this study by the U.S./Canada border and the U.S. Watershed Boundary Dataset (WBD) within Southeast. The dataset is described in greater detail in the *Description of Transboundary Watersheds* section of this report. Maps of each individual watershed are located at the beginning of the report section specific to each watershed.

Economic activity and assets related to each watershed were inventoried and described through a combination of primary and secondary research. Data sources are identified throughout the document. Five and ten-year averages are used when possible to account for fluctuations in weather, the natural environment, and the economy that may result in substantial changes in economic impacts from year to year. Study findings are reported in separate sections dedicated to each watershed in this document.

Economic Impact Analysis

This study employed IMPLAN, a widely-used model for estimating economic impacts of commercial and industrial activity.

Secondary economic impacts, often termed indirect and induced effects, associated with activity in the watersheds were estimated by modeling spending patterns and using IMPLAN software. Indirect effects include jobs and income created as a result of business spending on goods and services in support of operations associated with the watershed. Induced effects include jobs and income created as a result of employees of these businesses spending payroll dollars in Southeast communities.

Given watershed economic benefits derive primarily from renewable resources, the value today of on-going, perpetual economic benefits was calculated using the "present value" of future benefits A discount rate was applied to calculate present-day value of the watersheds. There is no generally accepted discount rate for a stream of watershed-related benefits such as those produced by the region's transboundary rivers, though discount rates for varying public asset valuation purposes typically range from 3 percent to 7 percent. Present value calculations in this study are based on a discount rate of 3 percent.

Fisheries Data and Methodology

Economic activity associated with harvests of fish from transboundary rivers is difficult to isolate due to a number of data limitations. Run sizes for many salmon species from the rivers are not well documented. Also, unless a species is tracked through a tagging program, it is not possible to identify exactly how many fish in a harvest are from a particular river, versus one of the many other rivers in the region.

Estimation of salmon harvests attributable to each specific transboundary river was a complex effort that combined published Alaska Department of Fish and Game (ADF&G) and Pacific Salmon Commission (PSC) data with interviews with area management biologists. Methodology for this effort varied by species and by river.

Resulting McDowell Group estimates of salmon harvests attributable to each watershed are a conglomeration of the best available data and information for each species. ADF&G produces detailed Chinook salmon harvest data by gear type through an extensive coded wire tagging initiative that includes Stikine, Taku, and Unuk River stocks. Sockeye estimates were obtained through data gathered and published in line with Pacific Salmon Treaty (PST) data requirements and through ADF&G U.S. harvest estimates. Coho estimates were derived through ADF&G reports and interviews with area management biologists. For chum and pink salmon, data is limited on annual escapements for each river, though annual harvest estimates by district are available through ADF&G. For both of these less well documented salmon species, area management biologist insights, including the estimated proportion of wild versus hatchery fish for each run, were used to calculate estimates for harvest attributable to each watershed. Other data limitations or additional extrapolations are noted in commercial fishing harvest sections in this report.

Ex-vessel and first wholesale values for salmon harvest attributable to each watershed were calculated using data from the Commercial Fisheries Entry Commission (CFEC) and ADF&G Commercial Operator's Annual Report (COAR). Data for each species includes average weight by area harvested, estimated ex-vessel prices, and first wholesale prices attributed to each species. First wholesale values were estimated by applying a head and gut recovery rate, the main value-added product form that processors produce from salmon in Southeast Alaska.[1] Due to inconsistency in the data, Chinook salmon wholesale prices were estimated by increasing ex-vessel prices by 20 percent, a common increase for Chinook. Lastly, all ex-vessel and first wholesale numbers are inflation-adjusted to provide a more accurate picture of the last ten years.

[1] Crapo, Paust, and Babbitt. 2004. *Recoveries and Yields from Pacific Fish and Shellfish.*

Participation in the fisheries near the watersheds was estimated using CFEC commercial fishing permit information, as well as ADF&G data on fishing within salmon statistical areas. The estimated number of fishing jobs was derived from IMPLAN models.

Sport fishing harvest estimates were derived from Pacific Salmon Commission date, ADF&G sport fishing harvest estimates, interviews with ADF&G biologists, and additional data from ADF&G tagging estimates.

Sport fish expenditure data was based on fishing effort, using region-specific angler days fished from the ADF&G sport fishing harvest survey and a region-specific expenditure average from the 2011 U.S. Fish and Wildlife National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. Results from the USFWS survey provide an estimate of expenditures on sport fishing per day in Alaska, including both guided and unguided trips. [2] Estimates are conservative due to the lack of data on other species harvested, and the fact that some anglers targeting other fish, such as halibut, crab, and cod, may catch salmon in the same trip but not be included in this data.

Personal use permit data was also obtained from ADF&G. A substitution value of $12 per pound for Chinook, $8 per pound for sockeye and steelhead, $6 per pound for coho, and $3.5 per pound for the other species was used to value all personal use harvests.

Hunting Data and Methodology

Hunting Harvest and Related Data

Hunters and trappers in Alaska are required to report a variety of data to ADF&G, especially in respect to big game hunting (deer, moose, mountain goat, black and brown bear, and other species). Information reported to the agency, and used in this report, includes data on hunting effort, harvest, resident/non-resident status of hunters, method of transportation to the location of the hunt, location of hunt, and any use of registered guides. Data was obtained via custom requests for each watershed.

Hunters are not required to report data on waterfowl hunting in Alaska, and no estimates were available with regard to total effort or harvest of waterfowl in the transboundary watersheds in Southeast Alaska.

Relevant trapping data reported to ADF&G is more limited. Data used in this report was obtained directly from ADF&G biologists on the annual number of animals harvested in total by all trappers in each watershed.

Estimated Hunting and Trapping Expenditures

To determine total spending in Alaska related to hunting activity in the Stikine, Taku, and Unuk River watersheds, hunting statistics were combined with trip expenditure estimates available in the 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.[3]

[2] U.S. Fish and Wildlife Service. 2014. *2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*.
[3] U.S. Fish and Wildlife Service. 2014.

No expenditure estimates were available related to trapping in Alaska. The total value of furs harvested was estimated for trappers in the watershed. Data on average prices per species and other background information was obtained from the most recent Alaska Trapper Report.[4]

Visitor Industry and Recreation Data and Methodology

Visitation to the transboundary watersheds is not tracked for tourism or more localized recreation. Estimating the volume of visitors to the watersheds required a number of interviews with visitor industry operators in areas near the watersheds. Data on permitted commercial landings on USFS properties was obtained from the USFS. When possible, visitation and revenue data from individual operators was combined and used to extrapolate total visitation. Information on known frequency and capacity of trips to the areas was also figured into this analysis. *Alaska Visitor Statistics Program* information was utilized whenever possible throughout this analysis.[5]

Information on cabin rentals and revenue was obtained through a custom data request to the USFS. Party size and expenditure data for cabin visits was obtained from USDA Forest Service National Visitor Use Monitoring system.

[4] Alaska Department of Fish & Game. (2013). *Alaska Trapper Report 2012-2013*. Wildlife Management Report, ADF&G/DWC/WMR-2013-5.

[5] *Alaska Visitor Statistics Program* 2011-12, conducted by McDowell Group for the Alaska Department of Commerce, Community, and Economic Development.

List of Acronyms and Definitions

Acronyms

ADF&G: Alaska Department of Fish and Game

AVSP: Alaska Visitor Statistics Program

CFEC: Commercial Fisheries Entry Commission

DIPAC: Douglas Island Pink and Chum Hatchery

DNR: Alaska Department of Natural Resources

NOAA: National Oceanic and Atmospheric Administration

PSC: Pacific Salmon Commission

PST: Pacific Salmon Treaty

WBD: U.S. Watershed Boundary Dataset

USFS: United States Forest Service

Definitions

Annual Allowable Harvest (AAH): According to the Pacific Salmon Treaty is the total run of salmon minus either the escapement requirement or the actual in-river escapement, whichever is less.[6]

Direct Impacts: Economic impacts occur in each industry through direct spending and employment associated with economic activity in the watersheds.

Ex-Vessel Value: The dollar amount received by commercial fishermen for their catch when delivered to a processor. This includes both initial payments and any bonuses or year-end adjustments paid by processors.

Fish Escapement: Spawning escapement is defined as the number of fish who have escaped fisheries and arrive at a natal stream or river to spawn.[7]

Gross Earnings: Earnings information is derived primarily through CFEC analysis of fish tickets and COAR data. Average price-per-pound estimates are derived for each area (which usually corresponds with the ADF&G fishery management area), species, gear, and delivery type (gutted, in-the-round, etc.) on fish tickets. These average prices are then applied to fish ticket data to estimate gross earnings.

[6] ADFG. Fishery Management Report No. 14-08. February 2015.
[7] Pacific Salmon Commission, 2015.

Indirect Impacts: Indirect impacts are the changes in sales, income or jobs in sectors within the region that result from spending on activities tied to the watershed.

Induced Impacts: The impacts resulting from household spending of income earned through activity tied to the watershed.

Labor Income: Wages, salaries, bonuses, and benefit payments to workers.

Secondary Effects: indirect and induced economic impacts.

Wholesale Value: The value of seafood products sold to buyers outside a processor's affiliate network. This is the value of the raw fish delivered to the processor (ex-vessel value) plus the value added by the first processor.

Description of Transboundary Watersheds

What is a watershed?

The boundaries for the three watersheds included in this study are defined using the U.S. Watershed Boundary Dataset (WBD). The WBD is a national dataset coordinated by the U.S. Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS), the United States Geological Survey, and the Environmental Protection Agency. These federal agencies create the dataset from sources in each U.S. state and aggregate the data into a standard national layer for use in GIS and other applications.

In the USDA description of this dataset, watersheds are described as follows:

> *Watershed boundaries define the aerial extent of surface water drainage to a point. The intent of defining hydrologic units (HU) for the Watershed Boundary Dataset is to establish a base-line drainage boundary framework, accounting for all land and surface areas. The selection and delineation of hydrologic boundaries are determined solely upon science-based hydrologic principles, not favoring any administrative or special projects nor particular program or agency…[hydrologic unit] boundaries are defined by hydrographic and topographic criteria that delineate an area of land upstream from a specific point on a river, stream or similar surface waters. A hydrologic unit can accept surface water directly from upstream drainage areas, and indirectly from associated surface areas such as remnant, non-contributing, and diversions to form a drainage area with single or multiple outlet points. Hydrologic units are only synonymous with classic watersheds when their boundaries include all the source area contributing surface water to a single defined outlet point.*[8]

Watershed Management

The majority of land in the watersheds lies in the Tongass National Forest, managed by the U.S. Forest Service (USFS). The Unuk River flows through Misty Fjords National Monument, a designated area that is also part of the Tongass National Forest and administered by the USFS. State lands are interspersed in the watersheds and are managed, primarily, by the State of Alaska Department of Natural Resources (DNR). City and private lands are also located in the watersheds, though they make up a very small proportion of total watershed acreage.

Wildlife and seafood resources in the watersheds are managed by the State of Alaska Department of Fish and Game (ADF&G). Management of the transboundary rivers in this study also falls under the purview of the Pacific Salmon Treaty. In order to manage salmon resources under the treaty, the National Oceanic and Atmospheric Administration (NOAA) and ADF&G conduct research on salmon produced in the rivers, including stock assessments and analysis, and incorporate research from fisheries that intersect with salmon from these rivers.

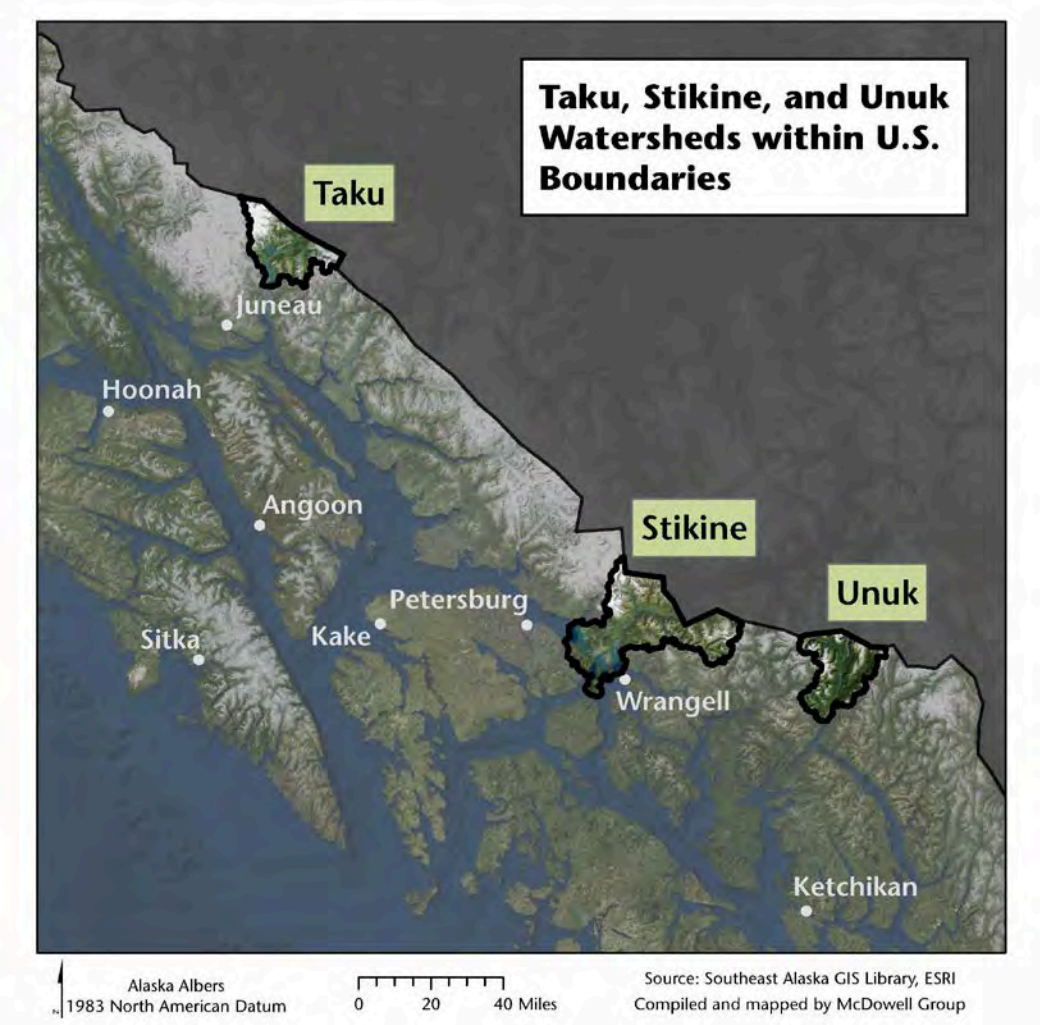
---

[8] United States Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS), the United States Geological Survey (USGS), and the Environmental Protection Agency (EPA). Watershed Boundary Dataset for Southeast Alaska: "http://datagateway.nrcs.usda.gov" [Accessed 10/13/2015].

Watershed Boundaries

The Stikine, Taku, and Unuk watersheds all cross the U.S.-Canada boundary; each river originates in British Columbia and flows to its terminus in Southeast Alaska waters.

Figure 1. U.S. Portions of the Boundaries of the Stikine, Taku, and Unuk River Watersheds

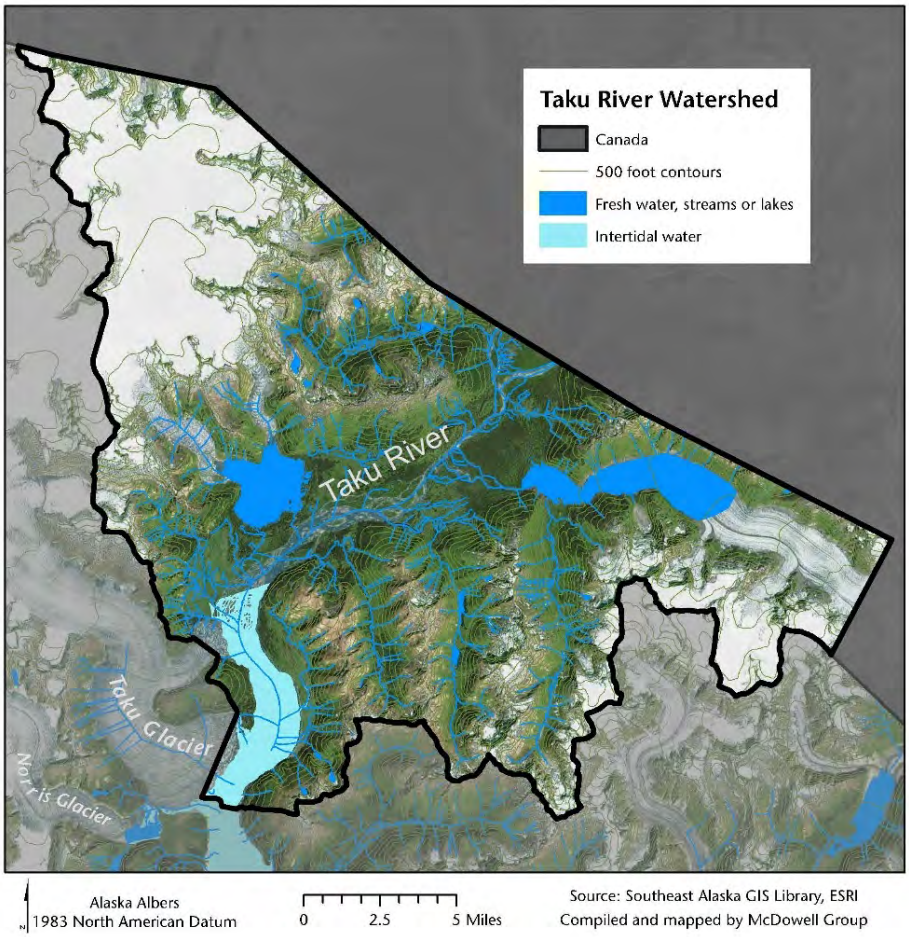


Source: U.S. Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS), United States Geological Survey, and Environmental Protection Agency, U.S. Watershed Boundary Dataset (WBD). Accessed 3/30/16.

Profile of the Taku River Watershed

The Taku River flows from British Columbia approximately 100 miles to its terminus in Taku Inlet near the U.S./Canada border in Southeast Alaska. The inlet and the lower 25 miles of the river are located in U.S. waters. The Taku River watershed covers approximately 5,000 square miles, including mountainous and glacial terrain. It includes the Taku Glacier, a 5-mile wide tidewater glacier at the head of Taku Inlet, which is the thickest known alpine temperate glacier in the world.[9] Hole-In-The-Wall Glacier, next to Taku Glacier, is another popular glacier within the watershed, and Norris Glacier borders the watershed boundary.

Figure 2. U.S. Taku River Watershed Boundary



Source: USDA-Natural Resources Conservation Service, USGS, and EPA, U.S. Watershed Boundary Dataset (WBD). Accessed 3/30/16.

All five species of salmon exist in the Taku River system, as well as other fish, including Dolly Varden; steelhead; and rainbow, cutthroat, and bull trout. The watershed also supports a wealth of other species, including grizzly

[9] Pelto, M. et. al, Mass Balance Measurements on the Taku Glacier, Juneau Icefield, Alaska 1946-2008. Juneau Icefield Research Program. https://www.nichols.edu/departments/glacier/taku.html. Accessed 1/8/15.

bear, mountain goat, Stone sheep, woodland caribou, moose, and black bear, as well as bald eagles, many species of migratory birds, and a Steller sea lion haulout of approximately 200 animals.

The majority of the Taku River watershed is part of the Tongass National Forest. A small proportion of the watershed is State of Alaska land, including State mineral locations on tidelands in the area. These mineral areas are mostly under the jurisdiction of the State Department of Natural Resources. Several federal mining claims are also located within the watershed. None of these mineral resources are actively explored at this time. City and Borough of Juneau, Alaska Native Regional or Village Corporation, and private lands are also interspersed in the area.

Taku River Fisheries

The Taku River supports wild stocks of all five salmon species, including the largest runs of coho and Chinook salmon in Southeast Alaska.[10] In the U.S., Taku River salmon are commercially harvested and are also caught for sport and personal use. In Canada, commercial fisheries operate on the lower Taku River, and personal use and sport fisheries operate upriver.

Taku River Commercial Salmon Fisheries

Taku River salmon are commercially harvested primarily in drift gillnet fisheries, and also in seine and troll fisheries around Southeast. Taku River Chinook salmon run earliest in the season of all the salmon species from the river. The Chinook run lessens by June and, at that time, fishery management emphasis shifts to sockeye. As for the Stikine River, in August, management focuses on pink salmon and then on coho in September for the remainder of the season.

Salmon enhancement activities occur in the Taku River to supplement the wild stock. Eggs are sent to DIPAC hatchery's Snettisham facility for over-winter incubation and deposited as fry in the river in spring. Typically, 1.4 million sockeye eggs are placed by DIPAC operations in Tatsamenie Lake, which is located in the watershed.

Fishing Districts

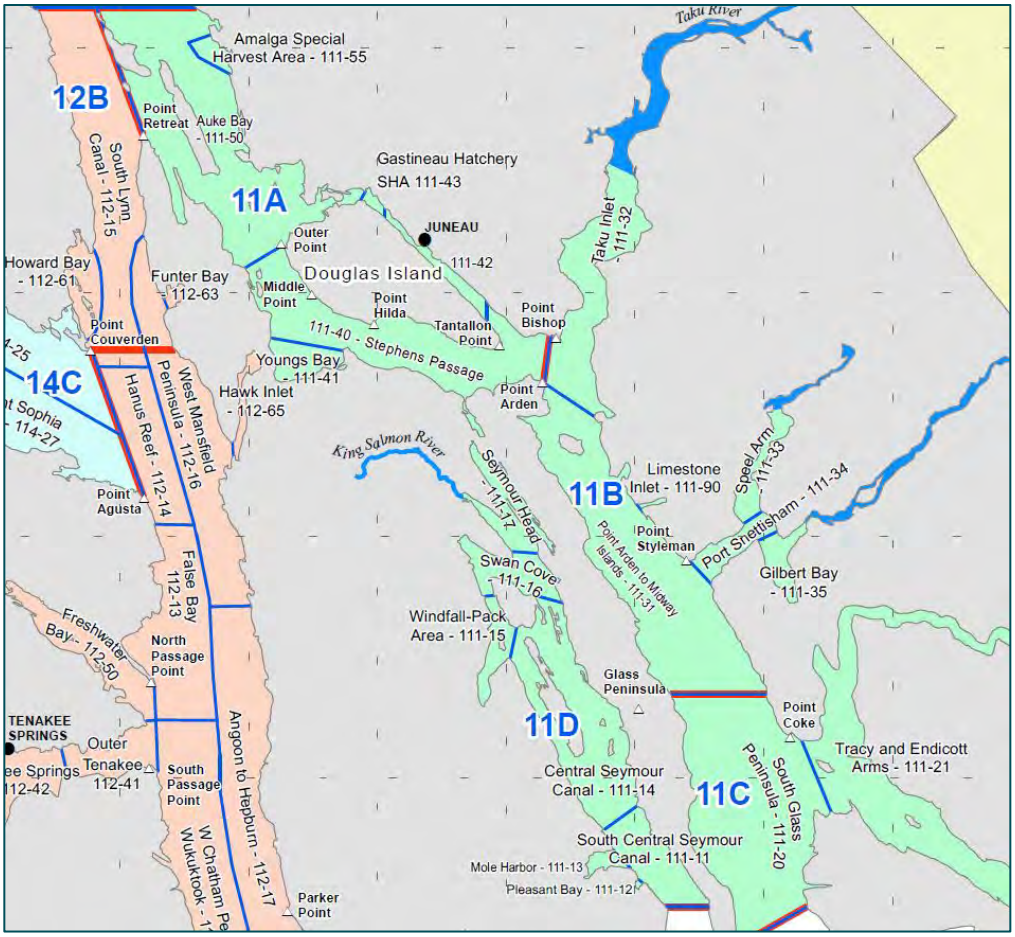
Commercial salmon fishing near the Taku River watershed occurs in ADF&G District 111, which includes areas near Juneau. While the Taku River is one of the largest, most productive rivers in the region, many other rivers produce wild salmon that are harvested in District 111. Several hatcheries are located in the district and contribute significant numbers of fish to the harvest as well. Fishing in the district captures the majority of the salmon harvest attributable to the Taku River.[11]

Under the Pacific Salmon Treaty, the Taku River is designated as a transboundary river, and estimated harvests are monitored in District 111 under the treaty. The PST includes requirements for management of Taku River sockeye, Chinook, and coho. Salmon stock assessments in the Taku River are conducted primarily by the Alaska Department of Fish and Game. According to the department, the ADF&G Sport Fish Division conducts research on Chinook and coho salmon, and ADF&G Commercial Fisheries Division research focuses on sockeye, pink,

[10] http://www.adfg.alaska.gov/FedAidpdfs/ROP.SF.1J.2014.05.pdf
[11] http://www.adfg.alaska.gov/FedAidPDFs/FMR15-08.pdf

and chum salmon. ADF&G works with the Canadian Department of Fisheries and Oceans and the Taku River Tlingit First Nation on Chinook, sockeye, and coho research.

Figure 3. Commercial Fishing Districts Near the Taku River



Source: ADF&G Commercial Fishing Division.

Fishing Fleets

The majority of the Taku River salmon harvest occurs in the gillnet fishery in District 111, though troll fisheries and the northern Southeast seine fisheries also intercept these salmon as they return through the Inside Passage to the river.

Gillnets are the primary gear type used to target salmon near the Taku River. The District 111 commercial drift gillnet fishery occurs in Taku Inlet, Port Snettisham, and Stephens Passage, in sections 11-B and 11-C specifically. Management of the gillnet fishery is based on wild sockeye abundance in early summer through mid-August and coho abundance in late summer and early fall. In 2014, the pre-season terminal run forecast for Taku River Chinook did not allow for a directed fishery. Chinook are harvested with other salmon species by gillnetters in other fisheries aside from those directed for Chinook. In 2014, 149 boats participated in the District 111 drift gillnet fishery.

The closest seine fishery to Taku River takes place west of Taku Inlet, near Juneau. Specifically, Sections 11-A and 11-D can be opened to seining. Most of the seine harvest in these areas targets hatchery salmon from

DIPAC. Most recently, the seine fleet in District 111 has almost entirely harvested hatchery salmon from the Amalga Special Harvest Area.

No localized troll fishery operates near the Taku River. However, Taku River salmon may be harvested in open troll fisheries around Alaska.

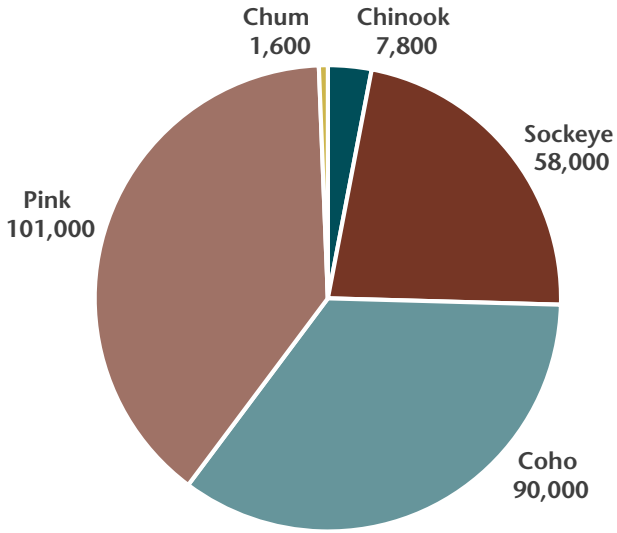
Taku River Commercial Salmon Harvests

Coded wire tagging operations for both Chinook and coho salmon occur in the Taku River under the requirements of the PST. Sockeye salmon are also managed under the PST, and enhanced sockeye are monitored using otolith markings. Because no estimates of escapements exist for pink and chum salmon on the Taku River, harvest estimates in this report for pink and chum are based on area biologists' understanding of the runs in the river from previous short-term studies and aerial surveys.

On average, 15,000 chum run in the Taku River, in addition to 750,000 pink salmon. An estimated 20 percent of chum harvested in District 111 are of Taku River origin, as are 50 percent of pinks.[12] Based on biologists' knowledge of pink and chum, it can be assumed that most of the of harvest of these Taku River fish occurs in District 111.

Alaska commercial fishery harvests attributable to the Taku River averaged 259,000 salmon annually over the past ten years. This included an annual average of 101,000 pinks, 90,000 coho, 58,000 sockeye, 7,800 Chinook, and 1,600 chum for all gear types combined.

Figure 4. Estimated Average Taku River Salmon Commercial Harvest by Species, 2005-2014



Source: McDowell Group estimates based on ADF&G reports, ADF&G COAR reports, ADF&G personal communication.

[12] ADF&G personal communication.

Table 1. Estimated Commercial Taku River Salmon Harvest, Number of Fish, 2005-2014

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
2005	24,000	45,000	102,000	91,000	1,000	263,000
2006	16,000	65,000	119,000	96,000	1,000	297,000
2007	5,000	65,000	65,000	50,000	1,000	186,000
2008	3,000	75,000	96,000	43,000	2,000	219,000
2009	9,000	35,000	141,000	28,000	2,000	215,000
2010	5,000	46,000	135,000	339,000	1,000	526,000
2011	5,000	71,000	60,000	172,000	1,000	309,000
2012	5,000	49,000	36,000	99,000	2,000	191,000
2013	2,000	97,000	83,000	80,000	4,000	266,000
2014	4,000	32,000	63,000	15,000	1,000	115,000
10-Year Average	7,800	58,000	90,000	101,300	1,600	258,700

Note: Chinook are Alaska-wide commercial harvests, sockeye and coho estimates are based on a PST report, and chum and pink estimates are based on ADF&G estimates.

Harvest Trends

The overall salmon harvest attributable to the Taku River has decreased by 55 percent in the last ten years, according to McDowell Group estimates. Much of this change can be attributed to the closure of directed Chinook fisheries near the Taku since 2007. Taku River sockeye harvests ranged between 31,500 and 97,000 fish, with 31,500 harvested in 2014. Coho harvests averaged approximately 90,000 in the last ten years. Typically, pink harvests fluctuate each year, with average annual harvests for the last five years of 141,000. Chum harvest attributable to the Taku River is substantially smaller, with annual harvests in the last five years closer to 1,800. Most chum harvest in District 111 can be assumed to be of hatchery origin.

Salmon runs are cyclical, a trend that is not always evident in the window of a ten-year time period. While data shows Chinook and sockeye salmon harvests are trending down, much of this decline is due to closures in directed fisheries near the Taku River in Alaska to allow for Canadian harvests under PST treaty requirements.

Canadian Fisheries

Drift and gillnet fisheries operate in the lower river on the Canadian side of the Taku River. The combined 2014 Taku River Canadian commercial, aboriginal, and recreational fisheries harvest totaled 1,242 large Chinook, 595 other Chinook, 17,795 sockeye, and 14,568 coho salmon. A significant portion of the Canadian Taku River harvest is processed in the U.S., primarily in Juneau. However, the amount of this harvest is not known and not included in this analysis.

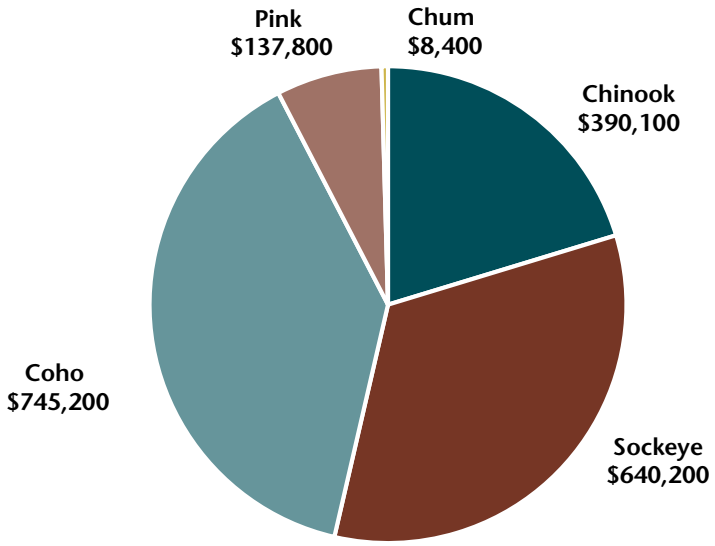
Value of Taku River Salmon Fisheries

EX-VESSEL VALUE

Salmon returning to the Taku River are harvested with salmon returning to other watersheds in the area. Of the total harvest, an estimated annual average of 259,000 salmon (all species combined) are attributed to the Taku River over the past ten years. The amount paid to fishermen who harvest these fish, the ex-vessel value,

totals approximately $1.9 million annually. Of this total value, coho comprise an estimated 39 percent, sockeye 33 percent, Chinook 20 percent, pink 7 percent, and chum less than 1 percent. Estimated ex-vessel earnings are based on area-specific ex-vessel prices and average weights for each species.

Figure 5. Estimated Ex-Vessel Value of Commercially Harvested Taku River Salmon by Species, 2005-2014 Average



Source: McDowell Group estimates based on ADF&G reports, ADF&G COAR reports, ADF&G personal communication.

Table 2. Estimated Total Annual Ex-Vessel Value of Taku River Salmon, in $000s, 2005-2014

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
2005	$1,118	$450	$787	$42	$5	$2,401
2006	$284	$660	$1,040	$73	$3	$2,060
2007	$339	$697	$491	$43	$4	$1,575
2008	$439	$1,314	$1,206	$56	$11	$3,025
2009	$319	$301	$921	$23	$8	$1,572
2010	$271	$481	$1,301	$574	$7	$2,634
2011	$310	$891	$529	$276	$9	$2,015
2012	$215	$441	$234	$158	$14	$1,062
2013	$217	$920	$531	$119	$17	$1,803
2014	$389	$247	$411	$15	$6	$1,068
10-Year Average	$390	$640	$745	$138	$8	$1,921

Source: McDowell Group estimates based on ADF&G reports, ADF&G COAR reports, ADF&G personal communication.

Ex-Vessel Value Trends

Overall ex-vessel earnings have decreased from a high point of $3.0 million in 2008 to a 10-year low of $1.1 million in 2014. These earnings have fluctuated along with harvest levels as well as changes in prices.

First Wholesale Value

An additional measure of economic activity associated with fishing is the first wholesale value, the value of raw fish delivered to the processor (ex-vessel value) plus the value added by the first processor. Some of the large processors in Juneau that process Taku River salmon include Alaska Glacier Seafoods and Taku Smokeries. The estimated annual average wholesale value of Taku River salmon over the past 10 years is $4.2 million.

Table 3. Estimated Annual First Wholesale Value of Taku River Salmon, in $000's, 2005-2014

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
2005	$688	$660	$1,735	$310	$13	$3,406
2006	$261	$1,074	$3,434	$468	$8	$5,245
2007	$194	$798	$1,351	$210	$8	$2,562
2008	$696	$1,773	$2,775	$231	$25	$5,500
2009	$205	$563	$3,311	$132	$22	$4,234
2010	$254	$842	$3,413	$1,877	$15	$6,401
2011	$248	$1,374	$1,385	$932	$19	$3,958
2012	$126	$1,035	$932	$662	$31	$2,785
2013	$302	$2,189	$2,499	$291	$42	$5,324
2014	$411	$613	$1,499	$64	$14	$2,601
10-Year Average	$339	$1,092	$2,233	$518	$20	$4,202

Source: McDowell Group estimates based on ADF&G reports, ADF&G COAR reports, ADF&G personal communication.

Participation

In the last five years, 22 percent of all fishermen who fished with drift gillnet gear in Southeast were from Juneau, the town closest to Taku Inlet. The gillnet fleet nearest the Taku River includes an estimated annual average 162 permit holders. While the exact number of permit holders who specifically catch Taku River salmon is unknown, it can be assumed that those fishing in the sub-districts closest to the river catch Taku River fish.

Table 4. Taku Commercial Salmon Participation by Gear Type, 2005-2014

	Gillnet Fleet	Troll Fleet	Total
2005	149	0	149
2006	134	2	136
2007	149	1	150
2008	156	1	157
2009	193	0	193
2010	174	1	175
2011	181	0	181
2012	162	0	162
2013	172	0	172
2014	147	0	147
10-Year Average	162	<1	162

Source: ADF&G. Fleet estimates are determined by closest statistical area to the river, including District 111-32.

Total participation in the harvest and processing of Taku River salmon extends beyond the number of permit holders. Assuming that on average each permit is fished by one permit holder and one crewmember, 320 fishermen participated in the gillnet fishery near the Taku River. Additionally, at some point during the fishing season, all large seafood processors in Juneau process some Taku River salmon. Estimated peak employment in Juneau's seafood processing industry totaled 250 employees in 2015. Though many other fisheries also contribute to the Juneau processing industry, Taku River salmon are certainly a component of this employment. It is important to distinguish the number of participants in the industry from the average annual employment attributable to fisheries related to the Taku River watershed. Average annual employment is discussed further in the concluding section of this chapter.

Wholesale Value Trends

Wholesale values totaled $2.6 million in 2014, compared to the ten-year average of $4.2 million. Coho and sockeye wholesale values are largely attributable to fluctuating harvest volumes.

Taku River Sport Fishing

On average, 81 percent of Southeast Alaska sport fishing effort occurs in marine waters and 19 percent in fresh water.[13] Similarly, most sport fishing in the Taku River watershed area takes place in saltwater areas near the river mouth. Primary saltwater sport fishing targets are Chinook and coho salmon, with Chinook salmon returning to the river in early summer and coho returning in late summer. A minimal amount of trout fishing occurs up the river.

An average of 1,200 Taku River Chinook and 4,700 coho were harvested annually in the sport fishery over the past ten years.

Table 5. Estimated Taku Chinook and Coho Sport Harvest, 2005-2014

Year	Taku Chinook Sport Harvest	Taku Coho Sport Harvest	Total Sport Harvest
2005	3,500	4,700	8,100
2006	2,400	4,600	7,000
2007	1,100	2,100	3,300
2008	800	1,500	2,400
2009	800	6,700	7,500
2010	1,000	14,300	15,300
2011	600	4,800	5,400
2012	700	1,200	1,900
2013	300	2,500	2,700
2014	700	4,700	5,400
10-Year Average	1,190	4,710	5,900

Source: McDowell Group estimates based on ADF&G reports, ADF&G COAR reports, ADF&G personal communication.

[13] http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2014-2015/southeast_finfish/rc3_tab13.pdf

ADF&G sport fishing Area E includes the Taku River watershed and Juneau. Angler days are not species specific, rather they cover the amount of days fished with a sport fishing permit. In a single fishing day, anglers may harvest multiple species, such as rockfish or halibut. For purposes of this study, it is assumed that Taku River salmon are targeted on most angler days near the Taku River, resulting in an estimated annual 8,800 angler days spent fishing for Chinook salmon and 11,100 days fishing for coho between 2005 and 2014. These should be considered conservative estimates for estimated sport fishing harvests, as angler days targeting other species may have also included harvests of Taku River salmon.

Table 6. Estimated Taku River Chinook and Coho Sport Angler Days Fished and Total Annual Expenditures, 2005-2014

Year	Taku River Chinook Angler Days	Taku River Coho Angler Days	Annual Angler Expenditure for Chinook ($Millions)	Annual Angler Expenditure for Coho ($Millions)
2005	23,900	6,900	$3.6	$1.0
2006	15,100	12,900	$2.2	$1.9
2007	7,700	4,900	$1.1	$0.7
2008	9,200	3,800	$1.3	$0.5
2009	6,000	14,800	$0.8	$2.0
2010	7,700	39,400	$1.0	$5.3
2011	3,900	10,700	$0.5	$1.4
2012	7,000	3,200	$0.9	$0.4
2013	2,500	4,300	$0.3	$0.5
2014	4,700	10,200	$0.6	$1.2
10-Year Average	8,800	11,100	$1.2	$1.5

Source: McDowell Group estimates based on ADF&G Reports, ADF&G COAR Reports, ADF&G Personal Communication.

Guided and unguided sport fishing trips occur in the area. Most (98 percent) of guided trips were purchased by non-residents in 2014. Also in 2014, 24 businesses took 2,578 anglers out on a chartered fishing trip departing from Juneau. Five percent of angler days fished were on a chartered vessel that landed in Juneau. The most common charter-caught species were Chinook salmon, coho salmon, and halibut. The remaining angler days may be attributed to unguided fishing.[14]

Estimated Sport Fishing Expenditures

Anglers spent an estimated annual average of $2.7 million fishing for Taku River Chinook and coho between 2005 and 2014.[15] This estimate includes costs associated with a day of fishing, which include boat-related expenses, fuel, bait, and gear.

14 "Alaska Sport Fishing Survey database [Internet]. 1996– Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited March 10, 2016). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/."

15 Any fishing done during a day is considered a day of fishing, which could include catching halibut and other species. We also have used a conservative value to estimate the average per day trip costs.

Taku River Personal Use Fishery

The in-river Taku River personal use fishery involved an annual average of 140 personal use permits between 2010 and 2014. On average, 1,200 sockeye, 200 coho, 180 pink, 30 Chinook, 7 chum, and one steelhead were harvested.

Table 7. Taku River Personal Use Fishery Permits and Harvest, 2010-2014

Year	Number of Permits	Chinook	Coho	Sockeye	Chum	Pink	Steelhead
2010	120	36	258	1,020	4	186	0
2011	133	48	224	1,111	1	494	2
2012	153	34	132	1,287	3	129	0
2013	158	20	238	1,371	25	78	1
2014	135	21	224	1,133	4	22	0
5-Year Average	140	32	215	1,184	7	182	1

Source: Alaska Department of Fish and Game.

The five-year annual average value of Taku River personal use harvest is estimated at $79,000.

Visitor Industry Activity in the Taku River Watershed

The Taku River is a popular destination for both area residents and visitors. They typically access the watershed by private boat or guided flightseeing and commercial boat trips. Destinations include the Taku Glacier, several USFS cabins, recreation properties, and the Taku Glacier Lodge.

Tour Operations

Commercial air and boat activity in the watershed is primarily based out of Juneau. Visitors to the region participate in flightseeing tours over the Juneau Icefield and the watershed, as well as glacier landings, hovercraft tours, and visits to the Taku Glacier Lodge. Air charter businesses also transport visitors and residents to the watershed for a variety of activities, including hunting, camping, and sightseeing. Almost all non-resident tour activity in the Taku River area occurs between May and September.

Taku Glacier Lodge

The Taku Glacier Lodge, a privately-owned lodge built in 1923, is typically accessed by floatplane from downtown Juneau. Wings Airways transports guests via a glacier flightseeing tour to the lodge. The lodge restaurant is a featured stop on the trip, offering lunch and dinner sittings throughout the summer. The lodge does not offer overnight lodging. The experience costs $309 per person for adults and $265 for children under 12 years of age; children two years of age and under are free.

Helicopter Tours

Four companies currently hold USFS permits to land on portions of the Juneau Icefield within or near the Taku River watershed, specifically on the Norris and Taku Glaciers. The companies offer tours from Juneau that often combine boat trips up the river with flightseeing over the glaciers and glacier landings.

Coastal Helicopters partners with Juneau-based company Airboat Alaska to offer an "Air, Water, Ice" excursion from Juneau to the Taku Glacier via a tour base on the Taku River. In addition to a helicopter ride over the icefield and the Tongass National Forest to the watershed, the trip includes an airboat tour up the Taku River and a glacier landing via helicopter. The tour cost is $560 per person.

ERA helicopters out of Juneau operates a glacier dog sledding tour that allows visitors to mush their own sled dog team from ERA's exclusive dog sled camp on the Norris Glacier. The tours, which include a helicopter ride roundtrip from Juneau, range from 2.75 to 4 hours and cost between $555 and $735 per person depending on tour length.

Northstar Trekking offers several flightseeing tours from Juneau that include glacier landings. The particular location of the glacier landing depends on weather and snow conditions. Northstar lands on several glaciers in the Juneau Icefield including the Norris and Taku Glaciers.

Temsco Helicopters also holds permits to land in the watershed. However, most of their tours focus on the Mendenhall Glacier and areas outside of the watershed.

All companies also offer charter operations that may include travel to portions of the watershed.

In total between 2011 and 2015, an annual average of 11,800 visitors landed on the Taku and Norris Glaciers combined. The last two years of data show a sharp decline in the number of landings on the two glaciers, in part due to low snow falls during these years and therefore limited snow conditions on the. If it is assumed that visitors pay an average of $560 per person for visits to the watershed that include glacier landings, annual average revenue to Juneau companies over the past five years from helicopter tour packages to the Taku River watershed is estimated at $6.6 million.

Table 8. Total Number of Helicopter Tour Visitors to the Taku River Watershed, by USFS Permitted Helicopter Landings, 2011-2015

Destination	2011	2012	2013	2014	2015	5-Year Average
Norris Glacier	10,941	9,316	9,450	1,650	1,604	6,592
Taku Glacier	7,447	8,802	7,392	1,271	1,150	5,212
Total Visitors	18,388	18,118	16,842	2,921	2,754	11,805

Source: U.S. Forest Service.

Other Tours

A variety of other tours are offered in the Taku River watershed, including fixed-wing flightseeing, boating, heli-skiing adventures, and canoe trips. The tours vary by the season, depending of specific company operations.

Allen Marine Tours began a four-hour catamaran/hovercraft tour from Juneau to Taku Glacier in 2015. The tour is offered to cruise ship passengers. The company is operating three hovercraft vessels on this tour in 2016, each with a five-person visitor capacity, and multiple trips per day.

Anchorage-based Equinox Wilderness Expeditions has offered a 12-day kayak adventure through the watershed. The tour begins in Canada and ends in Taku Inlet with a final charter trip to Juneau. This tour will not be offered in 2016.

Estimated Visitor Industry-Related Expenditures

In total, an estimated 40,000 visitors recreate in the Taku River watershed annually, with estimated visitor expenditures totaling approximately $15 million. The majority of this visitor activity consists of flightseeing activity focused on the glaciers in and near the watershed.

Applying Juneau's sales tax rate of 5 percent, an estimated $800,000 in Juneau sales tax revenue is attributable to the Taku River watershed.

Recreation Activity in the Taku River Watershed

Recreation Properties

Private Property

Property in the Taku River watershed is located within the City and Borough of Juneau (CBJ) boundary. Approximately 200 private property parcels are located in the Taku River watershed.[16] The majority are located in one of three rural, non-roaded areas, termed Taku River, Taku Valley, and Taku Point.

The CBJ FY14 mill rate for properties outside of the roaded area and fire district is 8.04. Assessed value for taxable property in the Taku River watershed totaled $6.9 million in 2015. When the borough mill rate is applied, the estimated value of tax collected by the CBJ in 2015 totaled $56,400.

Federal Property

U.S. Forest Service Cabins

The Forest Service rents three cabins in the Taku River watershed: Taku Glacier, West Turner Lake, and East Turner Lake cabins. West Turner Lake cabin is located on Turner Lake on the east side of Taku Inlet. The cabin may be accessed by boat and then a 0.8 mile trail from saltwater, or by floatplane. The East Turner Lake cabin is located on the east end of Turner Lake. Access is by floatplane only, and is a 40-minute trip from Juneau. Taku Glacier cabin is located on the east shore of Taku Inlet, approximately eight miles south of Taku Lodge. Access is by shallow draft boat or floatplane.

Between 2010 and 2014, average annual revenue from Forest Service cabin rentals totaled $4,400 for the three cabins in the Taku River watershed. Average expenditures on Taku River cabin visitation between 2010-2014 is estimated at $27,000 between 2010-2014, including transportation to the cabins, gear, and supplies.[17]

[16] CBJ Finance Department Assessor's Database.
[17] USDA Forest Service National Visitor Use Monitoring data was utilized for general Tongass NF visitor use numbers. These calculations assume an average of two nights per trip and an average party size of 3.33. Average per trip spending was estimated based on the average trip spending per party of $360.

Table 9. Taku River Watershed U.S. Forest Service Cabins
Annual Number of Nights and Revenue, 2010-2014

	2010	2011	2012	2013	2014	Annual Average
Annual Number of Nights						
Taku Glacier Cabin	36	39	52	27	8	32
West Turner Lake Cabin	78	68	67	74	87	75
East Turner Lake Cabin	18	26	18	26	7	19
Total	132	133	137	127	102	126
Annual Revenue						
Taku Glacier Cabin	$1,400	$1,155	$1,995	$595	$385	$1,106
West Turner Lake Cabin	$2,660	$2,380	$2,275	$2,905	$2,800	$2,604
East Turner Lake Cabin	$630	$910	$630	$910	$385	$693
Total	$4,690	$4,445	$4,900	$4,410	$3,570	$4,403

Notes: Data is for calendar years, and will vary from fiscal year reports. Data shown only reflects reservations made and fees collected through the NRRS and may not reflect the full reservations and collections for the cabins shown, as local district policies may allow last minute reservations at the local district offices.
Source: U.S. Forest Service – National Recreation Reservation System's (NRRS).

Hunting and Trapping

The Taku River watershed is home to healthy populations of various species targeted by hunters, including moose, mountain goats, black bear, brown bear, and small game.

In the five-year period between 2010 and 2014, an average of 87 people hunted moose each year in the watershed. These hunters spent an annual total of 426 days pursuing moose, for an average of five days each. The moose hunting success rate was 17 percent, or 15 total moose annually. Almost all moose hunters were Alaska residents (all but one in this time period), and no hunters used a registered guide during this time. The vast majority of Taku River watershed moose hunters use private boats for transportation within the watershed, with very small numbers using a plane (one hunter per year, on average) and airboats (two per year).

An average of 12.6 hunters take an average of three mountain goats each year in the watershed. Roughly the same number of hunters target black bear annually, with an average of 4.6 bears taken per year. Hunters rarely targeted brown bears in the Taku River area, and very few are taken (one every five years on average).

Table 10. Annual Average Hunting Effort and Success in the U.S. Portion of the Taku River Watershed, 2010-2014

Species	Total Hunters	Animals Harvested	Total Hunting Days	Average Hunting Days
Moose	86.8	14.8	426	5.0
Mountain Goat	12.6	3.0	42.4	3.7
Brown Bear	3.0	0.2	15.0	3.8
Black Bear	13.4	4.6	43.8	3.2
Total	115.8	22.6	527.2	4.6

Note: This study assumes each hunter is unique due to the small number of species aside from moose.
Source: ADF&G.

Trapping activity in the Taku River watershed yielded an annual average of 13.8 marten, 1.2 wolverine, 1.6 wolves, 0.6 otters, and 0.2 beavers over the last five years.

Estimated Hunting and Trapping Expenditures

A 2011 survey conducted by the U.S. Fish & Wildlife Service estimates an average $125 is spent in Alaska by hunters in Alaska per hunting day. Based on this estimate, hunters spend an estimated $65,900 per year in Alaska related to hunting in the Taku River watershed.

Trapping generated an estimated $1,795 in annual income to Alaska trappers operating in the watershed.[18]

Taku River Watershed Economic Impacts

Taku River watershed economic impacts on Southeast communities, particularly Juneau, and businesses near the watershed are significant. These impacts are distributed throughout Southeast in a wide range of economic sectors. In total, Taku River watershed economic activity creates an estimated average employment of 260 jobs annually, with $12.8 million in labor income. Annual spending in Southeast associated with the watershed totals $32.9 million, including multiplier effects. This includes $23.2 million in direct spending. The Taku River watershed's annual economic impact of $32.9 million has a 30-year present value of just under $650 million, based on 3 percent discount rate.

Table 11. Summary of Taku River Watershed Economic Impacts

	Direct Spending	Total Employment	Total Labor Income	Total Output
Seafood Industry	$4.2 million	75	$3.6 million	$6.0 million
Sport fishing	$2.7 million	22	$1.1 million	$3.6 million
Visitor Industry	$16.0 million	160	$8.0 million	$23.0 million
Other Activity	$0.2 million	2	$0.1 million	$0.3 million
Total	$23.2 million	260	$12.8 million	$32.9 million

Note: Columns may not sum due to rounding.
Source: McDowell Group estimates.

Annual estimated economic impacts from the Taku River watershed include the following:

- $1.9 million in ex-vessel value to fishermen for Taku River salmon harvests.
- $4.2 million in first wholesale value of Taku River salmon.
- $2.7 million in expenditures on sport fish activity for Taku River Chinook and coho salmon.
- $80,000 worth of Taku River salmon harvested in the personal use fishery.
- $65,000 in spending on hunting activity in the Taku River watershed.
- $16 million in visitor industry activity tied to the Taku River watershed.
- $55,000 in property taxes to the City and Borough of Juneau from Taku River watershed private properties.

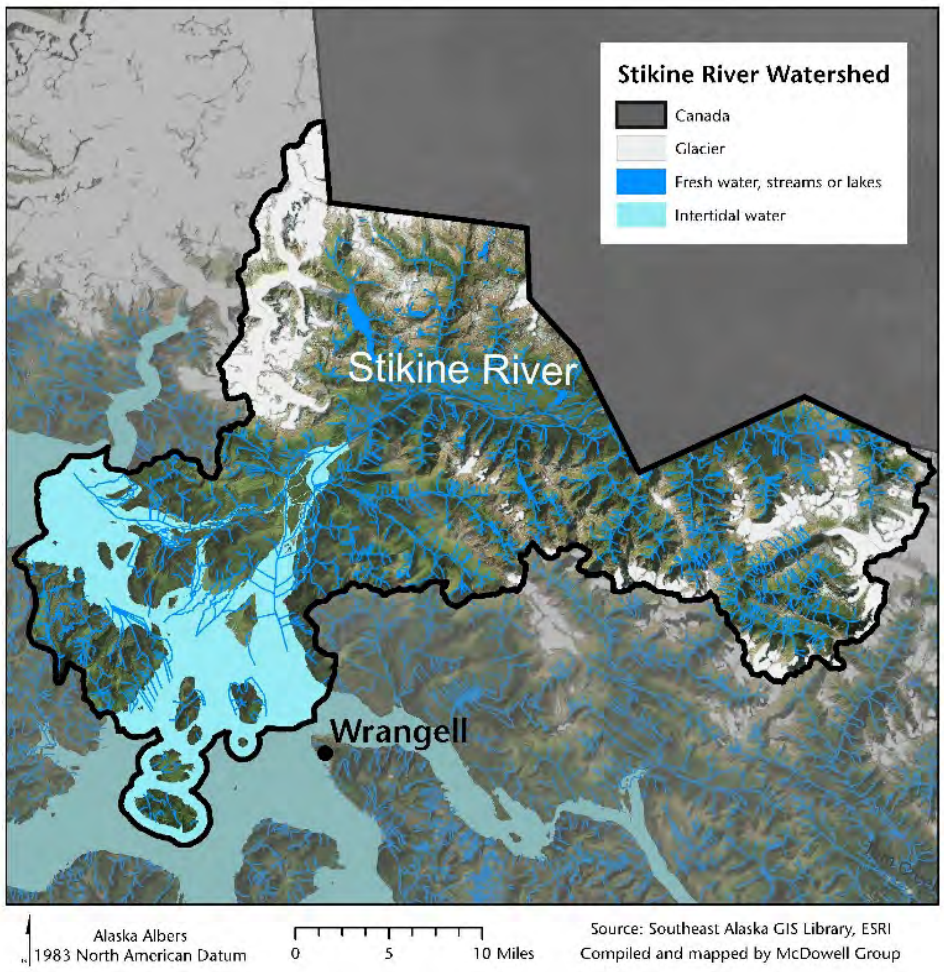
[18] Alaska Trapper Report 2012/2013.

The City and Borough of Juneau, where most jobs created by the Taku River watershed are located, had an average monthly employment of 17,980 jobs in 2014. The 260 jobs created by economic activity associated with the Taku River watershed represent a small but significant portion of those jobs, comparable to the monthly average employment of several other prominent sectors in Juneau: Information (which includes publishing and telecommunications) represented 269 jobs, Real Estate, Rental and Leasing represented 296 jobs, and Finance and Insurance represented 222 jobs.

Profile of the Stikine River Watershed

The Stikine River originates in British Columbia. It drains a 20,000 square-mile area ending in Southeast Alaska in a vast river delta approximately two miles north of Wrangell and 20 miles south of Petersburg. Only the lower 27 miles of this almost 400-mile river are located in the U.S. Within Alaska, the river flows through the Stikine-LeConte Wilderness in the Tongass National Forest.

Figure 6. U.S. Stikine River Watershed Boundary



Source: USDA - Natural Resources Conservation Service (USDA-NRCS), USGS, and EPA, U.S. Watershed Boundary Dataset (WBD). Accessed 3/30/16.

A mountainous region surrounding the river contains numerous glaciers, side channels, lakes, and several warm and hot springs. The area is home to an abundance of fish and wildlife, including Steller sea lions, harbor seals, moose, otters, black-tailed deer, and black and brown bears. At the mouth of the river, the Stikine River Delta

hosts over 120 species of migratory birds, including tundra swans, Canadian geese, sandhill cranes, waterfowl, and shorebirds.[19]

The Stikine River watershed contributes to some of the most productive fisheries in the Southeast region, including fisheries based out of Wrangell and Petersburg. The river supports wild runs of all five salmon species, in addition to arctic grayling, rainbow and cutthroat trout, and steelhead.

Garnet Ledge, located at the mouth of the Stikine River, is the site of an historic garnet mine. The site, which still yields garnets, is now held in trust for the children of Wrangell.

Stikine River Fisheries

The Stikine River and its tributaries provide spawning grounds for all five salmon species. Stikine River salmon are harvested in commercial, sport, and personal use fisheries. The river also produces Dolly Varden and other species of trout.

Stikine River Commercial Salmon Fisheries

Stikine River salmon are commercially harvested in drift gillnet, purse seine, and troll fisheries in Southeast Alaska. Stikine River Chinook salmon run earliest in the season of all the salmon species. The Chinook run lessens by June and, at that time, fishery management emphasis shifts to sockeye. In August, management focuses on pink salmon, then on coho in September for the remainder of the season.

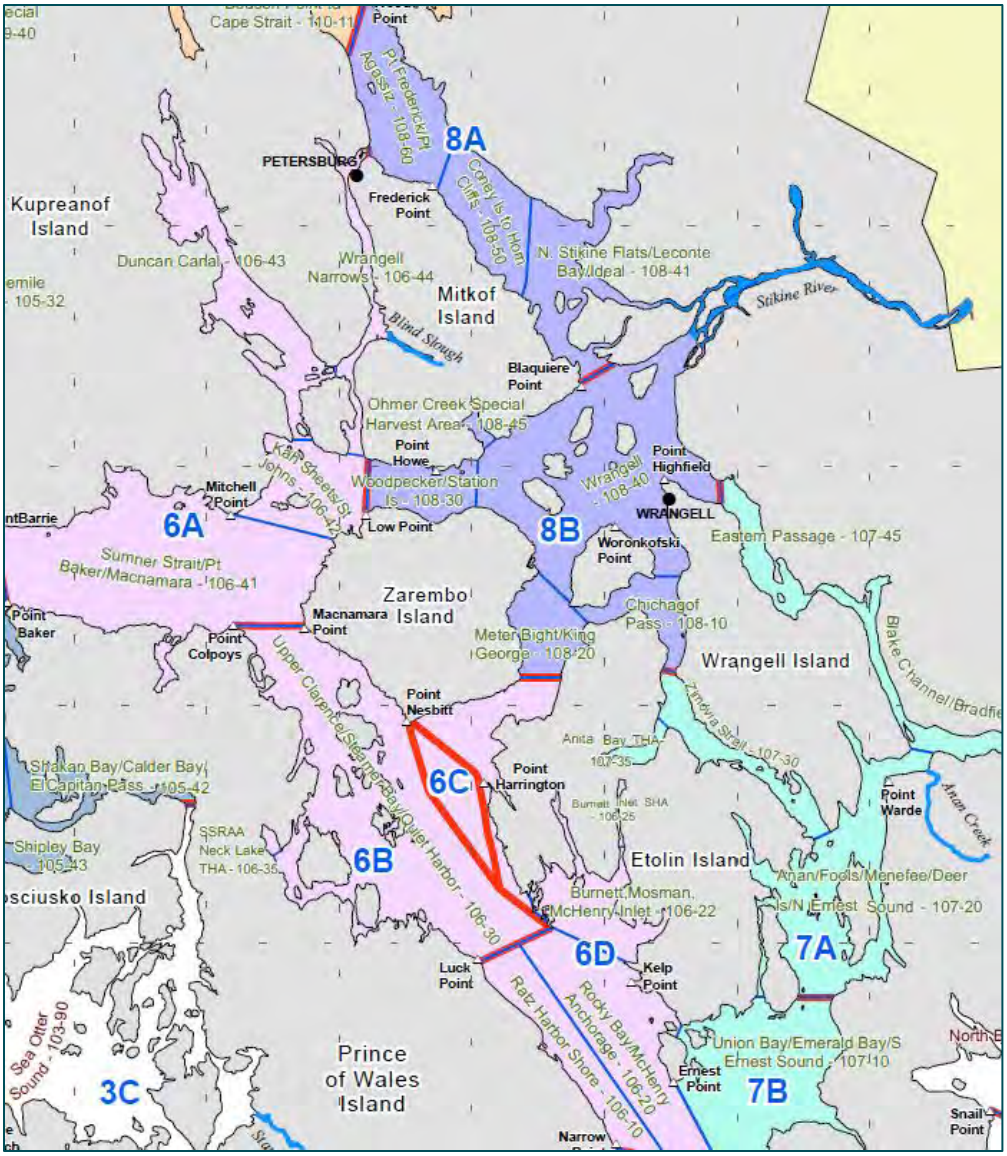
Salmon enhancement activities occur in the Stikine River. These activities are intended to supplement the wild stock. Eggs are sent to DIPAC's Snettisham hatchery for over-winter incubation and deposited as fry in the river in spring. Typically, sockeye fry are placed by DIPAC operations into Tahltan Lake (1.3 million fry annually) and Tuya Lake (755,000 fry). Salmon from both of these lakes migrate through the Stikine River.[20]

Fishing Districts

Commercial salmon fishing near the watershed is focused in ADF&G District 108, which includes areas near Wrangell and Petersburg, as well as in District 106 for some species (see map next page). Under the Pacific Salmon Treaty, the Stikine River is designated as a transboundary river, and estimated harvests are accounted for under the treaty in both Districts 106 and 108. These two districts capture the majority of the harvests attributable to the Stikine River, with District 108 capturing slightly more overall, due to its proximity to the mouth of the river and migration patterns of the salmon species.[21]

[19] www.wrangell.com. Accessed 11/10/15.
[20] http://www.psc.org/pubs/TCTR15-5.pdf
[21] http://www.adfg.alaska.gov/FedAidPDFs/FMR15-08.pdf

Figure 7. Commercial Fishing Districts Near the Stikine River



Source: ADF&G Commercial Fishing Division.

Fishing Fleets

The drift gillnet fishery, the primary fishery near the mouth of the Stikine River, catches more Stikine River salmon than any other gear type. The purse seine fleet also harvests some Stikine River salmon, along with a significant number of hatchery fish in the districts near the Stikine River. The troll fleet harvests few Stikine River salmon due to the migration pattern of the fish as well as the timing of openings; trollers largely operate outside the Inside Passage in summer, after the transboundary salmon have migrated closer to the Stikine River.

Drift gillnet fisheries in Districts 106 and 108 are managed together due to their proximity. All five species of salmon from the Stikine River are harvested in both districts in this fishery. Directed fisheries for Stikine River Chinook were closed from 1976 through 2004 and re-opened in 2005 for years with runs large enough to meet Pacific Salmon Treaty requirements. Chinook, hatchery and wild, are harvested with other salmon species by gillnetters regardless of whether a directed fishery occurs.

The purse seine fishery closest to the Stikine River is active in District 106. It is driven by pink salmon abundance, which is supplemented by nearby hatchery production of the species. This seine fishery harvests 50 percent of the sockeye harvested in the district as well. Twenty-two percent of seine permits fished in the last five years in Southeast were held by fishermen in communities near the Stikine River (Petersburg or Wrangell).

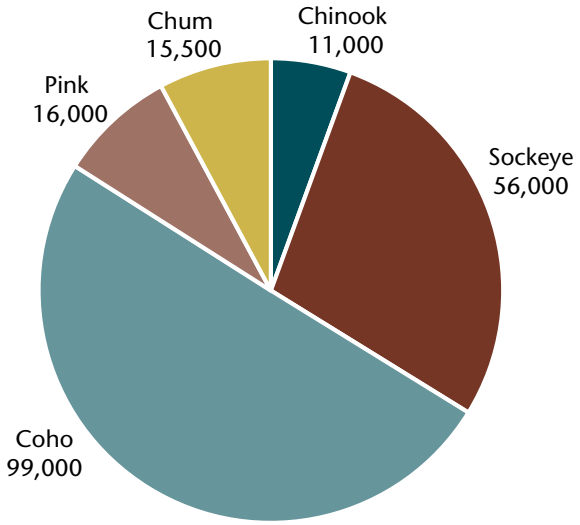
No localized troll fishery operates near the Stikine River.

Stikine River Commercial Salmon Harvests

A tagging program for Stikine River Chinook salmon provides accurate harvest numbers for this species. Sockeye runs are estimated for the river in accordance with the PST using otolith samples. No escapement estimates exist for Stikine River coho, pink, or chum. For purposes of this study, harvest estimates for these three species are based on previous short-term studies, aerial survey results, and ADF&G biologist estimates of the runs in the river.

Annual Alaska commercial fisheries harvests attributable to the Stikine River average an estimated 198,000 salmon between 2005 and 2014, including 99,000 coho, 56,000 sockeye, 16,000 pinks, 15,500 chum, and 11,000 Chinook for all gear types combined.[22]

Figure 8. Average Annual Stikine Commercial Salmon Harvest, by Species, 2005-2014



Source: McDowell Group estimate based on ADF&G Reports, ADF&G COAR Reports, ADF&G Personal Communication, and Pacific Salmon Treaty Reports.

[22] Estimated 10-year averages.

Table 12. Estimated Stikine River Salmon Commercial Harvest, Number of Fish, All Gear Types, 2005-2014

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
2005	37,000	92,000	112,000	32,000	15,000	288,000
2006	29,000	74,000	131,000	17,000	34,000	285,000
2007	14,000	86,000	72,000	12,000	18,000	202,000
2008	11,000	46,000	106,000	5,000	8,000	176,000
2009	4,000	73,000	156,000	8,000	19,000	260,000
2010	3,000	39,000	149,000	18,000	5,000	214,000
2011	4,000	72,000	66,000	19,000	14,000	175,000
2012	4,000	27,000	40,000	5,000	24,000	100,000
2013	3,000	27,000	92,000	35,000	10,000	167,000
2014	1,000	22,000	69,000	10,000	8,000	110,000
10-Year Average	11,000	55,800	99,300	16,100	15,500	197,700

Note: Chinook estimates are Alaska-wide commercial harvests, sockeye harvests are based PST data, coho estimates are based on ADF&G estimates, and chum and pink are based on ADF&G estimates.
Source: McDowell Group estimate based on ADF&G reports, ADF&G COAR reports, PST reports, and ADF&G personal communication.

Harvest Trends

Overall salmon harvest attributable to the Stikine River decreased by 61 percent in the last ten years according to McDowell Group estimates. Much of this change can be attributed to closure of directed Chinook fisheries near the Stikine River since 2007. Stikine River sockeye harvests ranged between 22,000 and 92,000 fish over the last ten years, with 22,000 harvested in 2014. Coho harvests averaged approximately 99,300. Pink and chum salmon harvests averaged 16,000 annually for each species, following relatively cyclical harvests of high and low runs.[23]

Salmon runs are cyclical and can vary significantly over time. While 10-year data suggests Chinook and sockeye salmon harvests are trending down, much of this trend reflects closures in directed fisheries near the Stikine River in Alaska in accordance with PST requirements. ADF&G biologists track Chinook and sockeye salmon runs in the Stikine River. If the fish are below their spawning escapement for the PST requirements, directed fisheries are closed until that number increases to a sustainable fishery level.

Canadian Fisheries

Drift and set gillnet commercial fisheries, as well as sport and personal use fisheries, also operate on the upper and lower Stikine River in Canada. The Canadian lower Stikine River commercial fishery operates with approximately 12 permit holders from the U.S.-Canada border to approximately 10 miles farther upriver.[24] The 2014 Canadian commercial harvest of Stikine River sockeye in the lower river totaled 30,487. This fishery also harvested 114 Chinook. The directed coho salmon harvest from the Stikine River in Canada totaled 4,992 coho. A portion of the Canadian lower Stikine River commercial harvest may be sold to processors in Alaska. However, the number sold in the U.S. is not known and not included in this analysis.

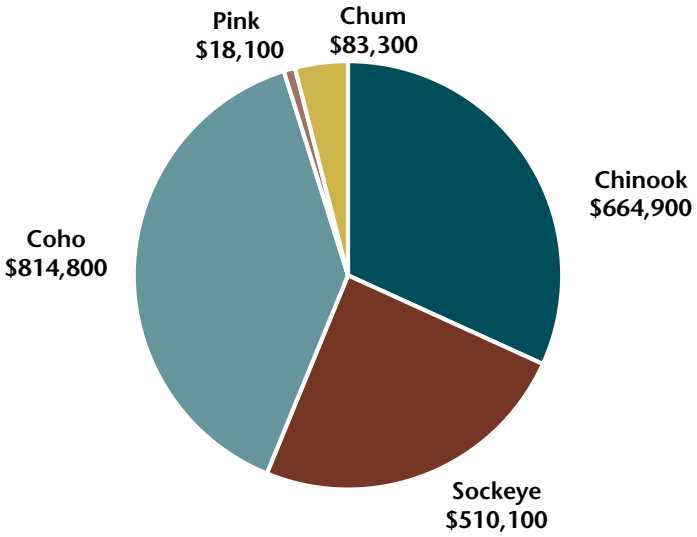
[23] Coho, chum, and pink salmon estimates in this report are based on a general estimate of typical harvests from the Stikine and shouldn't be considered suitable data to trend.
[24] ADFG Fishery Management Report No. 15-08. 2015.

Value of Stikine River Salmon Fisheries

EX-VESSEL VALUE

Fishermen who harvest the estimated 198,000 salmon returning to the Stikine River are paid approximately $2.1 million annually. Of this total ex-vessel value, coho comprise 39 percent of the value, Chinook 32 percent, sockeye 24 percent, and the remainder is pink and chum.

Figure 9. Average Annual Ex-Vessel Value of Commercially Harvested Stikine River Salmon, by Species, 2005-2014



Source: McDowell Group estimates based on ADF&G reports, ADF&G COAR reports, ADF&G personal communication.

Ex-vessel earnings are based on area-specific ex-vessel prices and weights for each species. Prices by species fluctuate greatly, both annually and by species. Chinook salmon consistently attract the highest price per pound of all salmon species, with prices around $4.43 for troll-caught Chinook. The lowest price received for salmon is for drift gillnet-caught pink salmon, near $0.28 per pound.

Table 13. Estimated Annual Ex-Vessel Value of Stikine River Salmon, in $000's, 2005-2014

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
2005	$1,680	$697	$676	$15	$55	$3,124
2006	$1,907	$640	$1,268	$13	$132	$3,960
2007	$847	$753	$571	$10	$65	$2,247
2008	$995	$440	$1,053	$7	$56	$2,551
2009	$190	$601	$986	$7	$82	$1,866
2010	$207	$419	$1,424	$29	$36	$2,116
2011	$253	$785	$580	$34	$106	$1,757
2012	$258	$248	$329	$8	$197	$1,040
2013	$263	$288	$698	$46	$53	$1,348
2014	$48	$230	$563	$11	$51	$903
10-Year Average	$665	$510	$815	$18	$83	$2,091

Source: ADF&G reports, ADF&G COAR reports, ADF&G personal communication.

Ex-Vessel Value Trends

Overall ex-vessel value has declined from an average $3.1 million in 2005 to $903,000 in 2014. For the two species with the most data, Chinook and sockeye, the downward trend in value is linked to lower harvest levels.

First Wholesale Value

Ex-vessel value, the amount paid to harvesters, is only one aspect of the value of the Stikine River fishery. An additional measure of economic activity is the first wholesale value, the amount spent by processors purchasing fish from harvesters, and the value added by processing and packaging. Some of the larger processors that likely process Stikine River salmon due to their proximity to the watershed include Trident Seafoods, Sea Level Seafoods (owned by Pacific Seafoods), Icicle Seafoods, and Ocean Beauty Seafoods.

In determining the first wholesale value of Stikine River salmon, a recovery rate of 74 percent of the fish was applied. This rate is the standard head and gut rate, as much of the salmon processed in Southeast Alaska is first processed as head and gut.[25] An estimated annual average $3.5 million in first wholesale value is associated with salmon attributable to the Stikine River for 2005 to 2014.

Table 14. Estimated Annual First Wholesale Value of Stikine River Salmon, in $000's, 2005-2014

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
2005	$1,492	$2,059	$1,204	$86	$151	$4,993
2006	$1,694	$1,897	$2,235	$67	$406	$6,298
2007	$752	$1,741	$953	$44	$195	$3,685
2008	$884	$1,459	$1,741	$31	$123	$4,238
2009	$169	$1,469	$1,779	$35	$172	$3,624
2010	$184	$871	$2,257	$105	$72	$3,489
2011	$225	$1,553	$908	$108	$212	$3,006
2012	$229	$701	$603	$32	$405	$1,971
2013	$233	$671	$1,160	$136	$124	$2,325
2014	$42	$493	$896	$43	$120	$1,596
10-Year Average	$590	$1,291	$1,374	$69	$198	$3,522

Source: McDowell Group estimates based on ADF&G reports, ADF&G COAR reports, ADF&G personal communication.

First Wholesale Value Trends

Estimated first wholesale revenue was $1.6 million in 2014, compared to the ten-year average of $3.5 million. Much of the decrease in value comes from lower harvest volumes in the last few years, with 2014 being the lowest harvest of Stikine River Chinook and sockeye in the last ten years.

Participation

Many participants in the commercial fisheries near the Stikine River are from multiple generations of fishermen, and participation in the fisheries is high in these nearby Wrangell and Petersburg compared to the rest of the

[25] To account for differences in how Chinook salmon are delivered between gear types and regional wholesale data discrepancies, a 20 percent increased based on ex-vessel values was used in place of reported wholesale values.

Southeast Alaska region. In the last five years, permits for fishermen in Petersburg and Wrangell made up a combined third (31 percent) of all Southeast drift gillnet permits.

While the exact number of permit holders in each gear type that specifically catch Stikine River salmon is unknown, it is highly likely those fishing in the sub-districts closest to the river catch Stikine River fish. At least 100 permits are fished near the Stikine River.

Table 15. Estimated Participation in Stikine River Salmon Commercial Fishery by Gear Type, 2005-2014

	Gillnet Fleet	Troll Fleet	Seine Fleet	Total
2005	100	54	20	174
2006	100	36	-	136
2007	93	31	28	152
2008	112	19	-	131
2009	46	22	-	68
2010	40	25	-	65
2011	37	30	-	67
2012	51	23	-	74
2013	33	20	34	87
2014	21	18	13	52
10-Year Average	63	28	24	101

Note: Fleet estimates are determined by closest statistical area to river. Gillnet and troll fleet include permits fished in District 108-40. Seine fleet includes permits fished in District 106-30.
Source: ADF&G (COAR).

At least 200 fishermen, including permit holders and crew members, harvest salmon near the Stikine River. Additionally, an estimated 500 employees work during peak months in the Petersburg seafood processing industry. Though the Stikine River accounts for a relatively small percentage of the value of salmon processed in Petersburg, Stikine River salmon are a component of this industry. It is important to distinguish the number of participants in the industry from the average annual employment attributable to fisheries related to the Stikine River watershed. Average annual employment is discussed further in the concluding section of this chapter.

Stikine River Sport Fishing

The Stikine River supports sport fishing activity upriver and in the river delta for salmon and a minimal number of trout. The Stikine River is a wide, fast flowing river, making travel with a large boats upriver difficult. Some sport fishing does occur from flat-bottomed river boats in the river, though most occurs in marine areas near the mouth of the river. Primary Stikine River saltwater sport fishing targets are Chinook and coho salmon, with Chinook salmon returning to the river in early summer and coho returning in late summer.

Harvest and Effort

On average, an estimated 1,500 Stikine River coho and 8,400 Stikine River Chinook were harvested annually in the sport fishery near the river over the past ten years.[26]

[26] More detail can be found in the methodology section.

The ADF&G sport fishing district Area C includes Petersburg and Wrangell. In Area C, an estimated annual average of 29,600 angler days are spent targeting Stikine River Chinook and coho. Angler days count the days fished with a sport fishing permit. In a single fishing day, anglers may harvest multiple salmon species and also harvest other species, such as rockfish or halibut. For purposes of this study, it is assumed most angler days in the area target salmon near the Stikine River. Thus, an estimated annual average 18,600 angler days were spent fishing for Stikine River Chinook salmon and 11,000 were estimated fishing for Stikine River coho. Overlap likely occurs, with some angler days spent fishing for both species. These numbers are conservative estimates, as anglers may spend time fishing for salmon when targeting other species as well.

Table 16. Annual Stikine Chinook and Coho Sport Harvest, 2005-2014

Year	Stikine Chinook Sport Harvest	Stikine Coho Sport Harvest	Total Sport Harvest
2005	3,700	20,800	24,500
2006	3,300	19,000	22,300
2007	2,200	12,600	14,800
2008	1,500	8,200	9,700
2009	900	5,000	5,900
2010	600	3,300	3,900
2011	650	3,700	4,300
2012	600	3,500	4,100
2013	600	3,600	4,200
2014	700	4,000	4,700
10-Year Average	1,500	8,400	9,900

Source: McDowell Group estimate based on ADF&G reports, ADF&G COAR reports, ADF&G personal communication.

Guided and unguided sport fishing trips occur in the area. In 2014, nearly all guided trips (97 percent) were purchased by non-residents. Also in 2014, 32 businesses took 3,452 anglers on a chartered fishing trip, departing from either Petersburg or Wrangell. Seven percent of angler days fished were on a chartered vessel that landed in either Petersburg or Wrangell. The remainder of angler days can be attributed to unguided fishing.[27] The most common charter-caught species were Chinook salmon, coho salmon, and halibut.

Estimated Sport Fishing Expenditures

Using McDowell Group estimates based on Chinook and coho runs attributable to the Stikine River, over the past 10 years, sport fishing estimated expenditures related to Stikine River Chinook and coho averaged a combined $4.2 million annually.[28] These estimates include typical expenditures associated with a day of fishing, including taking a boat out, fuel, bait, and gear.

[27] *Alaska Sport Fishing Survey* database [Internet]. 1996, Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited March 10, 2016). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.
[28] Any fishing done during a day is considered a day of fishing, which could include catching halibut and other species. We also have used a conservative value to estimate the average per day trip costs.

Table 17. Estimated Stikine River Chinook and Coho Sport Angler Days Fished and Total Annual Expenditures, 2005-2014

Year	Stikine River Chinook Angler Days	Stikine River Coho Angler Days	Annual Angler Expenditure for Chinook ($Millions)	Annual Angler Expenditure for Coho ($Millions)
2005	25,100	30,800	$3.8	$4.7
2006	21,100	53,000	$3.1	$7.8
2007	15,100	29,000	$2.2	$4.2
2008	15,800	20,500	$2.2	$2.8
2009	6,600	11,100	$0.9	$1.5
2010	4,600	9,200	$0.6	$1.2
2011	4,500	8,200	$0.6	$1.1
2012	6,400	9,200	$0.8	$1.2
2013	6,300	6,300	$0.8	$0.8
2014	4,600	8,600	$0.6	$1.0
10-Year Average	11,000	18,600	$1.5	$2.6

Note: Columns may not sum due to rounding.
Source: McDowell Group estimate based on ADF&G reports, ADF&G COAR reports, ADF&G personal communication.

Stikine River Personal Use Fishery

In coordination with the Pacific Salmon Commission, the Federal Subsistence Board established a subsistence fishery on the Stikine River in 2004. Participation in the fishery is limited to residents of Wrangell, Petersburg, Meyers Chuck, and the immediate vicinity of the river. The first year of the fishery solely focused on sockeye salmon, with Chinook and coho fisheries added in 2005.

An annual average of 123 personal use permits for salmon were issued for the Stikine River personal use fishery between 2010 and 2014. Within the fishery, an annual average of 1,576 sockeye, 123 coho, 106 pink, 82 Chinook, 61 chum, three steelhead, and seven Dolly Varden were harvested.

Table 18. Stikine River Personal Use Fishery Permits and Harvest (Number of Fish), 2010-2014

	Number of Permits	Chinook Harvest	Coho Harvest	Sockeye Harvest	Chum Harvest	Pink Harvest	Steelhead Harvest	Dolly Varden Harvest
2010	107	61	135	1,653	37	60	7	12
2011	129	86	40	1,741	74	189	5	3
2012	130	76	112	1,302	47	32	0	1
2013	124	101	186	1,655	87	156	2	15
2014	125	86	143	1,527	60	92	0	4
5-Year Average	123	82	123	1,576	61	106	3	7

Source: Alaska Department of Fish and Game.

The five-year annual average value of Stikine River personal use harvest is estimated at approximately $100,000.

Visitor Industry Activity in the Stikine River Watershed

The visitor industry in the Stikine River watershed is closely tied to the community of Wrangell. Some visitor activity also comes from Petersburg, as Wrangell-based jet boats pick up Petersburg travelers at the south end of Mitkof Island for Stikine River watershed tours.

McDowell Group's *Alaska Visitor Statistics Program* (AVSP) estimates that 18,000 people visited Wrangell, spending $4 million in the community, during summer 2011 (the most recent year for which data are available).[29]

Tour Operations

From Wrangell, the Stikine River may be accessed by jet boat, air, and other watercraft, such as canoes, kayaks, and rafts. Commercially guided trips are available for each of these transportation modes. Based on interviews with Wrangell tour providers, an estimated 3,600 people visited the Stikine River watershed on a paid tour in 2015. Over 95 percent of these visits occurred by jet boat.

Jet Boat Tours

Six Wrangell-based companies offer sightseeing tours along the Stikine River via jet boats. These tours cost between $140 and $275 per person, and generally last four to six hours. The tours include stops at various locations along the river. If paying clients access Forest Service lands (lands above the river's ordinary high water mark), a day use permit is required. According to data obtained from the Wrangell Ranger District, an annual average of 1,286 visitors accessed Forest Service lands in the watershed through these permits from 2011 to 2015.

Other Stikine Tours

While jet boat tours bring the majority of visitors to the Stikine River watershed, a variety of other activities also attract visitors, including flightseeing tours, guided and personal float trips, fly fishing trips, and other outdoor adventures. Flightseeing tours generally travel up the Stikine River roughly 20 miles, then over Shakes Lake to view the LeConte Glacier and other glaciers before returning to Wrangell.

Wrangell is a staging area for guided or personal float trips down the Stikine River. Visitors and locals alike arrange jet boat or float plane transportation up the river for float trips by kayak, canoe, or raft. Upriver paddling is strenuous and much less common. There are established canoe/kayak routes along the river. These routes often leave from Wrangell and proceed across Eastern Passage or from Petersburg via Mitkof Island and across Dry Straight. Float trips start at various points along the Stikine River, including Telegraph Creek in British Columbia, 160 miles upriver from Wrangell.

[29] McDowell Group, 2012. *Alaska Visitor Statistics Program VI: Summer 2011.* Prepared for the Alaska Department of Commerce, Community, and Economic Development. Maximum margin of error for the Wrangell sample was ±7.1 percent.

Based on data provided by Wrangell businesses offering Stikine tours described above, an estimated 3,600 visitors spent a total of $700,000 for Stikine River tours in 2015.[30]

In addition to tour expenditures, Wrangell visitors also spend money on lodging, food, transportation, gifts, and other expenses in Wrangell.

According to Wrangell-specific data from the *Alaska Visitor Statistics Program*, estimated spending by visitors to Wrangell averaged $223 per person, of which 61 percent was spent on tours and activities, 15 percent on food/beverage, 10 percent on lodging and rental cars/fuel/transportation (not including transportation to and from Alaska), and 3 percent on gifts.[31]

Based on these expenditure estimates and a total visitor volume of 18,000 to Wrangell, an estimated $2.45 million is spent on all Wrangell tours and activities, including those related to the Stikine River, per year. As discussed above, in 2015, known Stikine River watershed tour expenditures totaled $700,000, or 29 percent of total tour expenses. For the purposes of this study, it is assumed the best method to attribute non-tour visitor spending is proportionately based on tour spending. By this method, an estimated 29 percent of non-tour expenses by Wrangell visitors, or roughly $450,000, is attributable to the Stikine River.

Thus, total visitor industry activity in Wrangell associated with the Stikine River watershed in 2015 is estimated at $1.15 million. This amount combines $700,000 in direct tour expenses with $450,000 in non-tour expenses associated with Stikine River watershed tours and activities.

Applying Wrangell's sales tax rate of 7 percent, an estimated $80,500 in Wrangell sales tax revenue is attributable to the Stikine River watershed. Similarly, based on Wrangell's bed tax (known as a transient tax) rate of 6 percent and the lodging proportion of total expenditures (based on AVSP data), it is estimated that $6,900 in bed tax revenue is attributable to the watershed.

Recreation Activity in the Stikine River Watershed

Aside from sport fishing and visitor activity, the Stikine River watershed provides an abundance of recreation opportunities for local residents of Wrangell and, to a certain extent, Petersburg. Area residents participate in fishing, hunting, boating, camping, hiking, birding, and a variety of other outdoor activities in the watershed. Residents also stay in the watershed at private properties and Forest Service cabins.

An annual Stikine River birding festival occurs each year in April/May during the spring migration of millions of birds through the area. Popular birding sites during the festival, based out of Wrangell, include Sergief Island and the Stikine River delta. According to an interview with an official with the City of Wrangell, the majority of festival participants are Wrangell locals, with a few dozen visitors coming to town for the festival.

Chief Shakes Hot Springs is located in a slough of the Stikine River, approximately 12 miles upriver. The springs include two developed hot tubs. The hot springs are located downriver from two Forest Service cabins.

[30] Estimate combines data provided to McDowell Group by eight Wrangell tour providers, including all major companies.
[31] AVSP data is based on surveys of 189 randomly selected Alaska visitors that visited Wrangell.

Recreation Properties

Forest Service Cabins

The U.S. Forest Service (USFS) operates 13 cabins available to rent for the public within the Stikine River watershed. Most USFS cabins rent for $25 per night and are available year round, though some are slightly more expensive during the summer season. The cabins are generally accessed by boat, with some accessible by float plane. On average, cabin users spend $10,500 annually on USFS cabin rentals in the watershed.

Table 19. Stikine River Watershed U.S. Forest Service Cabins Annual Revenue, by Cabin, 2007-2014

	2010	2011	2012	2013	2014	Annual Average
Binkley Slough Cabin	$25	--	$25	--	--	$ 25
Garnet Ledge Cabin	$700	$875	$550	$700	$750	$719
Gut Island Cabin #1	$410	$275	$540	$510	$730	$514
Gut Island Cabin #2	$125	$150	$300	$200	$75	$181
Koknuk Cabin	$300	$425	$375	$350	$625	$444
Little Dry Island Cabin	$580	$860	$1,215	$665	$710	$ 863
Mallard Slough Cabin	$1,410	$970	$1,275	$930	$1,060	$1,059
Mount Flemer Cabin	$1,125	$1,350	$1,300	$1,225	$1,500	$1,344
Mount Rynda Cabin	$805	$2,245	$1,085	$1,220	$1,050	$1,400
Sergief Island Cabin	$125	$25	$125	$125	$350	$156
Shakes Slough Cabin #1	$925	$860	$800	$700	$1,050	$853
Shakes Slough Cabin #2	$2,040	$1,210	$1,605	$1,860	$2,055	$1,683
Twin Lakes Cabin	$2,105	$1,050	$1,270	$1,215	$1,450	$1,246
Total Revenue	$10,675	$10,295	$10,465	$9,700	$11,405	$10,466

Notes: Data is for calendar years, and will vary from fiscal year reports. The data shown only reflects reservations made and fees collected through the NRRS. The data may not reflect the full reservations and collections for the cabins shown, as local district policies have, or may still allow, last minute reservations and payments to be made at the local district offices. There is no historic data known that shows the per cabin breakdown for these situations. Per night fees vary from cabin to cabin. In some cases, the Annual Revenue collected does not equal the annual number of nights used if multiplying by the per night fee of each cabin. This is due in part to full or partial fee waivers.
Source: U.S. Forest Service – National Recreation Reservation System's (NRRS) Fee Analysis Report for Calendar Years 2007-2014.

Expenditures associated with stays at the cabins, including transportation, gear, and food is estimated to total an additional $75,500 annually. In total, an estimated $86,000 is spent on travel to Stikine River watershed USFS cabins each year.

Private Property

Approximately 125 private properties located in the Stikine River watershed are subject to property taxes. These properties are located within the boundaries of the City and Borough of Wrangell. The mill rate for properties in the watershed is 4 mills. Estimated tax revenue to the borough from Stikine River watershed properties totals approximately $15,000 annually.

Hunting and Trapping

Moose hunting along the Stikine River is a key subsistence activity for many Wrangell and Petersburg families. From 2010 to 2014, an annual average of 164 hunters targeted moose in the watershed, with 22.8 moose harvested on average each year. Based on data for Game Management Unit 1B, which includes the Stikine River, an estimated 58 percent of Stikine River watershed moose hunters are from Wrangell, 32 percent from Petersburg, 7 percent from other parts of Southeast Alaska, 1 percent from Southcentral Alaska, and 3 percent from out of state.[32] No registered guides were used for moose hunting in the Stikine watershed in the last five years (non-residents do not need a guide to hunt moose in Alaska).

Other wildlife species are harvested in the Stikine River watershed, though at much lower rates than moose. Between 2010 and 2014, an average of 1.4 mountain goat were harvested each year in the watershed, as well as 2 deer, 1 black bear, 0.4 brown bears, and 1.2 wolves. Average hunting days per hunter per year range from 3 days for mountain goats to 18 days for black bear.

Table 20. Annual Average Hunting Effort and Success in the U.S. Portion of the Stikine River Watershed, 2010-2014

Species	Total Hunters	Animals Harvested	Total Hunting Days	Hunting Days per Hunter	Guided Hunters
Moose	163.6	22.8	1,338.4	8.2	0
Mountain Goat	5	1.4	15	3	0.4
Brown Bear	5	0.4	28.7	5.7	0.4
Black Bear	3.6	1	64.8	18	0.2
Deer	12.8	2	137.5	10.8	0
Total	190	27.6	1,584.4	8.3	1

Source: ADF&G.
Note: The count of total hunters is potentially duplicative (hunters may hunt more than one species at a time). This study assumes each hunter is unique due to the small number of species aside from moose.

Most hunters in the Stikine River watershed reach the area via private transportation, predominantly by jet boat. Travel by commercial transportation is infrequent. In total, between 2010 and 2014, eight hunters reported using commercial air transportation to reach the area, all for mountain goat hunting.

Trapping activity on the Stikine yields an average of 54.2 marten, 1 wolverine, and 0.2 wolves per year.[33]

Estimated Hunting and Trapping Expenditures

A 2011 survey conducted by the U.S. Fish & Wildlife Service and the U.S. Census Bureau provides an estimated expenditure for hunters.[34] This study estimates an average $125 is spent in Alaska by resident hunters per hunting day. On average, hunters spent a total of 1,584 hunting days in the Stikine annually between 2010

[32] In 2014, in Game Management Unit 1B, which includes the Stikine River, 58 percent of moose hunters were from Wrangell, 32 percent from Petersburg, 7 percent from other parts of Southeast Alaska, 1 percent from Southcentral Alaska, and 3 percent were not Alaska residents. Moose hunters in the Stikine represent 65 percent of moose hunters in the Game Management Unit 1B, and it is assumed that hunter origins are consistent across the unit.
[33] ADF&G.
[34] U.S. Fish and Wildlife Service. (2014). 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

and 2014, resulting in an estimated $198,000 per year spent on hunting in the U.S. portion of the Stikine River watershed. These expenses can be broken down by day by type of expenditure, as shown in the table below.

Table 21. Average Per Day Expenditures in Alaska by Hunters in Alaska, by Type of Expenditure

Type of Expenditure	Average Per Day
Trip-related	$50
Hunting equipment	$34
Auxiliary and special equipment	$38
Other	$4
Total	$125

Source: U.S. Fish and Wildlife Service. (2014). 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

Trapping income is estimated using average prices for 2010 to 2014 ($86 for marten, $255 for wolverine, and $175 for wolves). At these prices, it is estimated that trapping in the Stikine brings an average $4,870 in annual income to Alaska trappers.[35]

Stikine River Watershed Economic Impacts

Activity associated with the Stikine River watershed produces economic impacts on nearby communities and businesses. These impacts are distributed throughout Southeast in a wide range of economic sectors. In total, Stikine River watershed economic activity creates an estimated 117 jobs annually, with $5.7 million in total labor income. Annual spending in Southeast associated with the Stikine River watershed totals $12.7 million, including multiplier effects. This includes $9.3 million in direct spending. The present value of the Stikine River's annual economic footprint of $12.7 million, measured over 30 years, is $250 million.

Table 22. Summary of Stikine River Watershed Economic Impacts

	Direct Spending	Total Employment	Total Labor Income	Total Output
Seafood Industry	$3.5 million	65	$3.2 million	$5.0 million
Sport fishing	$4.2 million	33	$1.7 million	$5.4 million
Visitor Industry	$1.2 million	14	$0.6 million	$1.7 million
Other Activity	$0.4 million	4	$0.2 million	$0.6 million
Total	$9.3 million	117	$5.7 million	$12.7 million

Source: McDowell Group estimates. Columns may not sum due to rounding.

These economic impacts include the following summary of expenditures and values:

- $2.1 million in ex-vessel value of Stikine River salmon paid to commercial fisherman.
- $3.5 million in first wholesale value for Stikine River salmon, which includes spending by processors purchasing fish from harvesters, and the value added by processing and packaging.

[35] Alaska Department of Fish and Game. (2013). Trapper Questionnaire Statewide Annual Report. Wildlife Management Report ADF&G/DWC/WMR-2013-5. 2014 prices from North America Fur Actions February 2014 Wild Fur Report, available at http://www.furfishgame.com/fur_auctions/2014/nafa_02_2014.php.

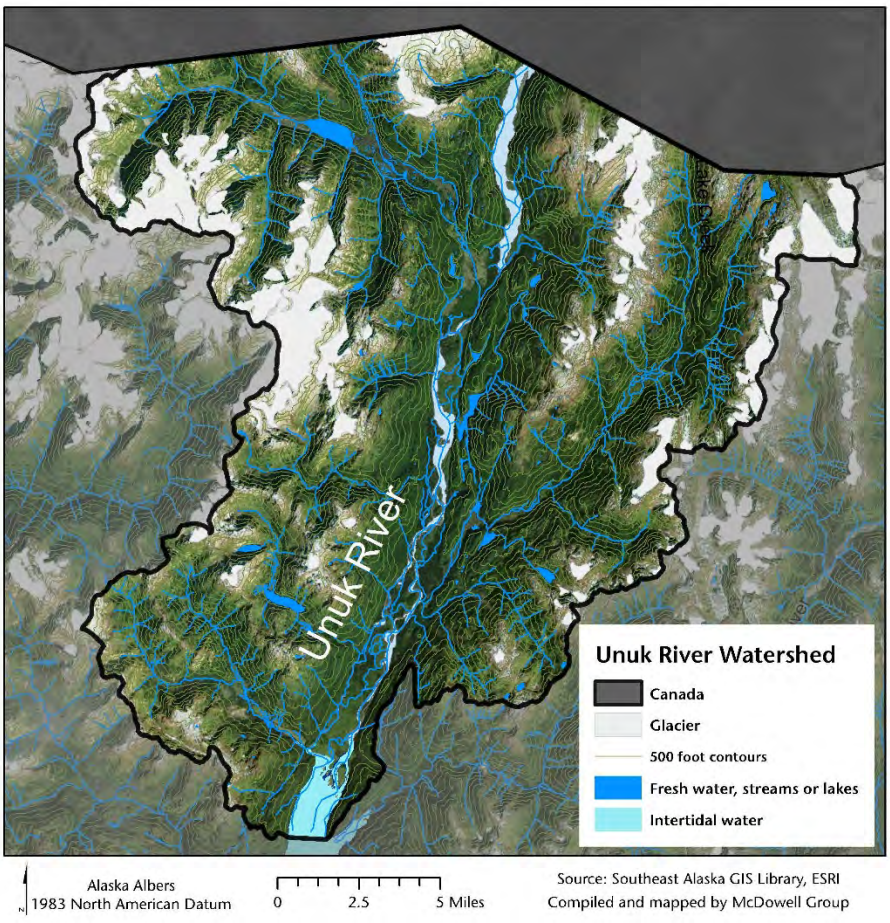
- $4.2 million in expenditures on sport fishing for Stikine River Chinook and coho salmon.
- $100,000 worth of salmon harvested in the Stikine River personal use fishery.
- $200,000 in spending on hunting in the Stikine River watershed.
- $1.2 million in visitor industry activity associated with the Stikine River watershed.
- $15,000 in property tax revenue to the City and Borough of Wrangell from Stikine River watershed private properties.

In the Wrangell Borough, average monthly employment totaled 880 jobs in 2014, and Petersburg Borough employment averaged 1,437 jobs per month. It can be assumed the majority of jobs created by the Stikine River watershed are located in Wrangell, with some in Petersburg. When compared to economic sectors in Wrangell, the 117 average monthly jobs created by the Stikine River watershed compare to 249 in Local Government, 95 in Retail Trade, 62 in Leisure and Hospitality, and 22 in Construction. Because many of the jobs created by the Stikine River watershed exist within these sectors, there is overlap between these figures.

Profile of the Unuk River Watershed

The Unuk River originates in a glaciated area of British Columbia and drains approximately 1,500 square miles, flowing approximately 80 miles to its terminus in Burroughs Bay in Behm Canal, approximately 50 miles northeast of Ketchikan. The lower 24 miles of the river are in Alaska. The river flows through a portion of Misty Fjords National Monument, a national monument and wilderness area overseen by the U.S. Forest Service.

Figure 10. U.S. Unuk River Watershed Boundary



Source: U.S. Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS), United States Geological Survey, and Environmental Protection Agency, U.S. Watershed Boundary Dataset (WBD). Accessed 3/30/16.

Unuk River Fisheries

The Unuk River supports all five salmon species, most notably the third largest run of Chinook salmon in the region, as well as a significant chum run. Commercial fishing for Unuk River salmon occurs throughout much of southern Southeast Alaska. These fish are also caught for sport and personal use in the region. Sport fishing occurs near the mouth of the river for trout, salmon, and euchalon.

Unuk River Chinook salmon have the earliest running time of salmon species from the river. Chum, sockeye, and pink salmon are harvested in mid-summer. The salmon season typically ends with coho runs. The Unuk River is one of 11 escapement indicator streams for Chinook salmon in Southeast Alaska for the Pacific Salmon Treaty.

Unuk River Commercial Salmon Fisheries

Unuk River salmon are commercially harvested in drift gillnet, purse seine, and troll fisheries in Southeast Alaska.

Fishing Districts

The Unuk is one of four large rivers tucked back into the Behm Canal, an area with limited commercial fishing activity. A gillnet fishery occurs 150 miles south of the mouth of the Unuk River near Ketchikan, in ADF&G District 101. This district is the closest ADF&G management area to the river. District 101 encompasses not only the Unuk River, but also several other large salmon producing rivers, including the Chickamin, Blossom, and Keta Rivers, and several high-production hatcheries, including Neets Bay.

Figure 11. Commercial Fishing Districts Near the Unuk River

Source: ADF&G Commercial Fishing Division.

Fishing Fleets

Unuk River salmon are intercepted on their migration back to the river in marine areas by multiple gear types. Fishing fleets, in particular gillnets, do not operate at the mouth of the river as they do for both the Stikine and Taku Rivers due to commercial fishing closures in the Back Behm Canal, though they do operate in District 101.

The troll fleet operates on the outer coast of the Inside Passage, and typically targets salmon migrating from the Gulf of Alaska. Dixon Entrance is an active entrance point into the Inside Passage for salmon, and there is significant trolling activity in this area. Much of the salmon harvest activity closest to the Unuk River also utilizes troll gear, primarily close to hatchery sites.

Unlike the Taku and Stikine River salmon stocks, the most common gear type for harvesting Unuk River Chinook is troll, followed by seine. In the last five years, Unuk River Chinook were harvested mainly in June. The gillnet fleets are successful near the Stikine and Taku Rivers because they are able to target salmon schooling near the river mouths. The closest open areas for commercial fishing near the Unuk River are within the vicinity of high-production hatchery release sites, which makes gear type estimates difficult by species.[36]

Unuk River Commercial Salmon Harvests

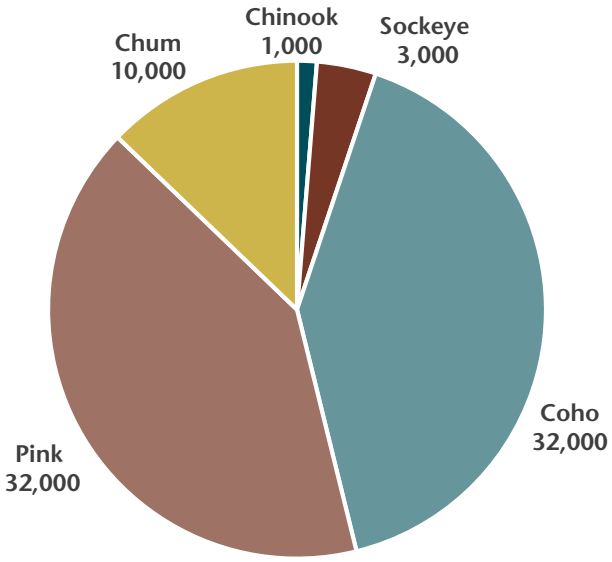
ADF&G operates an ongoing mark and recapture program for Chinook salmon of Unuk River origin. As part of this operation, ADF&G operates research camps to study Chinook runs on the river from spring through fall. This program includes information on the Chinook harvest.

While Chinook salmon estimates are well documented, Unuk River salmon harvests for the other four species are difficult to estimate. ADF&G relies on routine flyovers for information on these salmon species and does not produce escapement estimates for the river. Due to the extensive river systems near the Unuk River, stocks are mixed with other nearby rivers. Thus, Unuk River salmon harvest estimates in this study are based primarily on extrapolations from historical publications and interviews with area biologists.

The estimated annual average harvest of all Unuk River salmon between 2005 and 2014 totals 78,000 fish for all gear types. This total includes an annual average of 32,000 coho, 32,000 pink, 10,000 chum, 3,000 sockeye, and 1,000 Chinook.

[36] http://www.adfg.alaska.gov/FedAidPDFs/FMR15-06.pdf

Figure 12. Estimated Unuk River Salmon Harvest Volume, by Species, 2005-2014



Source: McDowell Group estimates based on ADF&G reports, ADF&G COAR reports, ADF&G personal communication.

Table 23. Estimated Commercial Harvest of Unuk River Salmon, Number of Fish, 2005-2014

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
2005	1,900	4,000	36,000	34,000	6,000	82,000
2006	1,500	3,000	25,000	5,000	14,000	49,000
2007	1,700	3,000	25,000	19,000	9,000	58,000
2008	800	2,000	29,000	21,000	9,000	61,000
2009	800	2,000	32,000	48,000	10,000	93,000
2010	1,200	2,000	31,000	41,000	9,000	86,000
2011	1,100	2,000	28,000	8,000	11,000	50,000
2012	2,100	4,000	25,000	22,000	9,000	63,000
2013	700	1,000	42,000	70,000	12,000	127,000
2014	1,200	2,000	44,000	50,000	13,000	111,000
10-Year Average	1,000	3,000	32,000	32,000	10,000	78,000

Note: Chinook are Alaska-wide commercial harvests, sockeye harvests are based on a PST report, coho estimates are based on previous tagging reports, and chum and pink are based on ADF&G estimates.
Source: McDowell Group estimate based on ADF&G reports, ADF&G COAR reports, ADF&G personal communication.

Harvest Trends

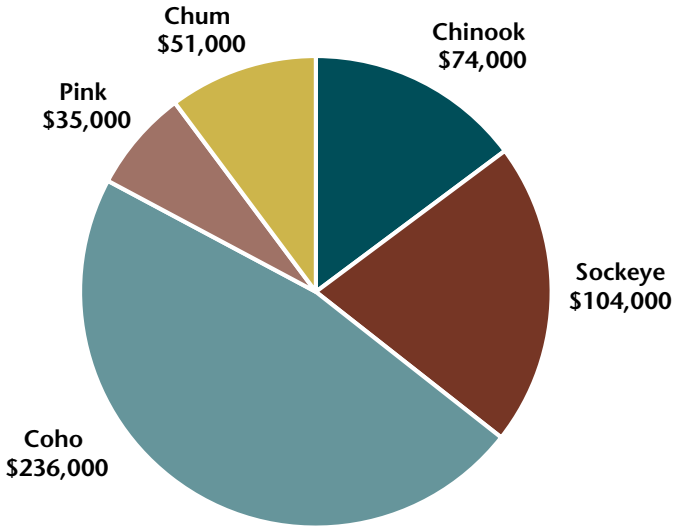
Chinook harvests have declined due to lower escapement numbers in the Unuk, as well as the other southern Southeast indicator stocks. Little is known about the other species. Since there is not a directed fishery for Unuk salmon, there is little trend data available.

Value of Commercial Unuk River Salmon Fisheries

EX-VESSEL VALUE

On average, over the past 10 years, the annual ex-vessel value for the estimated 78,000 Unuk River salmon harvested was $457,000. Of this total value, coho comprise an estimated 57 percent, Chinook 17 percent, chum 12 percent, pink 8 percent, and sockeye 6 percent.

Figure 13. Estimated Total Annual Ex-Vessel Value of Commercially Harvested Unuk River Salmon, by Species, 2005-2014



Source: McDowell Group estimates based on ADF&G reports, ADF&G COAR reports, ADF&G personal communication.

The estimated ex-vessel earnings are based on area-specific ex-vessel prices and average weight per fish for each species. Overall earnings have fluctuated over the years, with highest earnings reported in 2014, at $572,000, and lowest in 2009, at $337,000.

Table 24. Estimated Annual Ex-Vessel Value of Unuk River Salmon, in $000's, 2005-2014

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
2005	$85	$31	$220	$16	$23	$374
2006	$101	$32	$246	$4	$56	$440
2007	$102	$30	$198	$17	$33	$380
2008	$70	$19	$287	$27	$64	$467
2009	$40	$14	$202	$40	$41	$337
2010	$80	$26	$298	$70	$67	$541
2011	$65	$24	$246	$14	$73	$422
2012	$130	$40	$210	$35	$70	$484
2013	$60	$14	$323	$102	$57	$557
2014	$60	$24	$364	$50	$75	$572
10-Year Average	$79	$25	$259	$37	$56	$457

Source: ADF&G reports, ADF&G COAR reports, ADF&G personal communication.

FIRST WHOLESALE VALUE

Some of the larger processors near the Unuk River watershed include Ketchikan's shoreside processing sector: Trident Seafoods, Alaska General Seafoods, E.C. Philips and Sons, and Island Seafoods (Pacific Seafoods).

The estimated 10-year average wholesale value for the Unuk River salmon harvest totals $796,000.

Table 25. Estimated Annual Wholesale Value of Unuk River Salmon, in $000's, 2005-2014

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
2005	$75	$61	$513	$101	$53	$803
2006	$90	$58	$497	$23	$121	$789
2007	$91	$53	$358	$67	$105	$673
2008	$62	$52	$478	$118	$132	$842
2009	$36	$38	$449	$222	$106	$850
2010	$71	$52	$621	$225	$143	$1,113
2011	$58	$44	$427	$49	$152	$730
2012	$115	$91	$419	$136	$139	$900
2013	$53	$33	$580	$273	$151	$1,091
2014	$54	$36	$615	$226	$187	$1,117
10-Year Average	$70	$52	$496	$144	$129	$891

Source: McDowell Group estimates based on ADF&G reports, ADF&G COAR reports, ADF&G personal communication.

Wholesale Value Trends

Wholesale prices were 20 percent higher in 2014 compared to the ten-year average. Most of the value is from coho, which has seen steady first wholesale prices. Chinook harvests have remained fairly constant.

PARTICIPATION

In 2015, Ketchikan residents owned 240 Southeast Alaska salmon fishing permits, nine percent of all salmon permits in the region and 159 fishermen fished those permits. While the exact number of permit holders who specifically catch Unuk River salmon is unknown, those fishing in the sub-districts closest to the river likely catch Unuk River fish, as do many trollers. Assuming approximately 40 percent of permits fished catch Unuk River salmon at some point in the season, an approximate 125 fishermen (crew plus permit holders) gain a portion of their annual income from Unuk River fish. Additionally, State of Alaska employment numbers for Ketchikan seafood processing total an estimated peak of 900 employees in 2015. Though Unuk River salmon represent a small percentage of the total value processed in Ketchikan, salmon from the river are a component of this industry.

Unuk River Sport Fishing

On average, an estimated 1,800 Unuk River coho and 300 Unuk River Chinook were harvested annually in the Southeast Alaska sport fishery between 2005 and 2014. Many boats cannot access the narrow and fast-flowing Unuk River, though a minimal amount of trout fishing does occur up the river. Most sport fishing in the Unuk

River watershed area takes place in marine waters near Back Behm Canal. Unuk River salmon are also harvested near Ketchikan, where most area sport fishing charters operate from.

Table 26. Estimated Unuk Chinook and Coho Sport Harvest, 2005-2014

Year	Unuk Chinook Sport Harvest	Unuk Coho Sport Harvest	Total Sport Harvest
2005	750	4,200	4,950
2006	640	3,700	4,340
2007	260	1,500	1,760
2008	50	300	350
2009	290	1,700	1,990
2010	420	2,400	2,820
2011	210	1,200	1,410
2012	280	1,600	1,880
2013	110	600	710
2014	70	400	470
10-Year Average	308	1,760	2,068

Source: McDowell Group estimate based on ADF&G Reports, ADF&G COAR Reports, ADF&G Personal Communication.

ADF&G sport fishing district Area A encompasses the Unuk River watershed. This area also includes the Ketchikan Gateway Borough. Primary Unuk River saltwater sport fishing targets are Chinook and coho salmon, with Chinook salmon returning to the river in early summer and coho returning in late summer.

In Area A in 2014, an estimated 6,300 angler days targeted Unuk River Chinook and coho. In a single fishing day, anglers can harvest multiple salmon species and also harvest other species, such as rockfish or halibut. An estimated 2,300 angler days were spent fishing for Unuk River Chinook salmon and 4,000 were spent fishing for coho, though overlap occurred with some angler days spent fishing for both species.[37].

Guided and unguided sport fishing trips occur in the area. Most (97 percent) of the guided trips were purchased by non-residents in 2014. Also in 2014, 86 businesses took 30,702 anglers out on a chartered fishing trip, departing from Ketchikan, Knudson Cove, or Salmon Falls, which are common landing sites for sport fish businesses within the Ketchikan Gateway Borough. Thirty percent of angler days fished were on a chartered vessel that landed in Area A. The most common charter-caught species were Chinook salmon, coho salmon, and halibut. The remainder of the angler days may be attributed to unguided fishing.[38]

Estimated Sport Fishing Expenditures

An estimated $900,000 was spent annually by anglers sport fishing for Unuk River Chinook and coho between 2005 and 2014.

[37] More details may be found in the methodology section.
[38] *Alaska Sport Fishing Survey* database [Internet]. 1996. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited March 10, 2016). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

Table 27. Estimated Unuk Chinook and Coho Sport Angler Days Fished and Estimated Expenditures, 2005-2014

Year	Unuk Chinook Angler Days	Unuk Coho Angler Days	Annual Angler Expenditure for Chinook ($Millions)	Annual Angler Expenditure for Coho ($Millions)
2005	5,100	6,200	$0.8	$0.9
2006	4,100	10,300	$0.6	$1.5
2007	1,800	3,500	$0.3	$0.5
2008	600	700	$0.1	$0.1
2009	2,200	3,700	$0.3	$0.5
2010	3,300	6,600	$0.4	$0.9
2011	1,400	2,700	$0.2	$0.3
2012	2,900	4,300	$0.4	$0.5
2013	1,100	1,100	$0.1	$0.1
2014	500	900	$0.1	$0.1
10-Year Average	2,300	4,000	$0.3	$0.6

Note: columns may not add due to rounding.
Source: McDowell Group estimate based on ADF&G reports, ADF&G COAR reports, ADF&G personal communication.

Unuk River Personal Use Fishery

No significant personal use fisheries operate in the Unuk River at this time. A eulachon fishery once operated in the river, but was closed due to concern over the population size. Very few personal use salmon harvesters operate in the river. Over the past decade, less than three individuals have operated; due to confidentiality concerns, harvest information is not available.[39]

Visitor Industry and Recreation Activity in the Unuk River Watershed

The remote location of the Unuk River limits visitation to the area. Visitation, including hunting and subsistence uses, is limited to a maximum visitor capacity of 2,000 individuals annually. This number does not include visits to the area by private land owners. Only 5 percent of this visitor capacity is allocated for commercial use. In an average year, visitor capacity totals less than 100 days of use, though average use in recent years is closer to 50 days.[40] Two guided operators operate in the Unuk River area, one for freshwater fishing and the other for brown bear hunting and fishing. Aside from the cost for the commercial operation and transportation, these permitted service days generate approximately $2,000 in fees to the UFS annually. An annual $6,350 in visitor expenses is estimated for the Unuk River watershed.

[39] ADF&G personal communication 12/23/15.
[40] USFS personal communication 3/1/16.

Recreation Properties

Private Property

Private property on the Unuk River is accessed primarily by boat, although floatplanes are occasionally used. Property within the Unuk River watershed is located within the boundaries of the Ketchikan Gateway Borough. The Borough reports approximately 50 parcels in the watershed, including government and private property. The assessed value of the private, taxable property in the Unuk River watershed totals $2 million. The Ketchikan Gateway Borough mill rate for Unuk River watershed properties is 5.7, resulting in approximately $11,000 in tax revenue for the borough annually.

Hunting and Trapping

Moose and other species are hunted along the Unuk River in modest numbers. On average, from 2010 to 2014, 2.2 moose were taken by 17.6 hunters. These hunts occurred for an average of 3.9 days each. One black bear and one brown bear are also harvested each year on the Unuk, on average. No guided hunts occurred in the watershed between 2010 and 2014.

Table 28. Average Hunting Effort and Success in the U.S. Portion of the Unuk River Watershed, 2010-2014

Species	Total Hunters	Animals Harvested	Total Hunting Days	Average Hunting Days	Guided Hunters
Moose	17.6	2.2	68.6	3.9	0
Mountain Goat	0	0	0	0	0
Brown Bear	5.6	1.0	24.6	4.4	0
Black Bear	1.8	0.8	8.8	5.8	0
Total	25.0	4.0	102.0	14.1	0

Source: ADF&G custom data request.
Note: The count of total hunters is potentially duplicative (hunters may hunt more than one species at a time). This study assumes each hunter is unique due to the small number of species aside from moose.

Trapping activity on the Unuk yielded an annual average of 6.6 marten and 0.2 wolverine over the last five years.

Estimated Hunting and Trapping Expenditures

Based on U.S. Fish & Wildlife Service expenditure data, hunters spend an estimated $12,750 per year in Alaska related to hunting in the Unuk River watershed.

Trapping income is estimated using average prices for 2010-2014 ($86 for marten and $255 for wolverine). An estimated annual average of $609 in trapping income is associated with the Unuk River watershed.

Unuk River Watershed Economic Impacts

The Unuk River watershed has economic impacts on Southeast communities, particularly those within the Ketchikan Gateway Borough, and businesses near the watershed. These impacts are distributed throughout Southeast. In total, Unuk River watershed economic activity creates an estimated 24 jobs annually, with $1.2 million in labor income. Annual spending in Southeast associated with the watershed totals $2.5 million, including multiplier effects. This economic footprint includes $1.8 million in direct spending. Unuk River watershed economic benefits have a net present value of $50 million, based on $2.5 million in economic activity over a 30-year period.

Table 29. Summary of Unuk River Watershed Economic Impacts

	Direct Spending	Total Employment	Total Labor Income	Total Output
Seafood Industry	$890,000	16	$800,000	$1.3 million
Sport fishing	$880,000	7	$350,000	$1.2 million
Visitor Industry	$6,250	0	$3,100	$9,000
Other Activity	$24,000	0	$11,000	$34,000
Total	$1.8 million	24	$1.2 million	$2.5 million

Note: Columns may not sum due to rounding.
Source: McDowell Group estimates.

Annual estimated economic impacts from the Unuk River watershed include the following:

- $460,000 in ex-vessel value to fishermen for Unuk River salmon harvests.
- $890,000 in first wholesale value of Unuk River salmon.
- $880,000 in expenditures on sport fish activity for Unuk River Chinook and coho salmon.
- $13,000 in spending on hunting activity in the Unuk River watershed.
- $6,000 in visitor industry activity associated with the Unuk River watershed.
- $11,000 in property taxes to the Ketchikan Gateway Borough from Unuk River watershed private properties.

Most jobs created by Unuk River watershed-related economic activity are assumed to be located in the Ketchikan Gateway Borough.

Nass and Skeena Rivers

The Nass and Skeena Rivers in Northwest British Columbia do not flow into Southeast Alaska but they do contribute to salmon harvests in Southeast Alaska fisheries, primarily on the outer coast.

The Skeena River is the second largest river in British Columbia. The Skeena River is the second largest Chinook salmon producer on the B.C. coast and the second largest B.C. sockeye salmon producer as well. Skeena River Chinook are harvested in southern Alaskan troll and net fisheries, while Skeena River sockeye are harvested in a number of Southeast gillnet and purse seine districts.

The Nass River drains into an estuary less than 20 miles from the B.C./Alaska border. Nass River sockeye salmon harvests in Alaska occur in net fisheries in ADF&G districts 101, 102, 103, 104, and 106 at a minimum. These fisheries are regulated under the Pacific Salmon Treaty and PST data provides Alaska harvest data for these species.

In Southeast Alaska, the District 104 purse seine fishery, the PST allows for harvest of 2.45 percent of the Annual Allowable Harvest (AAH) of Nass and Skeena sockeye in the district prior to ADF&G statistical week 31. In 2014, 115,015 sockeye salmon were harvested by 101 purse seine vessels prior to statistical week 31. Of that total, ADF&G estimates 74,000 Nass and Skeena sockeye were harvested. An estimated 60 to 80 percent of sockeye salmon harvested in this fishery have historically been Nass and Skeena fish.[41] The 10-year average (2005 to 2014) harvest of Nass and Skeena River sockeye in this fishery totals 28,500 fish. Based on regional prices and weights, McDowell Group estimates the annual ex-vessel value of Nass and Skeena River sockeye in this fishery is $242,000 and the typical first wholesale value for this fishery is $513,000.

The District 101 Tree Point gillnet fishery is also subject to PST requirements. For Nass River sockeye salmon, the PST allows for an Alaska annual catch share of 13.8 percent of the AAH. In total in 2014, 56,000 sockeye salmon were harvested in the District 101 harvest, 39,080 of this total were of Nass River origin. Between 2005 and 2014, an annual average of 44,400 Nass River sockeye were harvested in this fishery. Based on regional prices and weights, McDowell Group estimates the annual ex-vessel value of Nass River sockeye is $378,000. The typical first wholesale value for Nass sockeye is $800,00 annually.

[41] ADF&G. February 2015. Annual Management Report of the 2014 Southeast Alaska Commercial Purse Seine and Drift Gillnet Fisheries. Fishery Management Report No. 15-08

Other Transboundary Economic Activity

The economic impact of the transboundary watersheds in Southeast Alaska extends beyond the distinct economic sectors described in this report. While the final economic impact analysis detailed above does include the economic benefits described in this sections, it is worth illustrating a few other important ways in which the watersheds create economic activity that are not readily apparent in the sector analyses.

Land and Resource Management Activity

Fishery management requires significant financial investment. ADF&G salmon management activities on the Taku River cost over one million dollars a year.[42] Management activities in the Stikine and Unuk River watersheds are also significant. ADF&G operates a summer fish camp on the Unuk River to tag and study Chinook salmon. In 2014 and 2015, an ADF&G *Unuk River Adult Chinook Salmon Spawning Abundance* study and a Unuk River juvenile Chinook study cost $200,000 each. ADF&G Stikine River studies in 2014 and 2015 were similar to those on the Unuk River, with an additional study on local and traditional knowledge of Chinook. These Stikine River projects cost over $500,000 combined. Taku River Chinook projects in these years also totaled $300,000. These numbers provide an idea of management investments that are occurring in these watersheds annually.

Taxes Associated with Transboundary Fisheries

State of Alaska taxes levied on the ex-vessel value of salmon generate revenue for communities and the state. The Fisheries Business Tax is a 3 to 4.5 percent tax on seafood processed in Alaska. A portion of revenue generated from this tax is shared with the borough and community where processing takes place. A 3 percent Salmon Enhancement Tax funds regional aquaculture associations that produce salmon for harvest. A 0.5 percent Seafood Marketing Assessment funds the Alaska Seafood Marketing Institute.

Annual harvests of transboundary salmon also generate revenue through a variety of other taxes and fees, including the marine fuels tax, corporate income tax, sales tax, permit and vessel fees, and crew licensing sales.

An estimated $280,000 associated with the transboundary watersheds is generated annually from the three primary State fisheries taxes. The Stikine River generates an estimated $131,000, while the Taku River accounts for $120,000 and Unuk River for $29,000.

Table 30. Estimated Annual Tax Revenue Associated with Transboundary Salmon Harvest, 2005-2014

	Stikine	Taku	Unuk	Total
Fisheries Business Tax	$57,000	$53,000	$13,000	$123,000
Salmon Enhancement Tax	$63,000	$10,000	$14,000	$87,000
Seafood Marketing Assessment	$10,000	$58,000	$2,000	$70,000
Total State Tax Revenues	$131,000	$120,000	$29,000	$280,000

Note: Based on ex-vessel values compiled by McDowell Group. Values are inflation adjusted.
Source: Alaska Department of Revenue Tax Division.

[42] Personal communication. ADF&G.