ECONOMIC BENEFITS OF THE BRISTOL BAY SALMON INDUSTRY

PREPARED BY

WINK RESEARCH & CONSULTING

JULY 2018

PREPARED FOR

BRISTOL BAY Regional Seafood Development Association

Providing Opportunities "Accept the Challenge" BBEDC

Bristol Bay NATIVE CORPORATION®

RESEARCH CONDUCTED FOR

This project was commissioned by the Bristol Bay Regional Seafood Development Association, Bristol Bay Economic Development Corporation, and Bristol Bay Native Corporation. These organizations are committed to developing regional salmon resources for the benefit of their respective stakeholders.

RESEARCH CONDUCTED BY

Wink Research & Consulting, LLC provides economic research and consulting services. Research and study findings contained in this report were conducted by Andy Wink. Mr. Wink has extensive experience researching markets for Bristol Bay seafood products and is an expert on economic benefits provided by the Alaska seafood industry.

Table of Contents

List of Tables & Figures

TABLES

FIGURES

EXECUTIVE SUMMARY

Bristol Bay, Alaska is home to the most valuable wild salmon fishery in the world. Each year, a fleet of roughly 2,350 small vessels hand-pick more than 25 million salmon from nets during a brief summer season. In a state known for salmon, the Bristol Bay fishery accounts for 41 percent of total salmon permit value and is truly the crown jewel of the state's commercial salmon fishing portfolio. The region's immense wild sockeye salmon run supports three of the top 10 U.S. commercial fishing ports and produces substantial economic benefits at a regional, statewide, and national level.

ECONOMIC BENEFITS OF BRISTOL BAY SALMON INDUSTRY

The Bristol Bay salmon industry directly employs approximately 14,800 people, most of whom work in the industry on a seasonal basis. Including multiplier effects, the fishery creates an estimated $1.2 billion in economic output and $658 million in labor income per year, resulting in 12,537 average jobs. Like any fishery, harvest volume and value vary from year to year. Therefore, economic benefit estimates have been developed using averages from the five most recent years with available data.

TABLE 1

Economic Benefits of Bristol Bay Salmon Industry, 2013-2017 Annual Average

Study Area	Number of Direct Resident Workers	Average Jobs	Total Labor Income ($M)	Economic Output ($M)
Bristol Bay Region	1,567	4,217	$220	$493
Alaska Total	4,537	5,216	$272	$573
U.S. Total	14,765	12,537	$658	$1,235

Note: Average jobs refers to the total number direct and secondary jobs created by area, regardless of residency. See page 45 for average job methodology. Job and dollar figures include multiplier effects.
Source: Wink Research estimates.

The industry's economic benefits are widely dispersed, yet still form the backbone of the regional economy. Non-Alaskan residents make up 69 percent of the direct workforce (primarily fishermen and processors) and residents of 41 U.S. states own commercial Bristol Bay salmon fishing permits. However, it is estimated that approximately one-third of working age regional residents are directly employed in the industry on at least a seasonal basis. Including multiplier effects, labor income created by the Bristol Bay salmon industry accounts for roughly 1 percent of total labor income earned in Alaska and the fishery directly employs about twice as many Alaska residents as the state's (non-oil/gas) mining sector.

Upstream activities, including fishery management, harvesting, processing, and shipping Bristol Bay salmon out of Alaska, account for the 78 percent of total labor income identified in this study. While other downstream jobs such as fishmongers, secondary processing workers, and chefs may still exist without Bristol Bay salmon, the majority of jobs created by the resource are highly sensitive to its productivity. See Chapter 5 for additional metrics about the economic benefits of the Bristol Bay commercial salmon fishery.

TABLE 2
Allocation of Economic Benefits Derived from Bristol Bay Salmon Industry

Place of Residence	Bristol Bay Salmon Permit Holders (2016)	Direct Industry Workers	Total Average Jobs
Regional Residents	680 (24%)	1,567 (11%)	775 (6%)
Other Alaska Residents	763 (27%)	2,970 (20%)	1,536 (12%)
Residents of Other U.S. States	1,377 (49%)	10,228 (69%)	10,221 (82%)
Total U.S. Residents	**2,820**	**14,765**	**12,537**

Note: Figures may not sum due to rounding. Total average job figures include multiplier impacts.
Source: Wink Research estimates & calculations.

Economic benefits quantified in this analysis are substantial but are conservative in that they do not include: 1) the impact of roughly $235 million in exports (e.g. effects on trade balance or jobs created in other countries), 2) Bristol Bay salmon caught in other commercial fisheries, 3) economic contributions of the subsistence and sportfishing sectors, or 4) the health benefits people enjoy when eating one of the world's healthiest proteins. Quantifying these aspects were not possible within the scope of this study but are likely large in their own right. In addition, these figures are based on a five-year study period average. Fishery productivity and harvest value has trended up in recent years, as the ex-vessel value of fish landed in 2017 was 31 percent higher than the 2013-2017 average.

RESOURCE & INDUSTRY VALUE

Abundant regional salmon runs have nourished Alaska Native peoples for millennia and supported a commercial salmon industry for more than 130 years. Since 1884, commercial fishermen have sustainably harvested 2.1 billion salmon from Bristol Bay waters, with several of the largest harvests on record coming in recent years. Applying actual and estimated historical prices to these harvests produces a cumulative, inflation-adjusted fishery value of $34 billion, in first wholesale terms. An evaluation of Bristol Bay commercial salmon fishing and processing assets places their collective value at $1.2 billion.

INTRODUCTION

This study examines the scale and value of the region's salmon resource and quantifies the economic benefits sustainably derived from commercial salmon harvests. The report contains six chapters providing a comprehensive assessment of the fishery's economic value in current and historical terms.

- **Chapter 1** profiles the Bristol Bay salmon resource itself, as well as the economic sectors which rely upon it.
- **Chapter 2** places the Bristol Bay salmon resource into context, versus other wild and farmed salmon resources.
- **Chapter 3** examines the remarkable historical performance of the Bristol Bay salmon fishery.
- **Chapter 4** explains the supply chain which is responsible for turning a wild resource in sustainable economic benefits.
- **Chapter 5** quantifies the economic impacts of the Bristol Bay commercial salmon fishery at a regional, statewide, and national level.
- **Chapter 6** analyzes the costs and revenues associated with managing the region's commercial salmon fishery.
- **Appendices** includes information about data sources, glossary of terms, study methodology, and supplementary data.

Fully assessing the scale, value, and economic impacts of this resource involves a great deal of data and careful construction of economic impact models. These data and assumptions are critical elements of achieving the goals of the research project; however, the sheer volume of data and complexities of impact modeling are significant. Therefore, supplementary data, key assumptions, explanations about model assumptions, and other reference information has been placed into an Appendices section. This arrangement makes it easier for readers to understand key research findings while also providing important documentation about data sources, study terms, and necessary assumptions. Finally, it should be noted that while extreme care has been taken to be consistent with respect to data sources, often times different data sets within state agencies will provide slightly different totals for a variety of reasons. Therefore, volume and value totals may not match exactly depending on the underlying data set or when that data was accessed.

GLOSSARY OF TERMS & ABBREVIATIONS

Average Jobs: A construct used in this report to calculate how many average year-round jobs are created in a largely seasonal industry and as a result of multiplier effects. The Number of average jobs equals labor income / average annual earnings per wage & salary job from the QCEW data series.

Bristol Bay: Alaska fishery area, defined as land contained in the Bristol Bay Borough, Dillingham Census Area, Lake and Peninsula Borough, and waters from east of Cape Newenham to north of Cape Menshikof.

Direct benefit/impact: an economic consequence that is a direct result of the study industry/topic. Direct impacts in this report refer to those occurring in the management, fishing, tendering, and processing industries.

Downstream activities: Downstream activities in the context of this report refers to the transportation, secondary processing, exporting, distributing, and retailing (including food service operators) of processed Bristol Bay salmon products.

Economic output: Quantity of goods or services produced in given time period by a firm, industry, or country.

Ex-vessel value: The value of salmon upon sale from fisherman to processor, in round weight terms.

First-wholesale value: The value of processed fishery products upon the sale from primary processor to a buyer outside of its affiliate network. First wholesale value includes the ex-vessel value of underlying raw material.

Indirect benefit/impact: economic contributions in other economic sectors resulting from business spending of a selected industry or group of industries.

Induced benefit/impact: economic contributions in various economic sectors resulting from household spending occurring from direct or indirect impacts.

Industry: a study term used to encompass the Bristol Bay salmon industry, including fishery management, commercial harvesting, processing, and tendering activities.

Secondary benefit/impact: sum of indirect and induced benefits or impacts.

Upstream activities: Upstream activities in the context of this report refers to the management, harvesting, tendering, and primary processing of Bristol Bay salmon.

Value added: the difference between an industry or establishment's total output and the cost of its intermediate inputs. It equals gross output (sales/receipts) minus intermediate inputs purchased from other industries.

ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish & Game
ADOR	Alaska Department of Revenue
ADOWLD	Alaska Department of Workforce and Labor Development
AMR	ADF&G annual regional management report
BB	Bristol Bay (used as shorthand where needed)
BBFC	Bristol Bay Fisheries Collaborative
BBRSDA	Bristol Bay Regional Seafood Development Association
BEA	U.S. Bureau of Economic Analysis
CFEC	Commercial Fisheries Entry Commission
COAR	Commercial Operators Annual Report (ADF&G data set)
EST	Estimate or estimated
EV	Ex-vessel value
FOB	Free on-board (value not including shipping/transport costs)
FW	First wholesale value
H&G	Headed and gutted product
ISER	Institute of Social and Economic Research, University of Alaska, Anchorage
$M	Millions of dollars
NMFS	National Marine Fisheries Service
NPAFC	North Pacific Anadromous Fish Commission
QCEW	Quarterly Census of Wages & Earnings
SAFE	Stock Assessment and Fishery Evaluation report

1. RESOURCE PROFILE

All economic benefits covered in this document are a consequence of the region's salmon productivity. The manner in which those benefits are sustainably derived from the resource, is a function of resource abundance and industry structure. Therefore, this economic analysis begins with a profile of the resource.

RESOURCE USE IN THE COMMERCIAL FISHERY

The Bristol Bay watershed sustains the largest sockeye salmon run in the world. Each river system has escapement goals unique to that river's history to ensure the resource remains abundant. Excess sockeye and other salmon species are harvested in commercial, subsistence, and sport fisheries. The commercial salmon fishery accounts for the vast majority of user group harvests. The commercial fishery averaged harvests of 31.5 million sockeye from 2013 to 2017, while total upriver escapement averaged 14.7 million fish. Sport and subsistence harvests for the most recent, available five-year period (2012-2016) averaged 114 thousand sockeye.

TABLE 3
Bristol Bay Sockeye Salmon Run Composition, 2008-2017
in Millions of Fish

Year	Commercial Harvest	Escapement*	Total Inshore Run
2008	27.67	12.74	40.42
2009	30.89	9.55	40.44
2010	29.05	11.60	40.65
2011	22.10	8.45	30.56
2012	20.92	9.45	30.37
2013	15.43	8.73	24.16
2014	29.13	12.03	41.16
2015	36.72	22.37	59.09
2016	37.59	14.06	51.65
2017	38.78	16.45	55.23
5-YR AVG.	**31.53**	**14.73**	**46.26**
10-YR AVG.	**28.83**	**12.54**	**41.37**

** Subsistence and sport harvests are not included in the data set, due to different in the fish accounting system. However, subsistence and sport harvests are relatively minor, typically amounting to 100,000 to 125,000 sockeye per year, combined.*
Source: ADF&G (2017 AMR).

The Bristol Bay commercial fishery management area includes all coastal and inland waters eastward from Cape Newenham to Cape Menshikof (see Figure 2). The area includes nine major river systems: Naknek, Kvichak, Alagnak, Egegik, Ugashik, Wood, Nushagak, Igushik, and Togiak. Sockeye accounted for 95 percent of harvest volume over the past 10 years and 98 percent of ex-vessel value.

TABLE 4
Harvest Composition of Bristol Bay Salmon, 2008-2017 Average

Salmon Species	Harvest Volume (000s lbs.)	Ex-Vessel Value ($000s)	Percent of Volume	Percent of Value
Sockeye	162,076	$164,653	94.7%	98.2%
Chum	6,313	$1,732	3.7%	1.0%
Coho	758	$518	0.4%	0.3%
Chinook	397	$371	0.2%	0.2%
Pink	1,615	$464	0.9%	0.3%
Avg. Harvest	**171,159**	**$167,737**	**-**	**-**

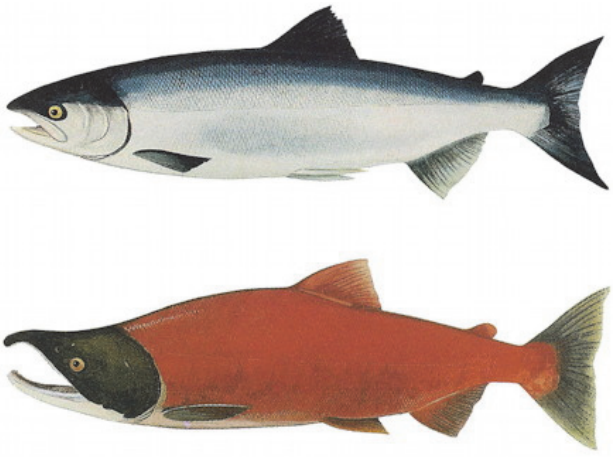
Note: 2017 data used in averages are preliminary.
Source: ADF&G (COAR).

The region's natural sockeye productivity is unparalleled and unlike other prolific salmon-producing regions in Alaska, salmon production is not supplemented with hatcheries. Commercial salmon fisheries in Bristol Bay have averaged harvests of 171 million pounds and $166 million in ex-vessel value over the past 10 years.

Sockeye salmon are typically the most valuable of the five Pacific salmon species caught in Alaska, in terms of total value. Chinook salmon fetch the highest prices and harvest volumes of pink salmon are often greater than sockeye, but the combination of value and abundance make sockeye the most economically important salmon species in Alaska.

Sockeye can grow up to 31 inches and 15 pounds, but most fish caught in commercial fisheries range from four to nine pounds. The average weight consistently falls between five to seven pounds. Immature, sea-going sockeye have a metallic green-blue color on their top side. As the fish return to rivers during spawning, their bodies turn a bright red color and their heads turn dark green. This appearance forms the basis for the moniker "red salmon."

Sockeye also have the darkest flesh color of any salmon species, ranging from bright orange to a deep red color.



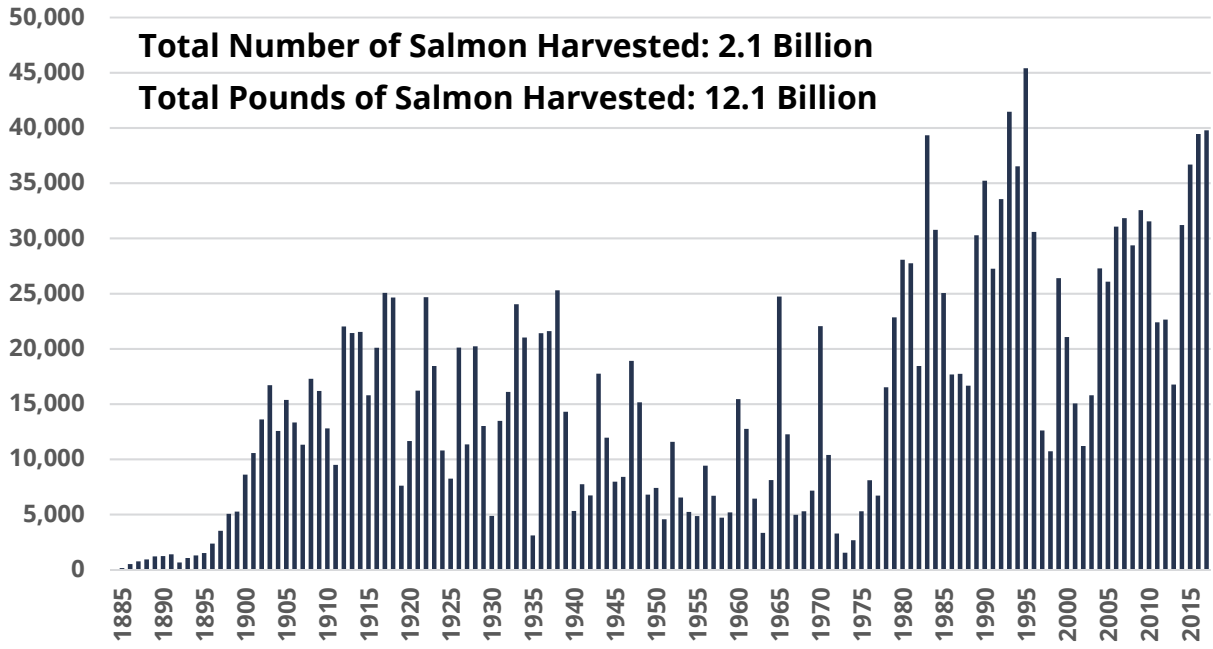
Like other salmon species, sockeye return from ocean waters to spawn in rivers during warmer months. After approximately one year, the small fry (measuring about 1 inch) typically migrate to lakes where the fish will spend one to three years eating a diet primarily consisting of zooplankton. The time spent in freshwater lakes is unique to sockeye. In systems without lakes, sockeye will migrate to ocean waters soon after emerging from gravel beds during the spring following the spawning season. Sockeye enter saltwater habitat weighing only a few ounces but grow quickly during its 1 to 3 years in ocean waters. After reaching an age of three to seven years and traveling thousands of miles as an adult salmon, sockeye return to the same freshwater system where they hatched to spawn and die soon after. Nutrients from decomposing salmon carcasses support habitat conditions for numerous plants and aquatic species, thereby providing a better rearing environment for its offspring.

Bristol Bay's large salmon runs have sustained local residents for millennia. The commercial fishery has a long, rich history predating statehood, manned flight, and the automobile. The first recorded commercial harvest of Bristol Bay salmon occurred in 1884 and catches have exceeded one million salmon every year since 1893. The scale and longevity of Bristol Bay salmon production is a testament to the area's unique salmon habitat and stakeholders' commitment to sustainable fishery management.

The number of salmon commercially harvested in Bristol Bay since the fishery began totals 2.07 billion fish, weighing an estimated 12.1 billion pounds. Harvests in recent years have been especially large. The 2015-2017 Bristol Bay salmon harvest is the second-largest, three-year harvest on record, just below the 1993-1995 harvest.

See table on following page.

FIGURE 1
Commercial Harvest of Bristol Bay Salmon, 1884-2017
in Thousands of Fish



Source: ADF&G (1884-1974: Bristol Bay Comprehensive Salmon Plan – 1989, 1975-2016: COAR, 2017: Preliminary Salmon Season Summary).

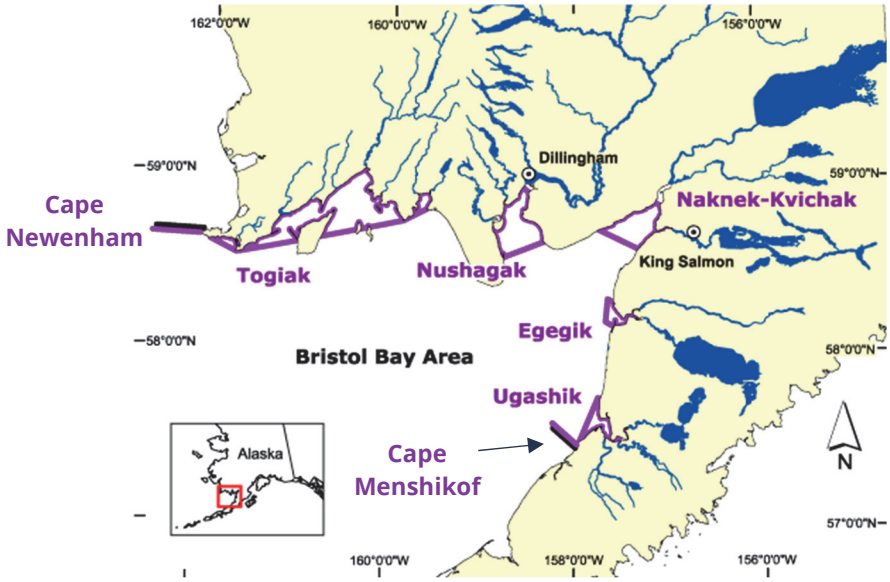
The commercial fishery has evolved over more than a century of harvests, benefitting from emerging technology. Vessel size has been limited to 32 feet since the 1920s. Small sailboats, typically crewed by a pair of men, employed gillnets to harvest salmon until the early 1950s. In the early 1950s, a restriction on using gas and diesel engines was lifted and the fleet quickly converted from sail to combustion power. Beginning in the 1970s and accelerating in the 1980s, fishermen transitioned from wood boats to vessels made of fiberglass and, later, aluminum. In the late 2000s, a greater emphasis on fish quality and processor bonuses incentivized fishermen to chill fish using on-board refrigerated seawater systems (RSW) or slush ice. Although hydraulics have expanded harvesting capacity for the driftnet fleet, harvesting salmon in Bristol Bay has not changed substantially since the fishery's early days. Fish are still hand-picked from nets by fishermen aboard relatively small vessels.

Regional salmon harvests have averaged 171 million pounds over the past ten years. As usual, sockeye comprise the majority of the harvest. Harvests declined from 2009 through 2013, but have more than doubled since then. As previously mentioned, recent harvests (2015-2017) have been among the best stretch in the fishery's 135-year history.

The Bristol Bay salmon fishery is divided into five fishing districts: Egegik, Naknek-Kvichak, Nushagak, Togiak, and Ugashik (see Figure 2). Harvests vary across districts from year to year, but often a portfolio effect occurs which makes regional harvests less variable. The Naknek-Kvichak district usually produces the largest harvest, averaging 10.6 million sockeye over the past 10 years (2008-2017). Egegik and Nushagak districts averaged 7.5 million and 6.6 million sockeye, respectively. The Ugashik and Togiak districts, which are located further from the most productive rivers systems, tend to produce relatively smaller harvests. These systems averaged 3.3 million and 568 thousand sockeye, respectively (See Table 5).

FIGURE 2

Map of Bristol Bay Commercial Salmon Fishery Districts



Source: ADF&G.

See table on following page.

TABLE 5

Commercial Sockeye Harvest by Fishery District, 2008-2017

in Thousands of Fish

Year	Naknek-Kvichak	Egegik	Nushagak	Ugashik	Togiak	Total
2008	10,382	7,404	6,903	2,334	651	27,674
2009	8,515	11,527	7,730	255	559	28,587
2010	10,858	5,071	8,424	4,032	668	29,053
2011	9,016	4,810	4,887	2,643	745	22,101
2012	10,153	5,062	2,663	2,419	623	20,920
2013	4,853	4,779	3,164	2,168	467	15,432
2014	13,791	6,929	6,448	1,507	443	29,118
2015	16,531	8,750	5,593	5,474	372	36,719
2016	13,466	8,740	8,110	6,630	646	37,592
2017	8,256	11,981	12,323	5,706	516	38,782
Average	**10,582**	**7,505**	**6,625**	**3,317**	**569**	**28,598**

Note: 2017 values are estimated based on differences observed in previous years between preliminary and final data.

Source: ADF&G (2008-2016: COAR, 2017: Bristol Bay Salmon Fishery Annual Management Report).

RESOURCE USE IN OTHER FISHERIES

The commercial fishery harvests the largest number of Bristol Bay salmon and creates the greatest economic benefit by a wide margin, but other fisheries also rely on the resource.

SUBSISTENCE FISHERIES

Subsistence fisheries are a critical resource for residents of the Bristol Bay region. Food costs significantly more in this remote area of Alaska, as non-local food sources must be transported to sparsely populated areas by barge or airplane (the region is not connected to the road system). Abundant local salmon resources provide a valuable source of protein and nutrition for regional residents.

In 2017, a total of 1,128 subsistence permits were issued to residents in the Bristol Bay region. Subsistence harvesters collected an estimated 116,537 salmon (ADF&G, 2017 AMR). Based on average weights of salmon caught in commercial fisheries, this volume of fish was equal to approximately 743,700 pounds of salmon. This works out to 99 round pounds of

subsistence salmon per capita (among regional residents of the area, based on 2017 population estimates from the Alaska Department of Labor and Workforce Development).

RECREATIONAL FISHERIES

Sport fisheries for Bristol Bay salmon provide access for recreational anglers and create additional economic benefits for the region. In 2016, a total of 102 sport fish guiding businesses, employing 563 guides, completed 16,041 sportfishing trips for salmon in the Bristol Bay area. Sportfishing clients caught a total of 85,353 salmon (retaining 28,366) and nonresidents accounted for 90 percent of the days fished. This means that most of the money generated by guided sportfishing for Bristol Bay salmon came from outside Alaska.

Unguided sportfishing activity is also significant in the region. ADF&G estimates that approximately 43,800 salmon were harvested (and retained) by anglers in the Bristol Bay region during 2016. Most anglers target Chinook and coho salmon.

Sportfishing impacts go far beyond creating jobs for guides. Lodges, airlines, restaurants, stores, and other local businesses all benefit from the additional influx of people looking to enjoy the natural beauty of the area and hook up with a Bristol Bay salmon. In addition, license sales to nonresident anglers provide revenue for the State of Alaska.

2. SUPPLY CHAIN & MARKET PROFILE

This chapter profiles the Bristol Bay salmon supply chain and markets for its products. The supply chain dictates how economic benefits are derived from the resource, as well as how they are distributed across the economy. Therefore, it is important to understand the general supply chain structure, its functions, and the role each link plays in adding value to the resource.

FISHERY MANAGEMENT

Fishery management provides a foundation for all the economic sectors which rely upon the Bristol Bay salmon resource. The Alaska Department of Fish & Game (ADF&G) is tasked with regulating the fishery according to the principles of maximum sustained yield. The Department seeks to achieve escapement goals for area river systems thus ensuring future salmon production.[1] Commercial fisheries are able to harvest salmon in excess of these escapement targets. Managers balance escapement versus harvest by selectively opening and closing fishing in different districts during the season. In-season escapement is tracked by ADF&G staff operating weirs, salmon "counting towers", and sonar equipment. Harvest data is compiled via "fish tickets", which is essentially a delivery receipt of the number, weight, and variety of salmon sold to a processor by a fisherman.

An ADF&G employee tracks migrating salmon. Photo credit: KDLG.

[1] Escapement refers to the number of salmon which "escape" the commercial fishery to reach spawning grounds in rivers and streams.

The Bristol Bay commercial fishery is primarily managed by ADF&G Central Region staff. In FY2017, fishery management functions employed an estimated 85 seasonal workers and full-time equivalent positions. While several ADF&G biologists and a few other positions are full-time employees dedicated to Bristol Bay management, the fishery utilizes a portion of other full-time agency staff (leading to partial full-time equivalent counts). Teams of more than six dozen seasonal workers collect much of the in-season data needed to manage the fishery. Total labor income of Bristol Bay management workers in FY2017 was $2.05 million. The number of management workers and their earnings has been relatively stable in recent years.

TABLE 6
Bristol Bay Salmon Management Employment Profile

Full-time Workers & Equivalents	10
Seasonal Workers	75
Total Full-time Equivalents & Seasonal Workers	85
Total Labor Income (includes wage/salary earnings & benefits)	$2.05 million

Source: ADF&G (Central Region Staff) and Wink Research estimates.

HARVESTING SECTOR


Photo credits (left to right): BBRSDA, Corey Arnold.

Bristol Bay salmon are harvested using gillnets. Salmon returning to spawn get their heads stuck in the net. Fishermen “pick” fish from the net as it is being retrieved from the water.

There are two types of commercial salmon fishing operations in Bristol Bay: driftnet and setnet. Drift gillnets are deployed from vessels with a maximum length of 32 feet. These vessels use gillnet gear that drifts in the water while remaining attached to the vessel. Fishing crews then use a hydraulic drum to reel in the net. Setnet operations are fixed. Here, a gillnet is attached to a fixed point on the shoreline and extends to an anchored buoy offshore. Setnet fishermen use skiffs to pick fish from the net or pick fish from the beach or shallow water, then return to shore to store their harvest in totes.

Access to commercial salmon fisheries in Alaska controlled through a "limited entry" system, which allows fishermen to operate as independent entities and access commercial fisheries through ownership of limited entry permits. The State of Alaska's Commercial Fisheries Entry Commission (CFEC) is based in Juneau and administers access to state-managed commercial fisheries. In order, to participate in commercial fisheries in Bristol Bay, fishermen must own a limited entry permit allowing them to fish driftnet or setnet gear in the region. All driftnet fishermen and some setnet fishermen must register their vessel with CFEC. All fishermen must pay annual permit renewal fees, which are relatively minor compared to the cost of the permits themselves. At the end of 2017 Bristol Bay salmon driftnet permits had an estimated value of $133,300 while setnet permits were worth an estimated $39,300 a piece. There are approximately 1,860 driftnet permits and 970 setnet permits in the region's commercial fishery. Crew members need not own limited entry permits but must buy commercial crew licenses to participate (or own a limited entry permit themselves).

Driftnet operations typically harvest greater volumes, and account for roughly 80 percent of the total commercial salmon harvest in Bristol Bay. Most Bristol Bay fishermen sell their harvest to processing companies located in the area, but some process their own catch or contract with processing companies to produce finished products they will sell directly to customers. These operations are known as "direct marketers."

Most Bristol Bay permit owners employ two or three crew members meaning there are typically three to four fishermen per boat. However, some boats employ additional crew members. Crew are paid a share of the operation's harvest value, often after deductions for fuel and food. Most crew shares are on the order of 10 to 12 percent, but greenhorns (i.e. inexperienced crew) may earn lower shares while highly skilled crew may earn higher shares. Permit owners' earnings come from fishing profits consisting of fishing revenues less operating and capital expenses. Operating expenses include payments to crew, fuel, food, nets, maintenance, and transportation. Capital expenses include payments for boats, permits, and any interest needed to acquire those assets.

TABLE 7
Bristol Bay Commercial Salmon Fishing Fleet & Permit Profile, 2017

Category	Total	Resident	Nonresident
Total Bristol Bay Salmon Permits	2,835	1,464	1,371
Number Permits Actively Fished	2,411	1,241	1,170
Total Bristol Bay Salmon Driftnet Permits	1,863	834	1,029
Number Permits Actively Fished	1,532	679	853
Total Bristol Bay Salmon Setnet Permits	972	630	342
Number Permits Actively Fished	879	562	317
Estimated Number of Crew Members	5,836	2,409	3,427
Number of Total Estimated Fishermen	8,247	3,650	4,597
Total Salmon Harvest Volume (Millions lbs.)	221	95	127
Driftnet Salmon Harvest Volume	177	68	109
Setnet Salmon Harvest Volume	44	27	17
Total Ex-Vessel Salmon Earnings ($Millions)*	$247	$101	$146
Driftnet Ex-Vessel Earnings	$205	$75	$130
Setnet Ex-Vessel Earnings	$42	$26	$16
Estimated Number of Fishing Vessels	2,348	1,271	1,077
Number of Driftnet Vessels	1,469	709	760
Number of Setnet Vessels**	879	562	317

** Final figures from CFEC are not available at this time. Figures shown here have been estimated based on previous relationships between preliminary and final data.*
*** It is estimated that each active setnet permit operates one setnet skiff, as vessel registration data for setnet vessels is incomplete.*
Note: Figures may not sum due to rounding.
Source: CFEC with compilations and estimates performed by Wink Research.

The Bristol Bay salmon fishery produces relatively large harvests in a short amount of time. Most fishing activity occurs during late June to late July, and the vast majority of sockeye are typically harvested during the first three weeks of July. While spring herring fisheries and salmon fishing targeting other species later in the summer contribute to the region's seafood industry, it is based around harvesting and processing large sockeye harvests during a few weeks in July. This hyper-seasonality presents challenges and opportunities, and also has a significant effect on how economic benefits stemming from the regional salmon resource are distributed.

Bristol Bay fishermen sell salmon to processors. The price of that fish is based on the round weight of fish delivered to processors and is known as the *ex-vessel price*. The total amount of money paid from processors to fishermen is known as the *ex-vessel value*. In Bristol Bay,

fishermen are typically paid a "base" price which is usually not established until the season is well underway. Large processors also pay bonuses based on fish quality. Fishermen who chill fish, bleed them, and employ tactics to minimize bruising can earn bonuses typically ranging from 15 to 30 cents per pound. Some large processors also pay production bonuses on the order of 2 to 12 cents per pound based on a fisherman's total harvest volume delivered to the processor. Table 8 summarizes harvest volume and ex-vessel value earned from 2013 to 2017.

TABLE 8
Harvest Volume & Value of Bristol Bay Salmon, 2013-2017

Category	2013	2014	2015	2016	2017	Avg.
Harvest Volume (Millions lbs.)	100.6	171.4	200.0	210.8	219.4	180.5
Sockeye Salmon	92.3	161.7	192.6	201.0	207.8	171.1
Other Salmon Species	8.3	9.7	7.4	9.9	11.6	9.4
Ex-Vessel Value ($Millions)	$151.4	$221.5	$125.1	$195.9	$247.4	$188.3
Sockeye Salmon	$148.4	$217.2	$122.7	$192.9	$243.1	$184.9
Other Salmon Species	$3.0	$4.3	$2.4	$3.0	$4.3	$3.4

Source: ADF&G (COAR).

Although most Bristol Bay fishermen reside in Alaska, the fleet comes from all over the United States. In 2017, there were only nine states which did not contain at least one Bristol Bay salmon permit owner among its residents. Nonresidents are more common in the driftnet fleet and have higher average harvests in each gear type. As a result, gross fishing revenues skew somewhat towards nonresidents. Nonresidents accounted for 49 percent of the permits fished in 2017 but earned 59 percent of gross revenues (see Table 7 for more information).

DIRECT MARKETERS

Some Bristol Bay salmon fishermen sell processed products during the offseason. These individuals are known as direct marketers. In other areas of the state, fishermen will occasionally process fish aboard their vessel and sell products directly to customers. The State of Alaska requires a license for processing fish on-board. However, in Bristol Bay most direct marketers will have salmon custom processed via contracts with regional processors or will buy processed products back from processors after the season. Fishermen do not need a license from the State if they are buying product back from the processor. As a result,

more research would be needed to quantify the exact number of Bristol Bay fishermen who sell processed products directly to consumers or other retail/restaurant customers.

Despite the lack of hard data, anecdotal reports suggest the practice is fairly common—especially among fishermen residing in other states. Direct marketing allows Bristol Bay fishermen to realize a greater share of the resource value and form a connection with customers, although it also brings additional responsibilities involved with marketing, storing, and transporting product.

PROCESSING SECTOR

Processing operations are a critical part of the Bristol Bay salmon industry, transforming raw material (i.e. dead fish) into valuable products. The region contains 16 large salmon processing plants, several floating processors, and more than a dozen smaller processing companies and direct market operations. Large companies often buy from hundreds of boats and several have multiple plants in the region, while small companies generally support direct market operations. Most Bristol Bay salmon are processed in shoreside facilities, but processing companies also bring in several floating processors for the season.

TABLE 9
Bristol Bay Salmon Processing Facilities

Company	Base of Operations	Approximate Workforce	Plant Location
Alaska General Seafoods	Kenmore, WA	640	Naknek
Big Creek Fisheries	Everett, WA	35	Egegik
Cape Greig & Sea Bird	Seattle, WA	90	Floating Processor
Coffee Point Seafoods	Seattle, WA	135	Egegik
Copper River Seafoods	Anchorage, AK	100	Naknek
Copper River Seafoods	Anchorage, AK	70	Togiak
Ekuk Fisheries	Seattle, WA	200	Ekuk
Great Ruby Fish Company	Anchorage, AK	N/A	Naknek
Icicle Seafoods	Seattle, WA	315	Egegik
Icicle Seafoods	Seattle, WA	350	Dillingham
Icicle Seafoods	Seattle, WA	190	Floating Processor
Leader Creek Fisheries	Vancouver, BC	400	Naknek

Nakeem Homepack	King Salmon, AK	N/A	King Salmon
Naknek Family Fisheries	Naknek, AK	N/A	Naknek
North Pacific Seafoods	Seattle, WA	225	Pederson Point
North Pacific Seafoods	Seattle, WA	450	Naknek
North Pacific Seafoods	Seattle, WA	150	Togiak
Ocean Beauty Seafoods	Seattle, WA	400	Naknek
Peter Pan Seafoods	Seattle, WA	320	Dillingham
Peter Pan Seafoods	Seattle, WA	500	King Cove
Peter Pan Seafoods	Seattle, WA	140	Port Moller
Silver Bay Seafoods	Sitka, AK	700	Naknek
Trident Seafoods	Seattle, WA	700	Naknek
Wild AK Salmon & Seafood	King Salmon, AK	25	King Salmon

Note: Worker totals may not match employment figures as plants do not always staff at capacity.
Source: ADF&G (2017 AMR), processor interviews, and company websites.

Bristol Bay processors employ a network of independent and company-owned tender vessels to transport salmon from the fishing grounds to processing plants (see images below). Tender vessels allow plants to source fish from a wider area and reduce offloading times for fishermen, which allows the fleet to spend more time fishing.

Photo credits: BBRSDA (Bob Waldrop).

Once the salmon reach the plant, fish are processed into one of three main product forms: headed/gutted (H&G), canned, or fillets. Frozen H&G is the dominant product form, but processors produce significant volumes of the other product forms, too. The vast majority of headed/gutted production in Bristol Bay is frozen, though fresh volumes have increased in recent years. Table 10 summarizes salmon production by product form.

TABLE 10

First Wholesale Volume of Bristol Bay Sockeye Products, by Type, 2013–2017

IN MILLIONS LBS.	2013	2014	2015	2016	2017	AVG.
Headed/Gutted	25.8	54.6	81.3	93.8	96.5	70.4
Canned	23.4	34.0	28.4	23.1	18.3	25.5
Fillets	9.7	12.3	13.3	20.5	23.0	15.7
Roe	2.4	3.4	5.0	5.6	5.1	4.3
Total	**61.3**	**104.3**	**128.1**	**142.9**	**142.9**	**115.9**
BY PCT.	**2013**	**2014**	**2015**	**2016**	**2017**	**AVG.**
Headed/Gutted	42%	52%	63%	66%	67%	42%
Canned	38%	33%	22%	16%	13%	38%
Fillets	16%	12%	10%	14%	16%	16%
Roe	4%	3%	4%	4%	4%	4%

Note: Canned production for 2017 estimated based on statewide totals due to unavailable data. Does not include production of meal/oil or other ancillary product forms which comprise a minor share of overall production. Figures above refer to processed volumes produced in region.
Source: ADF&G (COAR), ADOR Production Reports, and Wink Research estimates.

Photo credits (clockwise from top/left): Silver Bay Seafoods, Peter Pan Seafoods, Costco Wholesale, Orca Bay Seafoods, Trident Seafoods.

Decisions about which product forms to produce are influenced by many factors, such as market demand, pricing, and plant capacity. Periods of good fishing often produce harvests

that exceed processing capacity. When this occurs, processors put fishermen "on limits" with respect to the amount of fish they will buy from them for that day.

In general, demand for canned salmon has declined while increasing for frozen products over the past 15 years. This has led processors to make significant investments aimed at expanding freezing capacity.

Since the Bristol Bay salmon run is so massive, occurs in a remote area, and does so within a short time frame, relatively little fish is sold as a fresh product. Getting fresh fish to market requires sending product out on airplanes, greatly increasing shipping costs and logistical risk for both buyers and sellers. However, the volume of fresh sales out of Bristol Bay has trended up in recent years.

Photo credits (left to right): Silver Bay Seafoods, Peter Pan Seafoods.

Large salmon processing companies require thousands of seasonal workers. The vast majority of workers come from other states and live in bunkhouse facilities for the duration of the season. The scale of the fishery and the fact that many local residents are busy participating in the fishery or working other full-time jobs creates a significant need to import labor from outside the region. This results in a broader distribution of economic benefits associated with the fishery and affords local, unemployed residents with abundant job opportunities for at least a few months during the year.

See table on following page.

TABLE 11
Economic Profile for Bristol Bay Processing Sector, 2013-2017 Average

Number of Large Processing Facilities (100 or more workers)*	16
Estimated Seasonal Employment	5,600
Estimated Wages & Salaries (in $Millions)	$58.0
First Wholesale Production (Processed Weight in Millions lbs.)	124.7
First Wholesale Value of Salmon (Processed Value in $Millions)	$431.6
Net Processing Revenue of Salmon** (in $Millions)	$244.1

**Based on most recent available workforce data.*
***Equal to first wholesale value less ex-vessel payments to salmon fishermen.*
Note: Employment and wages/salaries estimates are based on AKDOLWD employment data but were adjusted to include an additional plant in the Aleutians East Borough which processes Bristol Bay salmon.
Source: ADF&G, AKDOLWD, and Wink Research estimates.

The Bristol Bay processing sector employs approximately 5,600 workers in seasonal jobs each year. Processors paid out an estimated $58.0 million in wages and salaries to regional processing workers and support staff per year from 2013 to 2017. Nonresidents account for roughly 90 percent of the processing workforce and labor income. Alaska residents from outside the region comprise the majority of resident processing employment in Bristol Bay; however, available data suggests approximately 90 local Bristol Bay residents earn the majority of their wage/salary income from working in regional processing plants.

Hourly wages for most processing laborers are relatively low on average; however, workers can earn a substantial amount of "take home" pay through overtime and the fact that food and housing are provided. Managerial and specialized positions receive significantly higher wages. The average earnings per processing worker was estimated to be $10,400 during the study period.[2] Although these earnings appear modest in annual terms, the vast majority of workers spent only two to six weeks working in the Bay.

Chapter continues on following page.

[2] This is an average of all processing workers across all regional processing jobs, not just wages from workers on the production lines.

TRANSPORTATION SECTOR

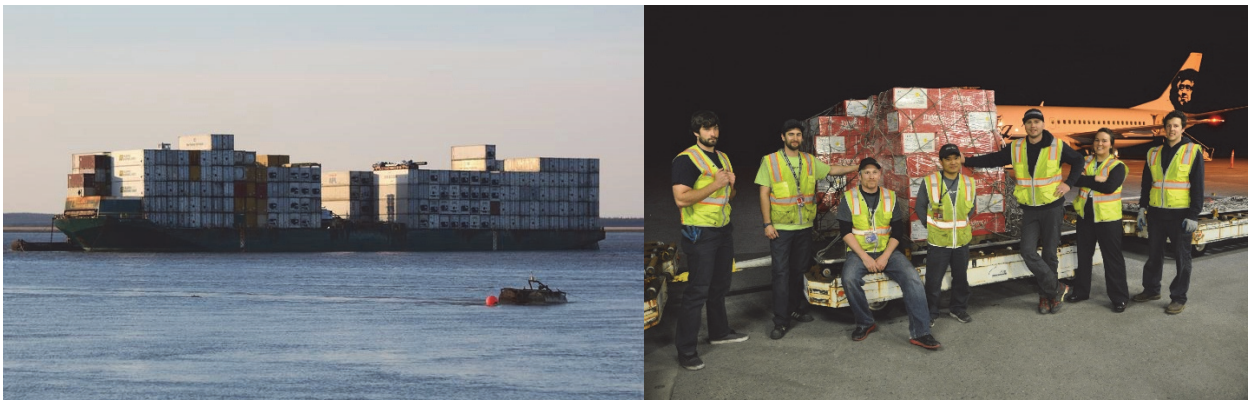


Photo credits (left to right): KDLG, Alaska Airlines.

The Bristol Bay salmon industry relies heavily on barge companies and airlines to transport people, inputs, and products. These services provide jobs for local residents and the scale of the region's salmon industry greatly reduces the cost of accessing these services for Bristol Bay residents. Without the salmon industry, barge and air service would be more infrequent and more expensive.

The Bristol Bay salmon fishery yields approximately 2,500 forty-foot containers worth of processed product each year (2013-2017 average). Many containers carry goods needed by processors and fishermen on the northbound route, but the influx of containers is also used by local residents and non-seafood businesses. Once the season is underway, barges begin shipping Bristol Bay salmon products to markets around the world.

Airlines are a key logistical cog in the salmon supply chain. Thousands of fishermen and processing workers fly to Bristol Bay each summer. In addition, airlines fly several million pounds of fresh salmon out of the Bay each summer. Fresh salmon sells for a premium price compared to frozen or canned products, and it speeds up the cash flow process for processors. As a result, air cargo capacity and service have a direct effect on salmon value.

TABLE 12
Bristol Bay Transportation Companies

Transportation Company	Type	Employees in Alaska
Abba Joy's Taxi Service	Taxi Service	N/A
Alaska Airlines	Passenger/Cargo Air Service	1,800

Alaska Central Express (ACE)	Air Cargo	135
Alaska Eagle Eye	Transportation Rentals	N/A
Alaska Logistics	Marine Cargo	5
Alaska Marine Lines (Lynden)	Marine Cargo	240 (sea only)
Everts Air Cargo	Air Cargo	287
Grant Aviation	Passenger/Cargo Air Service	200
King Salmon Ground Service	Freight Forwarding/Handling	N/A
Kodiak Cab	Taxi Service	N/A
Ling Ling Taxi	Taxi Service	N/A
Northern Air Cargo	Air Cargo	395
Northland Services	Marine Cargo	N/A
Nushagak Cab Company	Taxi Service	N/A
Peninsula Airways (Pen Air)	Passenger/Cargo Air Service	500
Ravn Alaska	Passenger/Cargo Air Service	1,000
Redline Taxi	Taxi Service	N/A

Source: VisitBristolBay.com, Alaska Business Monthly, and Wink Research.

DISTRIBUTORS & SECONDARY PROCESSORS

Most Bristol Bay salmon is sold to seafood distributors or secondary processing companies. Often times, a single company performs both secondary processing and local distribution services. Seafood distributors buy intermediate and finished products from around the world in bulk and sell products to retailers and restaurants in their local market in smaller quantities. This allows retailers and restaurants to access a wide variety of products in a manageable order size. Many distributors will also import fresh and frozen fish in a whole, dressed, or H&G format, then fillet the fish according to customer specifications.

The majority of Bristol Bay sockeye production is exported to foreign countries; however, the supply chain functions are typically the same. For instance, a secondary processor in Japan may import Bristol Bay sockeye roe in bulk, marinate it, package it, and sell it to retailers or a specialty distributor. Sockeye salmon smoked in Europe follows a similar path.

In some cases, primary processors may sell products directly to retailers, or fishermen may even sell processed products directly to consumers. However, the necessary supply chain functions remain in place. Raw material or intermediate products still need to be

transformed into a finished product and distributed to customers in relatively small lots. Many large retailers have their own distribution network, but some Alaska processors also have distribution services as well.

Photo credits (left to right): Santa Monica Seafoods, The Fish Guys, Inc.

RETAIL & FOOD SERVICE SECTORS

Retailers and food service outlets are the final link in the supply chain before salmon products are consumed. Retail and food service account for a sizeable portion of the total value of Bristol Bay salmon products due to the fact they incur significant costs to reach a large number of customers or transform fish into tasty recipes for diners.

Photo credits (left to right): Kowalski's Markets and Nick Karvounis.

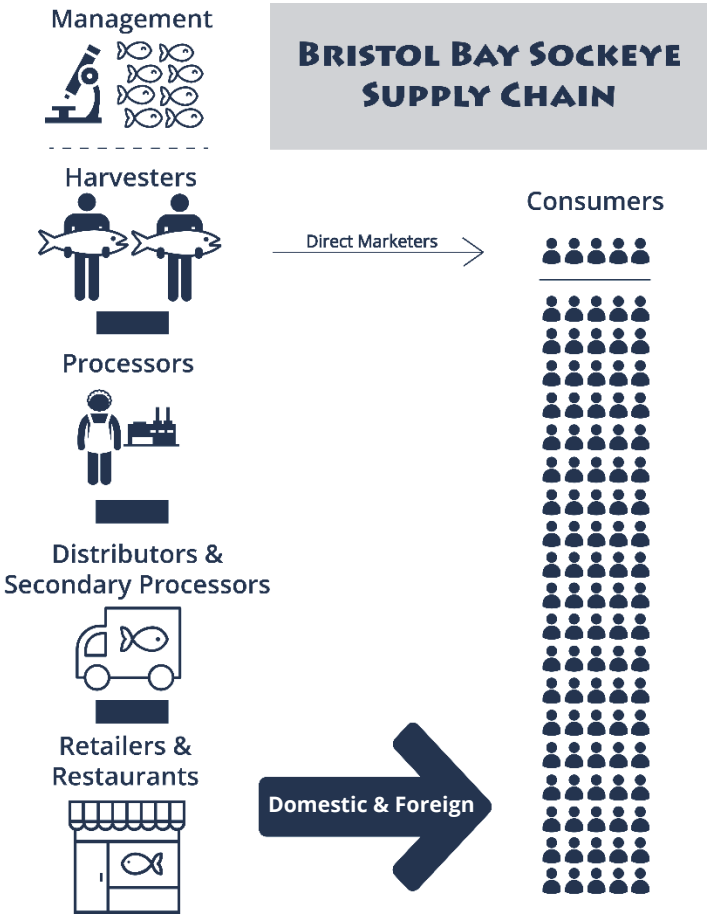
Direct marketers and online retailers can circumvent different links of the supply chain, but again, the basic functions of harvest, processing, distribution, and consumer sales remain

intact. Brick and mortar grocery stores and restaurants play a critical role in creating enough demand to handle the large scale of Bristol Bay salmon production. Millions of customers are needed each year to consume supply, and while supply chains are always evolving to become more efficient, the traditional links/functions will likely remain in place for the foreseeable future.

SUPPLY CHAIN SUMMARY

The diagram shown to the right was developed to summarize the Bristol Bay sockeye salmon supply chain. While most fish harvested eventually go through each link, there are situations in which salmon products by-pass different parts of the supply chain. Regardless of whether fish are sold by a direct marketer to consumers, or via retailers, many of the same functions must be performed: processing, packaging, marketing, shipping, etc. Also, this example does not distinguish between domestic and exports markets. Many distributors and secondary processors are located overseas and import Bristol Bay sockeye from primary processors.

FIGURE 3



MARKETS FOR BRISTOL BAY SOCKEYE

Bristol Bay sockeye is sold throughout the United States and U.S. sockeye products, which largely consists of Bristol Bay fish, were exported to 69 other countries during the study period. The U.S. is the largest market for Bristol Bay sockeye, based on a disappearance

model that subtracts export estimates from total production volume and value. The U.S. accounted for an estimated 42 percent of Bristol Bay sockeye market share by volume and 38 percent by value during the study period.

Export markets comprised 58 percent of production volume during the study period and accounted for 61 percent of value. Canada, Japan, South Korea, United Kingdom, and Australia accounted for 45 percent of market share by value, while all other export markets accounted for about 14 percent.

TABLE 13
Estimated Market Share for Bristol Bay Sockeye Products, 2013-2017 Avg.

Markets	Estimated Share of Volume	Estimated Share of Value
U.S. Market	42%	38%
Export Markets (Total)	58%	62%
Canada, UK, & Australia (Mostly Canned)*	22%	24%
Japan (Mostly H&G and Roe)*	21%	21%
Other Export Markets*	17%	15%
Processed Volume of Bristol Bay Sockeye (in Millions lbs.)		**124.7**
First Wholesale Value of Bristol Bay Sockeye (in $Millions)		**$431.6**

**Export figures do not sum because frozen sockeye fillet exports could not be attributed to markets, but an estimate is included within the total figure for all export markets. Foreign trade data does not provide a specific classification for sockeye fillets (only all Pacific salmon species combined).*
Notes: Export data was adjusted to reflect differences in volume reporting (i.e. product weight vs. net weight). U.S. estimates do not include products which are exported and may be re-imported back to the U.S., for example frozen sockeye filleted in China. China imported an estimated 7.9 million pounds, on average during the study period.
Source: Wink Research estimates & calculations based on NMFS Foreign Trade Data and ADOR (ASPR).

The amount of product going to the U.S. has trended up over the past decade, evidenced by the growing gap between the volume frozen H&G sockeye produced in Alaska and the volume of product exported from the U.S. The difference between production and exports of frozen H&G Alaska sockeye averaged 11.8 million pounds from 2008 to 2012 but averaged 31.6 million pounds from 2013 to 2017, a nearly three-fold increase. Much of this additional frozen H&G sockeye is slacked out by secondary processors and distributors during the offseason and sold as chilled fillets to grocery stores and restaurants. This is a high-quality, once-frozen product which allows U.S. consumers to enjoy sockeye on a year-round basis without needing to defrost frozen product.

Frozen fillet production has also increased over the past decade, as a percentage of total sockeye production. Frozen, vacuum-packed sockeye fillets are largely consumed in the U.S. market. Increasing consumption of Bristol Bay sockeye in U.S. markets, which largely displaces imported farmed salmon, increases the multiplier effect of the resource in the U.S. economy.

BRISTOL BAY SALMON VALUE CHAIN

All parts of the supply chain play a role in adding value to Bristol Bay salmon products until it is ultimately purchased by a consumer. Examining the amount of value added at each level allows for a more complete valuation metric than ex-vessel or first wholesale value. After all, a considerable amount of value is added to Bristol Bay salmon products after they leave the region.

The example in this section deals with sockeye and uses some assumptions in order to create a realistic valuation estimate based on available data. Most sockeye caught in Bristol Bay are headed, gutted, frozen and sold to secondary processors and/or distributors, who in turn sell fillets to retailers or restaurants. Roe from the females is also frozen and sold into export markets. A relatively small amount of revenue is earned from producing by-products. The calculations below use data from ADF&G, ADOR, BBRSDA, the Alaska Sea Grant program, and other sources to estimate the combined retail value of sockeye fillets and roe.

The final value of Bristol Bay sockeye is roughly equal to four times that of the ex-vessel price/value. In 2017, the average final price for Bristol Bay sockeye was estimated to be $1.17/lb. (including bonuses and retroactive payments made prior to 4/1/18). The final value of fillets and roe sold at retail resulted in an estimated value of $4.98 per round pound.

TABLE 14
Estimated Value of Bristol Bay Sockeye Through the Supply Chain, 2017

Cumulative Resource Value by Supply Chain Level	Value Per Round Pound
Final Harvested Value: Bristol Bay Sockeye (Ex-Vessel)	$1.17
Primary Processing: Frozen H&G (First Wholesale)	$2.67
Primary Processing: Frozen Roe (First Wholesale)	$0.13
Secondary Processing: Warehoused Frozen Fillet	$3.22
Secondary Wholesale Value: Distributed Frozen Fillet	$3.70
Fillet Retail Value at $10.50/lb. Average Retail Price*	$4.73

Retail Fillet + Roe Value	**$4.98**
Share of Resource Value by Supply Chain Segment	**Percent of Final Value**
Commercial Fishermen	24% ($1.17/Round lb.)
Processors, Distributors, & Tenders	53% ($2.67/Round lb.)
Retailers & Restaurants	23% ($1.15/Round lb.)

**Assumes 50% percent recovery rate and 10% retail shrink.*
Note: Value per round pound of later supply chain links includes value of previous segments (i.e. $2.67 of primary processing value includes $1.17 in ex-vessel value).
Source: Wink Research estimates & calculations.

Based on these conservative assumptions and calculations, Bristol Bay produced an estimated $1.03 billion of final salmon product value in 2017. The example used in this section estimates the value of sockeye roe and frozen sockeye fillets sold into the domestic market; however, the actual mix of products and markets is far more complex. However, a large percentage of production is sold as frozen or canned product into export markets, and a significant share of frozen sockeye is eventually converted into smoked product. These markets and specialty products likely add more value than the simplistic example used above due to additional shipping, handling, and processing costs. Therefore, this is a relatively conservative estimate of final annual value.

Many Bristol Bay sockeye are also sold in restaurants, where the average price per portion typically far exceeds retail prices. The 4x multiplier would be too conservative for products sold at restaurants, but it is difficult to assess how much value produced by food service operators should be attributed to the raw material (sockeye) as there are more variables involved than in retail sales.

Although Bristol Bay sockeye fillets routinely sell for more than $12 per pound at retail, after adjusting for shrink and the reduction in weight as fish move from a round basis to a fillet basis, fishermen receive an estimated 24 percent of the final value. Processors, distributors, and tender operators receive an estimated 53 percent of the value, while the retail and food service segments receive 23 percent.

3. VALUE OF RESOURCE & ASSETS

Chapter 3 examines the value of Bristol Bay salmon resources used in commercial fisheries. There are several ways in which this resource value can be quantified, providing an understanding of annual values, the asset value associated with the regional industry, and the value of the commercial resource as a whole.

KEY FINDINGS:

- The average value of Bristol Bay salmon in real, ex-vessel value terms over the past five years (2013-2017) was $188 million, and the average first wholesale value was $431 million.
- The value of major commercial salmon fishing and processing assets in the Bristol Bay region was estimated to be $1.17 billion, as of 2017. This figure includes permits, fishing vessels, and processing facilities/equipment.
- The commercial Bristol Bay salmon fishery has produced an estimated $18 billion in real, ex-vessel terms since its inception through 2017, and an estimated $34 billion in first wholesale terms.

EX-VESSEL & FIRST WHOLESALE VALUE

The commercial fishery creates value for fishermen and processors. The value paid to fishermen by processors is known as the ex-vessel value. The value paid to processors is known as the first wholesale value and is equal to the value of processed products sold to customers or other affiliates outside of the processor's network. First wholesale value also includes the ex-vessel value of the fish.

Additional value is added to sockeye products as they move to distributors, import/export businesses, retailers, and restaurants; however, the aforementioned metrics are commonly used to approximate the value of seafood upon leaving the state of Alaska.

The ex-vessel value of Bristol Bay salmon was worth an estimated $247 million in 2017. The 2017 season was one of the most valuable harvests ever in Bristol Bay, due to the large

harvest volume and relatively strong pricing. Over the past 10 years (2008-2017), ex-vessel value has averaged $168 million per year, in nominal terms.

It is estimated that the first wholesale value of Bristol Bay salmon was $563 million in 2017. Over the past 10 years, first wholesale value has averaged $381 million per year. The ex-vessel share of first wholesale value has averaged 44 percent over the past decade, meaning fishermen have received 44 percent of the resource value (at the first wholesale level).

TABLE 15

Ex-Vessel & First Wholesale Value of Bristol Bay Salmon, 2008-2017

in $Millions

Year	Ex-Vessel Value	First Wholesale Value
2008	$121	$280
2009	$148	$302
2010	$165	$404
2011	$159	$364
2012	$143	$299
2013	$151	$323
2014	$222	$408
2015	$125	$382
2016	$196	$482
2017E	$247	$563
5-Year Average	**$188**	**$432**
10-Year Average	**$168**	**$380**

Source: ADF&G (COAR).

ESTIMATED ASSET VALUE

Bristol Bay fishermen and processors have made substantial investments in assets used to catch and process salmon. These assets primarily include limited entry permits, fishing boats, and processing facilities. In addition, operators buy materials, equipment, fishing gear, food, fuel, and hire crew and plant staff. The State of Alaska collects data regarding the value of permits and boats, making it possible to estimate the value of the lion's share of fishery assets.

Bristol Bay permits and fishing vessels are estimated to be worth $531 million, as of December 2017. Permits comprised 57 percent of the asset value at $303 million, while all

fishing vessels registered in 2017 were worth an estimated $227 million.[3] Table 47 summarizes the historical value of Bristol Bay salmon permits and can be found in the appendices on page 83.

Driftnet fishermen catch the most fish and this gear group makes up the majority of the fishing assets as well. Bristol Bay driftnet assets were worth an estimated $461 million in 2017. Driftnet permits were worth $142,400 apiece as of December 2017, resulting in a total value of $265 million. Driftnet vessels were estimated to be worth $196 million in total, based on 2017 vessel registration data.

Setnet assets were estimated to be worth $70 million in 2017. Setnet permits comprised $32 million of the value, while setnet skiffs were worth an estimated $38 million.

TABLE 16

Estimated Value of Selected Assets in Bristol Bay Salmon Industry, 2017

in $Millions

Asset Type	Driftnet	Setnet	Total
Limited Entry Permits	$265	$38	$303
Fishing Vessels	$196	$32	$228
Fishing Sector Total	**$461**	**$71**	**$532**
Processing Plants & Assets	-	-	$638
Fishing & Processing Total	**-**	**-**	**$1,170**

Note: Figures may not sum due to rounding.
Source: Wink Research estimates & calculations.

Commercial fishing assets are only a part of the regional commercial salmon industry. Processing companies also own substantial portfolio of regional assets and play a critical role in transforming a natural resource into a saleable product. Unfortunately, the value of processing plants is not reported and plants are rarely sold. However, by applying some reasonable assumptions about expected cash flows to first wholesale value, it is possible to approximate the asset value of the processing sector as a whole.

[3] Many fishermen self-report vessel value as part of their annual vessel registration. In a few cases, the valuation was obviously incorrect due to misreporting or data entry errors. Those errors were omitted from the data. While the majority of driftnet fishermen report vessel value, about 30 percent do not. Data from reported vessel valuations was used to estimate missing values based on the age and type of vessel (aluminum, fiberglass, etc.). Most Bristol Bay setnet fishermen are not required to register their skiffs with CFEC, but just over 100 are registered and provided a valuation for their fishing vessel. This sample was used to approximate the value of all setnet skiffs with the assumption that each active permit operated one skiff in 2017.

The value of any commercial asset is a function of its ability to produce cash flows (in excess of any expenses) versus the risk involved in receiving those cash flows. There are numerous methods to estimate asset values based on these factors, but the most straightforward proxy is to evaluate the sector similar to an annuity. Annuities are financial assets that consist of a series of promised cash flows (for a fixed period or in perpetuity) in exchange for an upfront cost.

Valuing a perpetual annuity (that is one which provides static payments with no expiration) is done by dividing the periodic cash flow by a periodic discount rate. The discount rate is a percentage that describes the risk related to the promised cash flows. Lower risk annuities have lower discount rates and are therefore more valuable than riskier annuities promising the same amount. Estimating the value of Bristol Bay processing assets then requires an estimate of cash flows divided by a reasonable discount rate.

Net margins of food and beverage manufacturers tend to fall between 3 and 10 percent, depending on the year and sub-sector. Given that the Bristol Bay salmon industry is a niche sector, an average net margin of 8.5 percent was used for this estimation. Therefore, the expected cash flow would be 8.5 percent of first wholesale value. Using the 10-year inflation-adjusted first wholesale figure from above, this results in an annual after-tax cash flow of $34.5 million for the entire Bristol Bay processing sector.

The yield index on corporate Baa-rated bonds was approximately 4.4 percent as of December 2017.[4] Bristol Bay salmon is a relatively volatile natural resource serving as the key raw material for these plants. In addition, Bristol Bay processors generally face greater risks than the average manufacturing company. As such, it would be prudent to account for that additional risk by adding to the 4.4 percent proxy rate. Using a modified discount rate of 5.4 percent, Bristol Bay processing assets are valued at an estimated $638 million as of 2017.[5] This figure would apply to land, buildings, and equipment, but would generally not include tender vessels.

Additional examination suggests this is a reasonable valuation of the sector assets, in terms of enterprise value. In 2014, Silver Bay Seafoods built a new plant in Bristol Bay. According to company officials, the project cost $37 million including land and buildings.[6] The company

[4] https://fred.stlouisfed.org/series/BAA.
[5] 10-Year Average Real First Wholesale Value of BB Sockeye * 8.5% net margin / Annual Discount Rate = Estimated Asset Value (($405.34*0.085)/0.064 = $538.34 million).
[6] http://www.akbizmag.com/Alaska-Business-Monthly/July-2014/Bristol-Bays-New-Player/

has also made millions of dollars of additional investments at its facility since that time. Dividing the total processing asset valuation by the thirteen large processing facilities in the region results in an average value of roughly $41 million per processing facility.

Collectively, the assets of Bristol Bay fishermen and processors were worth an estimated $1.17 billion, as of 2017. While this is a substantial sum within any context, the total value of assets & businesses dependent upon the Bristol Bay sockeye resource is greater still. Support sectors companies, regional infrastructure, and local government agencies are heavily dependent upon a vibrant Bristol Bay salmon fishery. Although quantifying the value of other resource-dependent assets is beyond the scope of this analysis, a measure of relative scale can be deduced from economic impact analyses conducted for this report. Fishing and processing assets in the Bristol Bay salmon industry support an estimated $803 million in secondary and downstream economic output, on average, each year, which creates approximately 8,600 jobs in the U.S. economy.

TOTAL RESOURCE VALUE

A fishery's value is typically quoted in annual terms but many other natural resources are often valued in terms of their total lifetime value. This leads to the question of what is the value of the Bristol Bay salmon resource, not just in annual terms but rather in its totality? With multiple user groups accessing a sustainable resource, the question is difficult to fully quantify. However, data from the commercial fishery can be used to estimate the total value of the commercial fishery resource.

Before considering the present value of future fishery returns, a look back at the commercial fishery's historical value is warranted. Commercial salmon fishing operations in Bristol Bay began in 1884 and have produced harvests exceeding one million pounds every year since the 1890s. Commercial fishermen have harvested 2.07 billion salmon in Bristol Bay since the fishery's inception for an estimated harvest volume of 12.1 billion pounds.

The ex-vessel value of the commercial Bristol Bay salmon fishery from its inception to 2017 is estimated to be $18.2 billion, in real terms. The first wholesale value of the fishery is estimated to be $34.0 billion, in real terms.[7] These estimates are derived from historical data

[7] First wholesale estimated based on average relationship between first wholesale value and ex-vessel value from 1984-2017.

and assumptions about past prices (where valuation data was unavailable). Table 45 in the appendices provides more detail and information about data sources and methodology used to estimate or source these figures.

The Bristol Bay salmon resource is one of the most valuable natural fish resources on the planet. However, analyzing the importance of resource value isn't only about scale. The manner in which a resource is extracted/managed, the number of people it employs, the purpose it serves, its ability to replenish itself, and the number of people who use it are equally as important as the question of how much the resource is worth in current value terms.

4. Bristol Bay Salmon in Context

Chapter 4 places the Bristol Bay salmon resource in context within Alaska fisheries and salmon fisheries around the world.

KEY FINDINGS:

- The Bristol Bay sockeye fishery is the most valuable wild salmon fishery in the world.
- The region accounts for 45 percent of global sockeye harvests, and about 8 percent of all commercial wild salmon harvests (over the past 10 years with available data).
- Bristol Bay sockeye generated an average of $235 million worth of U.S. exports each year from 2013-2017; accounting for 22 percent of all U.S. salmon exports and 4.1 percent of all U.S. seafood exports.
- Three of the top-10 U.S. commercial fishing ports, by landed value, depend upon Bristol Bay salmon.
- Bristol Bay accounted for 31 percent of Alaska's total ex-vessel salmon value from 2013-2017. Sockeye salmon is the second-most valuable species caught in Alaska fisheries, in terms of total ex-vessel value, and Bristol Bay is responsible for approximately two-thirds of statewide sockeye harvests.
- Bristol Bay accounted for about a third of all active commercial salmon fishing permits in Alaska during 2016, and 41 percent of total salmon permit value in 2017.
- The average Bristol Bay commercial fisherman (including crew) catches 4,000 salmon per season (in an average year), enough salmon to produce roughly 30,000 fillet portions.
- The average driftnet boat hauls in about 100,000 pounds of salmon per season, and averages exceed 120,000 pounds in years with large harvests. Some producing boats can even exceed 200,000 pounds per year.
- During the busiest three weeks of the season, driftnet boats average harvests of 783 salmon per day, or 33 salmon per hour.
- Bristol Bay fishermen produced $22,957 of ex-vessel value per year during the study period.

REGIONAL

Salmon and herring are the only marine species commercially harvested on a large scale in the Bristol Bay region.[8] From 2013 to 2016, salmon comprised 99 percent of the regional ex-vessel value and 79 percent of the harvest volume, while herring accounted for the balance (not including halibut).

Large fisheries for groundfish and crab exist in the adjacent Bering Sea. These fisheries account for the lion's share of all groundfish and crab harvested in the United States. However, the impact of these fisheries on the Bristol Bay region is significant, as royalties collected by the local CDQ corporation do help fund community development projects, and fisheries support.

STATEWIDE

Alaska salmon is a world-famous resource and the Bristol Bay region is the crown jewel. Easily the most valuable salmon fishery in the state, the region accounted for 19 percent of total Alaska salmon harvest volume and 31 percent of ex-vessel salmon value from 2013-2017.

Sockeye salmon are critically important to the Alaska seafood industry as a whole. Sockeye are the second-most valuable commercial species behind pollock (in most years), and far more valuable than cod, the third-most valuable species. Sockeye comprised 17 percent of total ex-vessel value derived from harvests of all species during 2013-2016. Sockeye typically account for more than half of the state's total salmon value and the Bristol Bay region supplies two-thirds of Alaska's sockeye.

A total of 2,441 Bristol Bay salmon fishermen made landings on permits in 2017. These fishermen accounted for approximately one-third of all active Alaska salmon fishermen that year (who made landings on a commercial permit). Bristol Bay salmon permits were worth

[8] Despite the name, the Bristol Bay red king crab fishery actually occurs in waters well outside the Bristol Bay region as defined by the salmon management area or the three borough and census areas (Dillingham CA, Bristol Bay Borough, and Lake and Peninsula Borough). Virtually all vessels participating in the red king crab fishery work out of Dutch Harbor or Akutan. Relatively small volumes of halibut are landed in the region, as a result, regional halibut landings are confidential.

$286 million, on average, in 2017, comprising 41 percent of the total value of all commercial salmon permits in Alaska.

Not only does Bristol Bay salmon drive virtually all commercial harvest activity in the region, the fishery is a true cornerstone of the entire Alaska seafood industry.

TABLE 17
Bristol Bay Salmon in Context of Statewide Industry, 2013-2017
in Millions

Year	BB Sockeye	Share of Total Alaska Sockeye	BB Salmon	Share of Total Alaska Salmon	All Alaska Species
CY	*POUNDS*	*PCT. OF POUNDS*	*$EX-VESSEL*	*PCT. OF $EV*	*$EX-VESSEL*
2013	92	52%	$151	20%	$2,017
2014	162	66%	222	36%	1,935
2015	193	67%	125	25%	1,796
2016	201	71%	192	40%	1,751
2017	208	72%	247	33%	-
AVG.	**171**	**67%**	**$188**	31%	**$1,875**

Note: Statewide averages for all species do not include 2017, where the final ex-vessel value is not yet available.
Source: ADF&G (COAR) and NMFS (SAFE).

NATIONAL

Ports that process Bristol Bay salmon ranked fourth, seventh, and tenth, nationwide in landed value during 2016, based on NMFS data.[9] These ports accounted for 20 percent, or one-fifth, of all value landed in the top-10 U.S. commercial fishing ports (see Table 18). As Alaska typically produces over 95 percent of the country's salmon harvest, Bristol Bay comprises a significant percentage of the national salmon harvest.

It is estimated that the Bristol Bay salmon fishery produced an average of 67 million pounds of processed product sold into export markets worth $235 million per year, during the study period. Exports of U.S. seafood products averaged $5.8 billion during the study period,

[9] Link: https://www.st.nmfs.noaa.gov/pls/webpls/MF_LPORT_YEARD.RESULTS

including $1.1 billion in salmon exports. Bristol Bay salmon comprised an estimated 21.9 percent of all salmon exports and 4.1 percent of total U.S. seafood exports.

TABLE 18

Top 10 U.S. Commercial Fishing Ports, by Landed Harvest Value, 2016

Landing Figures in Millions

Port	Pounds (M lbs.)	Dollars ($M)	Value Rank
New Bedford, MA	106.6	326.5	1
Dutch Harbor, AK	770.0	198.0	2
Empire-Venice, LA	440.0	122.0	3
Naknek, AK	**170.0**	**108.0**	**4**
Kodiak, AK	417.0	107.0	5
Honolulu, HI	32.3	106.0	6
Aleutian Islands (Other), AK	508.0	105.0	7
Alaska Peninsula (Other), AK	**243.0**	**85.0**	**8**
Cape May-Wildwood, NJ	46.6	84.7	9
Bristol Bay (Other), AK	**54.0**	**76.0**	**10**

Source: NMFS (OST).

GLOBAL

The Bristol Bay sockeye fishery is the most valuable wild salmon fishery in the world (see Table 19). Bristol Bay sockeye accounts for approximately 8 percent of all wild salmon caught in commercial fisheries around the world and makes up 45 percent of global sockeye harvests.[10]

Bristol Bay is unique, globally, in that it produces substantial volumes of salmon without hatcheries. In terms of volume, pink and chum fisheries in Alaska, Russia, and Japan are also among the world's largest producing wild salmon fisheries. Pink and chum account for about 80 percent of global wild capture salmon harvests. However, sockeye are often two to four times more valuable than pink or chum salmon. Also, many pink/chum begin their life in a hatchery where they are less dependent on regional ecosystems than Bristol Bay sockeye, whose survival is linked to rivers and lakes in western Alaska. Despite the smoothing effects

[10] Over the past 10 years with available data (2007-2016).

of hatchery production, actual pink and chum salmon harvests in many large fisheries have been more erratic in recent years, compared to Bristol Bay sockeye.

TABLE 19
Most Valuable Wild Salmon Fisheries in the World, 2015-2016 Average

Rank	Fishery – Species - Area	2015-2016 Average $EV ($Millions)	2015-2016 Average Harvest (Millions lbs.)
1	Bristol Bay Sockeye Salmon (Alaska)	$158	197
2	Hokkaido Chum Salmon (Japan)	$125	217
3	Western Kamchatka Sockeye Salmon (Russia)	$62	66
4	Eastern Kamchatka Pink Salmon (Russia)	$51	175
5	Prince William Sound Pink Salmon (Alaska)	$50	184
6	Southeast Chum Salmon (Alaska)	$50	84

Notes: Salmon fisheries in Russia and Japan do not report ex-vessel value, as the structure of these fisheries are different than those in Alaska. Average statewide Alaska ex-vessel prices were applied to 2015 and 2016 harvests in Russia/Japan and used as a proxy for ex-vessel value.
Source: Wink Research estimates based on ADF&G (COAR) and NPAFC harvest data.

Even within the context of all the wild salmon in the world, the Bristol Bay region is a critical part of the global population and market supply.

NUMBER OF SERVINGS PRODUCED FROM BRISTOL BAY SOCKEYE

Bristol Bay salmon, largely comprised of sockeye salmon, is a substantial wild food source. Harvests are often quantified in millions of fish, metric tons, or millions of pounds. However, greater context is required to understand just how many people can be fed by the resource.

Over the past five years (2013-2017), the commercial fishery produced an average harvest of 31.5 million sockeye weighing 171.1 million pounds. Regional processors converted this into 113.9 million pounds of processed sockeye product. This production, in total, amounts to nearly 404 million servings of Bristol Bay sockeye products (see Table 20). Such a volume is enough to feed every man, woman, and child in the U.S. a single serving of Bristol Bay sockeye. Of course, a large portion of the production is exported and many consumers eat sockeye many times throughout the year, but still the conversion to servings provides useful context about just how much food is created by the commercial fishery and the regional sockeye resource. Including other salmon species caught in Bristol Bay, the total number of servings would increase by several million.

TABLE 20
Servings Derived from Bristol Bay Sockeye Production, 2013-2017 Avg.

Product Form	Average Production (Millions lbs.)	Yield Pct.	Portion Size (Oz.)	Millions of Servings
Canned	23.7	100%	3.00	126.2
Frozen H&G	66.4	72%	5.00	152.9
Fresh H&G	4.1	72%	5.00	9.4
Frozen Fillets	15.7	100%	5.00	50.4
Roe	4.1	100%	1.00	65.0
Total	**113.9**	**-**	**-**	**403.9**

Note: Figures may not sum due to rounding.
Source: Wink Research estimates & calculations based on ADOR (ASPR Production Reports).

WORKER PRODUCTIVITY

This report largely focuses on the overall production and value of the fishery, but it is important to remember it is all the product of a few men and women hand-picking fish onboard small boats or at setnet sites. This subsection dissects fishery production totals into operator/worker level statistics, in order to add important context regarding how the fishery is able to produce such impressive results.

The average Bristol Bay fisherman (including crew) catches more than 4,000 salmon per season and nearly 5,000 in a big year. Even in an average year, that's enough salmon fillets to produce approximately 30,000 portions. Meanwhile, each Bristol Bay processing worker also works long hours and packs almost enough seafood to fill a 20' reefer container, on average.

Bristol Bay's sockeye salmon run is known for its size and intensity. Typically, 85 to 95 percent of the salmon harvest occurs within a three-week period. Most districts are open for commercial fishing continuously during this period as fishermen try to maximize their ratio of fish caught-to-hours slept. The average driftnet boat caught 783 salmon per day during the peak run (from 2013 to 2017). That works out to an average of 33 salmon per hour of every day during the three-week peak; including time spent sleeping, delivering to tenders, eating, bleeding fish, cleaning the boat, fixing gear, waiting out the weather, and calling home

to tell everyone you're ok. And that's the average driftnet boat. The top boats in the fleet averaged 78 salmon per hour (1.3 fish per minute!) during the peak season in 2017.[11]

TABLE 21
Dissection of Bristol Bay Salmon Production & Value

Per Season	2013-2017 AVG.	2017 Season (Large Harvest)
Pounds Caught per Fisherman	22,007	26,603
Number of Salmon Caught per Fisherman	4,031	4,916
Ex-Vessel Value Created per Fisherman	$22,872	$29,996
Pounds Processed per Regional Processing Worker	22,264	26,895
Avg. Labor Income per Regional Processing Worker	$10,364	$11,107
Per Fishing Business		
Average Driftnet Boat (Pounds per Season)	100,236	120,520
Average Driftnet Boat (Salmon per Season)	18,276	22,100
Average Driftnet Boat (Pounds per Peak Day)	4,296	5,165
Average Driftnet Boat (Salmon per Peak Day)	783	947
Avg. Driftnet Boat (Salmon per Hour during Peak)	33	39
Average Setnet Permit (Pounds per Season)	39,114	50,108
Average Setnet Permit (Salmon per Season)	7,145	9,189
Average Setnet Permit (Salmon per Peak Day)	306	394

Notes: Peak period is equal to three weeks, which generally produces 85% to 95% of the harvest volume. Skippers and crew are counted as fishermen, skippers are assumed to be permit owners.
Source: ADF&G, CFEC, and Wink Research estimates.

Each season, thousands of hearty men and women join local residents to harvest a truly unique renewable resource. Several weeks later, millions of pounds of salmon products leave Bristol Bay for markets and dinner tables around the world. This bounty is the collective result of extraordinary skill, risk, and endurance on the part of nearly 15,000 people, each trying to add one more sockeye to the supply chain with each passing minute before the run is over.

[11] Based on estimates involving CFEC quartile data for 169 of the top earning driftnet boats.

5. Economic Benefits of Bristol Bay Salmon

Chapter 5 quantifies the economic benefits of Bristol Bay salmon caught in commercial fisheries at a regional, statewide, and national level. An estimate regarding the number of Americans who depend upon the resource is also provided, including sport and subsistence users.

KEY FINDINGS:

- The Bristol Bay salmon fishery directly employed an estimated 14,765 workers in seasonal jobs per year during the 2013-2017 study period. Including multiplier effects, the fishery generated a total of 12,537 average jobs per year.
- The fishery created an estimated $658 million of labor income and $1.23 billion of economic output on average during the study period.
- While downstream activity has increased due to Americans eating more Bristol Bay sockeye salmon, 78 percent of total labor income stems from management, harvesting, processing, tendering, and other industry-related sectors. These are jobs that would disappear without the fishery.
- Economic benefits of the Bristol Bay salmon industry are widely distributed. While the industry accounts for the majority of employment in the Bristol Bay region and creates approximately one percent of all labor income in Alaska, it is estimated that 82 percent of all average jobs created by the fishery are held by residents of other U.S. states.
- Residents of 41 U.S. states hold commercial Bristol Bay salmon fishing permits.
- Bristol Bay salmon accounts for an estimated 5,216 FTE jobs and $272 million of labor income in Alaska, nearly half of which is earned by Alaska residents.
- At a statewide level, the Bristol Bay commercial salmon fishery directly employs nearly twice as many Alaska residents (4,537) as the non-oil/gas mining industry (2,626) (Kreiger, 2018). The total amount of Alaska resident labor income generated by the fishery is approximately equal to all wages and salaries in Sitka's private sector economy.

- The commercial salmon fishing industry is the basis for most jobs in the Bristol Bay region. The region has approximately 4,700 working-age adult residents and it is estimated that one-third of these local residents are employed in the industry at some point during the year.
- The economic benefits presented in this chapter do not include those which occur in other countries, or exchange rate benefits as a result of Bristol Bay salmon being exported abroad. However, these benefits are significant. It is estimated that roughly 60 percent of all Bristol Bay salmon production was exported during the study period, worth approximately $235 million per year (on average).

INTRODUCTION

This chapter focuses on several metrics to quantify economic benefits created by the Bristol Bay commercial salmon fishery. Those metrics are number of workers, employment (i.e. "Average Jobs"), labor income, economic output, and value added (see Glossary on page 4 for definitions). These metrics are calculated for *direct* impacts and *secondary* impacts. *Direct* activity refers to economic activities which are directly tied to the execution of the commercial fishery and regional salmon processing. *Direct* activity includes commercial fishing, seafood processing, and fishery management operations. *Secondary* impacts refer to activities that support or result from *direct* activities, in this case the Bristol Bay commercial salmon fishery. *Secondary* activities are the result of business or household spending stemming from commercially-harvested Bristol Bay salmon.

The supply chain is divided into *upstream* and *downstream* activities. Upstream activities include fishery management, harvesting, tendering, regional processing, and (generally) transport ports in the Pacific Northwest. Direct, upstream activities are also referred to generically as the "industry" in this report. Air freight shipments of fresh product to market are also included in upstream activities. Downstream activities include domestic warehousing and product storage, transport from storage or port facilities, secondary processing, canned salmon labeling, distributing, and retailing. Downstream activities are not unique to Bristol Bay salmon and would likely exist in roughly the same scale if not for the fishery's production. However, upstream activities are wholly dependent upon Bristol Bay salmon production and resource health.

QUANTIFYING EMPLOYMENT USING AN AVERAGE JOB APPROACH

The Bristol Bay salmon fishery is a seasonal affair. The fishery directly employs fishermen, processors, and tenders for a few weeks to a couple months during the season, though fishermen may also be involved in offseason work (e.g. boat maintenance/upgrades, marketing, administrative duties). Therefore, there is a significant distinction between the number of workers directly employed in seasonal jobs and a typical full-time equivalent job. This is a common issue when it comes to quantifying employment in the fishing industry, where some workers may spend a few weeks in the industry while others may work on boats or in plants nearly year-round. Typically, the number of workers is far greater than if employment was calculated based on fishing days. However, most fisheries are seasonal, the working hours at sea are typically much longer than a typical business day, and a considerable amount of employment/work activity takes place before or after the season. A more realistic and comparable employment figure would fall somewhere between the number of workers employed by commercial fisheries and average monthly employment calculated by time spent fishing.

Therefore, this analysis quantifies employment using a calculated statistic called “Average Jobs.” This approach is straightforward and provides a more relatable employment figure, from an economic evaluation standpoint. All direct and secondary job figures quoted in this report are calculated as follows:

Average Jobs = Labor Income / Average Earnings per Wage & Salary Job

Where,

Labor Income = Labor income of the economic sector or group (e.g. commercial fishing or downstream effects). Note: estimated pre-tax profits are included in labor income for the commercial fishing and tendering sectors, as it is assumed that skippers own and operate the vessels/permits.

Average Earnings per Wage & Salary Job = Total calendar year wage & salary earnings divided by average monthly wage and salary employment, calculated for Alaska and U.S. (jobs occurring in Alaska use the Alaska average while jobs occurring in rest of the U.S. use the U.S. average). This is a proxy figure for earnings in an average job occurring in Alaska and the U.S. The average earnings per Alaska wage & salary job during the study period was $52,143 while the U.S. average was $52,649.

Depending on the average compensation structure in each related industry sector, actual employment figures may differ from the average job approach. However, from an overall economic evaluation standpoint, the average job proxy is a very useful metric and addresses problems associated with quantifying employment in the commercial fishing industry.

Additionally, it is important to understand economic benefits in a geographic sense. The Bristol Bay salmon supply chain creates jobs throughout the nation and even the world. Economic benefits are further dispersed due to the fact that many Americans travel to work in the Bristol Bay salmon industry each year, then return home to their communities after the season. This chapter analyzes not only the scale of total economic benefits, but also the geographic allocation in terms of labor activity (where work occurs) and residency (where people live).

See the Appendices chapter (pages 64-73) for more information about the methodology used to estimate direct and secondary economic benefits. Definitions of economic terms can be found in the Glossary of Terms on page 4.

REGIONAL ECONOMIC BENEFITS

The Bristol Bay salmon industry is the region's economic foundation. The industry directly employs roughly one-third of working-age, regional residents and the large influx of summer workers more than doubles the regional population. The vast majority of private sector activity in the region is derived from the salmon resource, which in turn funds most local government operations.

The industry directly employs approximately 14,500 workers in the region earning an estimated $220 million per year (on average from 2013-2017). Business and household spending (resulting from the fishery) generate an estimated 542 average secondary jobs and an additional $28 million of labor income. All told, the commercial salmon industry creates an estimated 4,217 average jobs, $220 million of labor income, and $493 million of economic output per year in the region.

See table on following page.

TABLE 22

Regional Economic Benefits of the Bristol Bay Salmon Industry, 2013-2017 Avg.

ALL REGIONAL WORKERS (RESIDENT & NONRESIDENT)

Industry Sector	Number of Workers	Average Jobs	Labor Income ($Millions)	Output ($Millions)
Commercial Fishing	8,201	2,411	$125.7	$187.6
Salmon Processing	5,600	1,113	$58.0	$244.1
Management & Tendering	737	151	$7.9	-
Direct Regional Benefits	**14,537**	**3,675**	**$192**	**$432**
Secondary Regional Benefits	**-**	**542**	**$28**	**$62**
Total Regional Benefits	**-**	**4,217**	**$220**	**$493**

Note: Figures may not sum due to rounding.
Source: Wink Research estimates & calculations.

The majority of the economic activity shown above is created in Bristol Bay, but the actual economic gains are widely distributed throughout Alaska and the nation. Due to the enormous scale and short window of the salmon fishery, many industry participants come from other places to work in the Bay each summer. These workers return home after the season where Bristol Bay salmon earnings stimulate hundreds of local economies. Nonresident impacts will be incorporated into statewide and regional estimates presented later in this chapter.

Although regional residents would seemingly have an upper hand in participating in the commercial salmon industry, there are unique hurdles for regional residents. The seasonal nature of the fishery prevents many local workers with inflexible, full-time work schedules from participating. Many industry workers need or want to supplement Bristol Bay salmon earnings, but there are only so many regional employment opportunities during the offseason. Therefore, the pool of regional residents who have the ability to participate in the fishery is somewhat limited.

However, the regional salmon industry does not rely solely on nonresident labor. Many local residents are employed by the industry, particularly in the commercial fishing and support sectors. Although regional residents comprise just 6 percent of all average jobs created by the commercial fishery, no other group of stakeholders depends more upon the resource than local residents.

The commercial fishery creates an estimated 775 average jobs for regional residents and directly employs approximately 1,600 people in seasonal jobs each year. This means roughly one-third of all working-age, regional residents directly participate in the commercial salmon industry and many other regional residents can trace at least part of their job back to the salmon resource.[12] In addition, sport and subsistence salmon fisheries create hundreds of seasonal jobs for other regional residents.

TABLE 23

Regional Economic Benefits of the Bristol Bay Salmon Industry, 2013-2017 Avg.

REGIONAL RESIDENTS ONLY

Industry Sector	Number of Workers	Average Jobs	Labor Income ($Millions)	Output ($Millions)
Commercial Fishing	1,275	339	$17.7	$29.3
Salmon Processing	110	27	$1.4	$5.8
Management & Tendering	182	37	$1.9	-
Direct Benefits	**1,567**	**402**	**$21**	**$35**
Secondary Benefits	**-**	**373**	**$19**	**$43**
Total Benefits	**-**	**775**	**$40**	**$78**

Note: Figures may not sum due to rounding.
Source: Wink Research estimates & calculations.

Confidentiality restrictions on regional economic data and the relative scale of the salmon industry make it virtually impossible to accurately quantify the percentage of the local economy dependent upon the commercial salmon industry. However, available data suggests it makes up the vast majority of regional jobs, either directly or indirectly. In 2016, regional average monthly employment was approximately 4,600, plus the U.S. Bureau of Economic Analysis lists 1,450 active sole proprietors in the region (many of which are probably fishermen). The commercial salmon industry, by comparison, creates an estimated 4,217 average jobs in the region.[13]

Available data regarding wage and salary earnings in the construction, health services, business/professional services, and leisure/hospitality sectors show combined labor earnings of $55 million in 2016 (ADOLWD, QCEW). These sectors have a relatively lower

[12] Based on DOLWD population figures, it is estimated that the region contained an average of 4,684 residents between the ages of 18 and 69 during the study period.

[13] Comparing these figures still does not provide an accurate portrayal of regional employment, as the average job calculation is based on income, not the length of employment. Also, there are likely many fishermen which are not included in the regional sole proprietor employment figure.

connection to the commercial salmon industry, but pale in comparison to the estimated $220 million of labor income attributable to the commercial salmon industry.

STATEWIDE ECONOMIC BENEFITS

At a statewide level, the Bristol Bay salmon industry creates an estimated 5,216 average jobs, $272 million in labor income, and $573 million in economic output per year, including direct and secondary effects. Direct impacts are largely unchanged, outside of some additional processing of Bristol Bay sockeye which occurs primarily in Anchorage and a few fishery management jobs that are performed by non-regional staff. At a statewide level, the fishery directly creates seasonal jobs for an estimated 14,669 people. Most of these workers are employed in seasonal jobs harvesting or processing Bristol Bay sockeye.

Secondary impacts from the industry are more expansive at the statewide level, as business and household spending experience less economic leakage than the regional level. Secondary impacts at the statewide level are also bolstered by the spending of other Alaska residents who participate in the industry and business spending which occurs outside the region, such as boat building in Homer.

For context, total statewide economic benefits of the Bristol Bay salmon industry are roughly on par with average monthly employment and total wage/salary income in the Valdez-Cordova Census Area (ADOLWD, QCEW). Including secondary effects, the Bristol Bay salmon industry accounts for roughly one percent of total employment and labor income in Alaska (BEA). One percent may not sound significant, but it is a substantial figure in the context of Alaska's economy, which is large and diverse. For instance, (direct) labor earnings in the trucking, non-oil/gas mining, and utilities sectors each contribute approximately one percent to the state's total labor income.

Table 24 summarizes the total, annual economic benefits of the Bristol Bay salmon industry in the Alaska economy.

See table on following page.

TABLE 24

Statewide Economic Benefits of the Bristol Bay Salmon Industry, 2013-2017 Avg.

STATEWIDE ACTIVITY (ALASKA RESIDENTS AND NONRESIDENTS)

Industry Sector	Number of Workers	Average Jobs	Labor Income ($Millions)	Output ($Millions)
Commercial Fishing	8,201	2,411	$125.7	$187.6
Salmon Processing	5,725	1,171	$61.1	$244.1
Management & Tendering	744	162	$8.4	-
Direct Regional Benefits	**14,669**	**3,744**	**$195**	**$432**
Secondary Regional Benefits	**-**	**1,473**	**$77**	**$141**
Total Statewide Benefits	**-**	**5,216**	**$272**	**$573**

Note: Figures may not sum due to rounding.
Source: Wink Research estimates & calculations.

Table 24 quantifies the total amount of economic activity occurring within the Alaska economy stemming from the Bristol Bay salmon industry, including contributions from residents and nonresidents. Table 25, shown below, summarizes economic benefits which accrue to Alaska residents.

TABLE 25

Statewide Economic Benefits of the Bristol Bay Salmon Industry, 2013-2017 Avg.

ALASKA RESIDENTS ONLY (INCLUDING BRISTOL BAY RESIDENTS)

Industry Sector	Number of Workers	Average Jobs	Labor Income ($Millions)	Output ($Millions)
Commercial Fishing	3,375	948	$49.5	$76.8
Salmon Processing	745	85	$7.9	$31.54
Management & Tendering	417	95	$4.9	-
Direct Benefits	**4,537**	**1,128**	**$62**	**$108**
Secondary Benefits	**-**	**1,184**	**$62**	**$124**
Total Resident Benefits	**-**	**2,312**	**$124**	**$232**

Note: Figures may not sum due to rounding.
Source: Wink Research estimates & calculations.

It is estimated that the Bristol Bay salmon industry creates a total of 2,312 average jobs and $124 million in labor income for Alaska residents. The industry directly employs an estimated 4,537 Alaska residents each year in seasonal jobs. For context, this is only about 400 fewer workers than all Alaska residents employed in the Arts, Entertainment, and Recreation

sector.[14] Put another way, the total amount of Alaska resident labor income generated by the Bristol Bay salmon industry is roughly equal to all wages and salaries earned in Sitka's private sector (Kreiger, 2018).[15]

NATIONAL ECONOMIC BENEFITS

The Bristol Bay commercial salmon fishery directly employs 14,765 workers in seasonal jobs; and creates an estimated 12,537 average jobs and $658 million of labor income in the U.S. economy each year, based on an analysis of data spanning from 2013 to 2017. The fishery generated total economic output of $1.23 billion, on average per year, during the study period. See Table 26 for a summary of direct, secondary, and total economic benefits.

TABLE 26
National Economic Benefits of the Bristol Bay Salmon Industry, 2013-2017 Avg.

Industry Sector	Number of Workers	Average Jobs	Labor Income ($Millions)	Output ($Millions)
Commercial Fishing	8,201	2,411	$125.7	$187.6
Salmon Processing	5,821	1,335	$69.7	$244.1
Management & Tendering	744	162	$8.4	-
Direct Upstream Benefits	**14,765**	**3,908**	**$204**	**$432**
Secondary Upstream Benefits[1]	**-**	**5,823**	**$306**	**$531**
Total Upstream Benefits	**-**	**9,731**	**$510**	**$962**
Total Downstream Benefits[2]	**-**	**2,806**	**$148**	**$272**
Total Benefits in U.S. Economy	**-**	**12,537**	**$658**	**$1,235**

[1]Refers to secondary benefits of commercial harvesting, primary processing, tender operations, and fishery management.
[2] Includes secondary processors, food distributors, exporters & trading companies, retailers, and food service operators.
Note: Figures may not sum due to rounding.
Source: Wink Research estimates & calculations.

This analysis demonstrates that while commercial fisheries are often valued in terms of ex-vessel payments or the number of fishermen employed, the complete impacts of that production often extend far beyond the ports where fish landed. In the case of Bristol Bay

[14] Based on calculations from Table 5 of the *Nonresidents Working in Alaska, 2016* report published by AKDOLWD.
[15] Not including sole proprietor or self-employed earnings.

salmon, commercial fishermen hailing from 41 different states account for only 19 percent of total labor income and just 15 percent of total economic output. Each dollar of Bristol Bay salmon sold by commercial fishermen created an additional $2.49 of labor income for other American workers, and an additional $5.58 in economic output within the U.S. economy.

See page 44 in the Appendices for a count of Bristol Bay commercial salmon fishing permits owned by state of residence.

ALLOCATION OF ECONOMIC BENEFITS

The allocation of economic benefits derived from a public resource, like Bristol Bay salmon, is an important consideration often ignored in standard economic assessments. Not only are economic impacts associated with the Bristol Bay salmon fishery significant in scale, they are both substantial at a regional and statewide level and widely distributed across the U.S. economy.

Each driftnet boat and setnet operation is an independent small business owned by a U.S. resident. Fishery entry is regulated to preserve the ability of independent U.S. fishermen to access the resource. Fishermen and processors alike come from all over the U.S. to participate in the industry. With only a few exceptions, the vast majority of Bristol Bay salmon processors and downstream companies are also owned by U.S. residents. This means that both profits and labor income derived from the industry largely stay in the U.S. economy. Finally, business and household spending resulting from the fishery creates an enormous amount of fractional jobs throughout many local economies in the U.S.

TABLE 27
Allocation of Economic Benefits Derived from Bristol Bay Salmon Industry
BY PLACE OF RESIDENCE

Place of Residence	Bay Salmon Permit Holders[1]	Direct Industry Workers	Total Average Jobs
Regional Residents	680 (24%)	1,567 (11%)	775 (6%)
Other Alaska Residents	763 (27%)	2,970 (20%)	1,536 (12%)
Residents of Other U.S. States	1,377 (49%)	10,228 (69%)	10,221 (82%)
Total U.S. Residents	**2,820**	**14,765**	**12,537**

[1] Permit figures shown are for calendar year 2016, ownership totals do not fluctuate significantly from year to year.
Note: Figures may not sum due to rounding. Total average job figures include multiplier impacts.
Source: Wink Research estimates & calculations.

In relative terms, the fishery's economic significance is greatest within the Bristol Bay region, where it accounts for the majority of regional employment. It is estimated that the industry directly employs 1,567 regional residents in seasonal jobs and creates a total of 775 average jobs for regional residents. Although a relatively small share of total impacts, they are significant figures considering the working-age resident population in the region was approximately 4,700 during the study period (ADOLWD, Population & Census).[16] The presence of a vibrant industry and healthy resource provides significant potential for even greater participation in the future by regional residents.

Alaska residents, including regional residents, comprise approximately half of all fishery permit holders and 18 percent of all average jobs resulting from the industry. The industry is an important source of employment for Alaska residents and not just those residing in the Bristol Bay region. Other Alaska residents own 27 percent of Bristol Bay salmon permits and comprised 20 percent of all direct workers associated with the industry.

While this is a quintessential Alaska fishery, most of the economic benefits accrue to residents of other U.S. states. This occurs for a few reasons. First, the fishery is a seasonal affair that captures large volumes of salmon in a remote area. There simply are not enough local residents to prosecute the fishery and execute necessary processing operations. Even if all industry participants lived in the region year-round, there is not enough offseason employment opportunities to accommodate such a large number of people at this time. Secondly, Alaska's population is very small compared to the rest of the U.S., therefore many people who do fly in to participate in the industry are from other states. The share of secondary jobs created outside the state is relatively high for virtually all Alaska industries. Finally, the products produced from the fishery are sold across the U.S., where they create jobs in many local economies. Residents of other U.S. states own approximately half of all Bristol Bay salmon permits, account for 69 percent of direct industry workers, and comprise 82 percent of total average jobs (including multiplier effects) created by the fishery. Due to supply chain and multiplier effects, the famous Alaska salmon fishery creates many jobs across the country.

ADDITIONAL DISCUSSION: EXPORT BENEFITS

Commercial fishermen in Bristol Bay are only the first link in a supply chain that touches every U.S. state and reaches around the world. In fact, estimates about the amount of U.S.

[16] Working-age is defined as individuals between the ages of 18-64.

jobs and income resulting from the fishery greatly understate its contributions to the global economy. It is estimated that 60 percent of Bristol Bay sockeye production is exported to foreign countries, a figure including approximately 69 million pounds of processed product worth roughly $235 million per year. These exports create a significant number of jobs in other countries, and export revenue benefits the U.S. by injecting new money into the economy. Quantifying the extent of these benefits is beyond the scope of this analysis, but given the scale and value of exports, they are certainly substantial.

ADDITIONAL DISCUSSION: ECONOMIC BENEFIT TRENDS

Economic benefits generated by the fishery increased substantially in 2017 and the scale of total economic benefits quantified in future studies is likely to increase if current trends continue, due to a couple factors. Wild capture fisheries are more variable than many other economic sectors, which is why this analysis deviated from the typical economic assessment approach of using a single base year and instead averaged data/impacts across a five-year period (2013-2017). As usual, the study period encompassed a range of good and bad seasons, in terms of harvest volume and value. However, Bristol Bay salmon runs have been extremely robust in recent years and prices are trending up, largely as a result of better quality and market development efforts. The ex-vessel value of the 2017 Bristol Bay sockeye harvest was 34 percent higher than the 2013-2017 average, and while it's foolish to believe each new year will produce higher values than the last, there are good reasons to believe that performance in the next five years will exceed the 2013-2017 study period.

An expectation of increasing economic benefits in future years is also informed by anecdotal and quantifiable evidence which suggests a larger share of the Bristol Bay sockeye harvest is being consumed in the U.S. This leads to more jobs/income for distributors, retailers, restaurants, and other support industries, thereby increasing the scale of downstream activities and associated multiplier effects.

In short, the amount of benefits accruing to the U.S. economy in 2017 were significantly higher than the five-year study period average, and the fishery's multiplier effect is trending up. Economic benefits of the 2013-2017 study period are also greater than similar metrics published in the 2013 ISER study (which used 2010 as the base study year), due to a higher resource value and expanding U.S. consumption of Bristol Bay salmon.

ADDITIONAL DISCUSSION: BRISTOL BAY SALMON CAUGHT IN OTHER FISHERIES

This study does not attempt to quantify the number of salmon which originate in Bristol Bay river systems but are intercepted by commercial fisheries in the Alaska Peninsula (Area M) fishery. Located to the south of the Bristol Bay fishery region, a significant percentage of sockeye caught in the Area M fishery likely originate (and are returning) to Bristol Bay rivers according to discussion with ADF&G biologists. Unfortunately, it was not possible to determine exactly how many salmon caught in the southern part of the Alaska Peninsula are dependent upon habitat productivity in the Bristol Bay region. However, the Area M fishery averaged sockeye harvests of 28.8 million pounds during the study period. The economic benefits of Bristol Bay's commercial salmon industry would be even greater if it was possible to accurately estimate how many sockeye harvested in the south Peninsula and Area M originated in Bristol Bay.

ADDITIONAL DISCUSSION: HEALTH BENEFITS

This study does not consider the health benefits of Bristol Bay salmon, which are numerous. The fact that Americans are eating more Bristol Bay salmon likely means U.S. consumers are reaping health benefits which they may not have otherwise enjoyed. This saves money which would otherwise have been spent on health care measures, but most important contributes to a healthier population. Obviously, quantifying the effect wild sockeye consumption has on health outcomes is beyond the scope of this study; however, it is an aspect which should not be overlooked when considering the total value of the Bristol Bay salmon resource. At its core, Bristol Bay salmon is a uniquely healthy, wild protein.

ADDITIONAL DISCUSSION: SUBSTITUTION EFFECT

The substitution effect resulting from downstream sales is also not quantified in this analysis. The issue of substitution goes like this: if buyers did not purchase Bristol Bay salmon, would they not simply purchase another wild or farmed salmon to meet their food needs? People have to eat. This calls into question the dependence of some downstream jobs upon the resource. Substitution effects can be difficult to measure but are important considerations in assessing the economic value of any resource.

However, in the case of Bristol Bay salmon, the alternatives are generally less productive, from a U.S. economic standpoint. Virtually all farmed salmon consumed in the U.S. is

imported. While the role of distributing and retailing farmed salmon is similar to Bristol Bay salmon, much of the product value leaves the U.S. economy when consumers eat farmed salmon. As Bristol Bay comprises roughly half the world's sockeye salmon, there would be significantly less wild sockeye available in the absence of the Bristol Bay resource.

Like many other studies, this analysis quantifies downstream economic benefits attributable to the resource but that does not mean those downstream jobs would cease to exist if not for the resource. In this situation, the substitution issue is not a great concern. Direct and secondary labor income stemming from the harvest, processing, and shipping of Bristol Bay sockeye accounts for 78 percent of total labor income, while downstream impacts account for the balance of total labor income.

6. Fishery Cost/Revenue Analysis

Natural resources can provide public revenue but managing the extraction and allocation of natural resources also creates costs for government. Chapter 6 analyzes the costs incurred by the State of Alaska compared to local and state government revenue created by the Bristol Bay commercial salmon fishery.

FISHERY MANAGEMENT COSTS

The Bristol Bay commercial salmon fishery costs approximately $3 million per year to manage. This figure is based on a FY2018 estimate; however, ADF&G staff indicate the annual fishery management costs have been stable in recent years. Approximately 60 percent of the operating costs are needed to pay for full-time and seasonal labor. Most costs stem from payments to staff located in the Bristol Bay area or local supplies/services. However, the fishery does receive support (and bears cost) from regional management staff, most of whom are located in Anchorage.

TABLE 28
Estimated Management Costs for Bristol Bay Commercial Salmon Fishery
in $Thousands

Management Category	Annual Cost ($000s)
Regional Management Staff & IT/Administrative Support	$300
Area Management Staff, Infrastructure, & Expenses	$1,256
Catch Monitoring & Stock Origin Allocation	$230
In-Season & Post-Season Assessments of Runs & Escapement	$1,209
Total Fishery Management Costs	**$2,995**

Note: Costs are based on FY18 estimates. ADF&G staff report that management costs for previous recent years were very similar to those listed above.
Source: BBFC and ADF&G (Central Region Staff).

Chapter continues on following page.

PUBLIC REVENUES DERIVED FROM FISHERY

The Bristol Bay commercial salmon fishery creates substantial revenues for state and local government. These revenues are derived from the following taxes and fees:

- Shared Business Tax: a three to five percent tax based on ex-vessel value, shared evenly between state and local government
- Local Fish Taxes: some communities and boroughs levy an additional tax based on the ex-vessel value of fish landed in the community/area.
- CFEC Vessel and Permit Fees: the Commercial Fisheries Entry Commission collects annual fees for renewing licenses for limited entry permits and fishing vessels, a large portion of these costs are used to fund ADF&G management activities
- Property taxes: local governments levy property taxes on land used to process fish and store vessels/gear, some local governments also collect taxes on vessels/nets stored in the area

The fishery directly generated an estimated $19.3 million per year for state and local governments during the study period (2013-2017), based on a conservative estimate of tax and fee data. In years with more valuable harvests, such as 2017, the amount of revenue increases because fish taxes are based on the value of landed fish. Public revenues totaled an estimated $24.4 million in 2017. It is assumed that property taxes and CFEC fees remain relatively stable from year to year.

TABLE 29

Estimate of Selected State and Local Revenues Derived from Fishery

in $Thousands

Tax/Fee Type	2013-2017 AVG.	2017
Shared Fisheries Business Tax	$7,106	$9,239
Municipal & Borough Fish Taxes	$6,955	$9,922
CFEC Permit & Vessel Fees & ADF&G Crew Licenses	$1,417	$1,417
Bristol Bay Borough & Dillingham Property Taxes	$4,180	$4,180
Total Public Revenues	**$19,658**	**$24,758**
Local Government Revenues	**$14,688**	**$18,722**
State Government Revenues	**$4,970**	**$6,037**

Notes: Self-assessments, such as marketing taxes for ASMI and BBRSDA, are not included. Local sales taxes are also not included.

Source: Wink Research estimates.

Local government received approximately three-quarters of the total state/local revenue during the study period, while state government received the remaining one-quarter. Commercial fisheries have been criticized for not contributing greater revenues to State coffers in comparison to the oil/gas industry. However, as this conservative calculation illustrates, commercial fisheries do contribute significantly to local government revenues across much of coastal Alaska. Without these revenues derived from commercial fisheries, local governments would need to raise taxes on residents and other businesses or receive greater funding assistance from state government.

These estimates were calculated by applying applicable fish tax rates to regional salmon harvest values, multiplying permits/vessels by corresponding CFEC fees, and apportioning local property taxes. This figure does not include employment taxes for processors or local sales tax levied on purchases by fishermen and processors. This figure only applies to state and local revenue and does not include sizeable federal income tax revenues.

MANAGEMENT COSTS & PUBLIC REVENUES

It can be instructive to compare fishery management costs and public revenues in order to determine whether a resource is covering the costs government incurs to manage and monetize it. The University of Alaska Anchorage's Institute of Social and Economic Research analyzed this subject at a statewide level in a 2015 report entitled *Fiscal Effects of Commercial Fishing, Mining, and Tourism – What does the Alaska receive in revenue? What does it spend?* The report found State revenues derived from all commercial fisheries did not cover operational costs, based on an analysis of 2010-2014 data. However, when shared tax revenue allocated to local governments was included, State and local revenues from commercial fisheries exceeded the State's cost to manage/execute the fishery.

Thanks to its large scale, Bristol Bay's commercial salmon fishery typically produces more revenue for the State of Alaska than the state expends on fishery management, enforcement, and other related governance costs. From 2013 to 2017, the State of Alaska received an average of $4.97 million per year in revenues derived from the Bristol Bay commercial salmon fishery. All costs associated with managing and executing the fishery totaled $4.09 million, creating a difference of $879,000 per year or $4.40 million during the five-year period (see Table 30 on following page).

TABLE 30

Estimate of State Government Costs & Revenues Associated with Fishery

in $Thousands

State Government Costs	2013-2017 AVG.	2017
ADF&G (Commercial Fisheries Division)	$2,995	$2,995
Other (Enforcement, ADEC, CFEC, and Board of Fish)*	$1,096	$1,096
Total State Costs	**$4,091**	**$4,091**
State Government Revenues	**2013-2017 AVG.**	**2017**
Fisheries Business Tax (50%)	$3,553	$4,619
CFEC Permit & Vessel Fees & ADF&G Crew Licenses	$1,417	$1,417
Total State Revenues	**$4,970**	**$6,037**
Revenue-Cost Difference	**$879**	**$1,946**

**Estimates based on relationship between ADF&G Commercial Fisheries Division costs and other State of Alaska commercial fishery administration/management costs found in Loeffler, B. and Colt, S. (2015).*
Note: Additional industry contributions, to avoid a cost recovery fishery, for example, are not included.
Source: BBFC (Michael Link), ADF&G (Central Region Staff), and Wink Research estimates.

Assuming a relatively static amount of State revenue for CFEC permit/vessel fees and crew licenses sold to Bristol Bay fishermen, the Bristol Bay fishery has failed to exceed the $4.09 million breakeven threshold just one time since 2010. That was during the 2015 season, when the base ex-vessel price fell to $0.50/lb. Since 2010, estimated State revenues (from the Bristol Bay commercial salmon fishery) have exceeded estimated State costs by $5.3 million.

It should be noted that the figures shown above are estimates. While every reasonable effort has been made to be rigorous and complete in their compilation, there simply isn't sufficient data or scope in this project to allow for a comprehensive review. However, the costs were derived with input from ADF&G staff and the Bristol Bay Fisheries Collaborative (BBFC). It is assumed that State government costs have been relatively static over time (again, based on input from ADF&G staff), with budgetary pressures offsetting the typical course of inflation. License and fee revenue was estimated for 2016 and assumed to be static for the periods mentioned, as the differences in actual changes would have been immaterial.

Based on analyses found in this report and Loeffler & Colt (2015), it is clear that Bristol Bay salmon fisheries more than pay their way, in terms of costs borne by the State, while this is generally not true of other Alaska fisheries. The Bristol Bay revenue surplus from 2010-2014 was not enough to make up for shortfalls in other areas, resulting in an overall revenue shortfall (versus operating costs) detailed in the Loeffler and Colt report.

The State of Alaska had been dealing with significant budgetary pressures for several years, stemming from a decline in oil tax revenue. So, it was not a total surprise when the FY2016 budget did not sufficiently cover management costs in the Bristol Bay commercial fishery. The only recourse for ADF&G was to enact a cost recovery fishery in order to raise revenue for critical fishery management functions. Fishermen and processors quickly realized that a cost-recovery fishery would result in lower revenues for both parties. BBRSDA and Bristol Bay processors ended up donating $250,000 to ADF&G to avoid a cost recovery fishery in 2016. Another budget shortfall preceding the 2017 season required $180,000 from BBRSDA to prevent a cost recovery fishery. In addition, the Bristol Bay Fisheries Collaborative (BBFC) was formed in October 2016 to create an entity that could raise funds to preserve core fishery management programs. BBFC has raised several hundred thousand dollars each year in recent seasons to fund and preserve core fishery management programs and data series.

While industry realizes the State of Alaska is under continued budgetary pressure, there is concern that 1) accessing additional funding assistance from industry will become status quo moving forward and 2) that potential legislation to alter fishery taxes rates would also be applied to Bristol Bay operators, which already generate more state general fund revenue than is needed to manage and execute Bristol Bay salmon fisheries. Both of these outcomes would appear unfair, given the fishery's track record of exceeding its operating costs and the taxation structure of commercial fisheries as a whole in Alaska.

List of References

ADF&G (Alaska Department of Fish & Game). 1989. Bristol Bay Comprehensive Salmon Plan.

ADF&G (Alaska Department of Fish & Game). 2017 Bristol Bay Salmon Season Summary. http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/865497019.pdf

ADF&G (Alaska Department of Fish & Game). Commercial Operators Annual Report (COAR) and other relevant salmon data. http://www.adfg.alaska.gov/index.cfm?adfg=fishingCommercial.statisticsanddata

ADOLWD (Alaska Department of Labor and Workforce Development). 2017. Historical Quarterly Census of Employment and Wages (QCEW). http://live.laborstats.alaska.gov/qcew/

ADOLWD (Alaska Department of Labor and Workforce Development). Population & Census. http://live.laborstats.alaska.gov/pop/index.cfm

BEA (U.S. Bureau of Economic Analysis). Personal income by major component and earnings by industry and total full-time and part-time employment by industry. https://www.bea.gov/iTable/iTable.cfm?reqid=70&step=1&isuri=1&acrdn=6#reqid=70&step=1&isuri=1

BEA RIMS II (U.S. Bureau of Economic Analysis – Regional Input-Output Modeling System). https://bea.gov/regional/rims/rimsii/

BBFC (Bristol Bay Fisheries Collaborative), personal communication with Michael Link. 2018. ADF&G costs associated with managing the Bristol Bay salmon fishery.

CFEC (Commercial Fisheries Entry Commission). Fisheries Statistics: Participation and Earnings: Basic Information Tables (BITS) and Permit & Fishing Activity by Year, State, Census Area or Alaskan City, available at: https://www.cfec.state.ak.us/fishery_statistics/earnings.htm

Elison, T., P. Salomone, T. Sands, G. Buck, K. Sechrist, and, D. Koster. 2018. *2017 Bristol Bay annual management report (2017 AMR)*. Alaska Department of Fish and Game, Fishery Management Report No. 18-11, Anchorage.

Knapp, G., Guettabi, M., & Goldsmith, S. 2013. *The Economic Importance of the Bristol Bay Salmon Industry.* Institute of Social and Economic Research, University of Alaska Anchorage.

Kreiger, R. *Nonresidents working in Alaska: 2016.* Alaska Department of Labor and Workforce Development, Research and Analysis Section, Juneau.

Loeffler, B. & Colt., S. 2015. *Fiscal Effects of Commercial Fishing, Mining and Tourism: What does Alaska receive in revenue? What does it spend?* Institute of Social and Economic Research, University of Alaska Anchorage.

National Marine Fisheries Service, Office of Science and Technology (NMFS OST). Commercial Fisheries Statistics: Total Commercial Fishery Landings at Major U.S. Ports Summarized by Year and Ranked by Dollar Value. https://www.st.nmfs.noaa.gov/commercial-fisheries/commercial-landings/index

APPENDICES

APPROACH TO ECONOMIC MODELING

This study uses a multi-year approach to quantify economic benefits derived from Bristol Bay salmon caught in the region's commercial fishery because wild salmon runs and market prices can vary significantly from year to year. As a result, the amount of secondary economic benefits created from the resource can vary substantially from year to year. Direct jobs, income, and output was averaged over a five-year study period from 2013 to 2017. Indirect and induced benefits were estimated based on these annual averages and applied to 2016 BEA multipliers.

UPSTREAM IMPACTS

Data pertaining to direct-upstream operations (i.e. fishery management, harvesting, and primary processing) was compiled from several government agencies, including ADF&G, ADOR, CFEC, ADOLWD, and NOAA-NMFS. Management employment and activity was based on data supplied by the department. See Tables 39-42 for economic statistics pertaining to the commercial fishing, salmon processing, and tendering sectors. Compiling public data for use in this study's economic models required some modification. Modifications made to data covering direct activities is explained on pages containing the tables mentioned above. Most data for 2017 was either preliminary or unavailable. However, it is possible to accurately estimate final 2017 figures based on the adjustments made in previous years. These 2017 estimates were included in the study period average.

Worker counts are only available for direct-upstream activities. This is because many thousands of other support sector workers and direct-downstream jobs owe a part of their employment to the fishery, whereas direct-upstream workers are fully employed (seasonally or full-time equivalent) by their involvement in the industry. Therefore, it is not possible to compile an accurate count of workers for other sectors.

Indirect upstream benefits (based on business spending) were estimated by creating a spending model informed by previous studies and interviews with fishermen, processors, boat/permit sales representatives, and a local accountant who does taxes for many commercial fishermen. Information gathered through interviews was used to alter and updated previous assumptions about spending patterns.

TABLE 31

Upstream Business Spending & Income Assumptions, 2013-2017 Average

in $Millions

Category	Total	Bristol Bay Region	Rest of Alaska	Alaska Total	Lower 48
Total FW Value (FOB BB)	**$431.6**	**-**	**-**	**-**	**-**
Value Added by BB Processors	244.1	-	-	-	-
EV Payments to Fishermen	187.6	-	-	-	-
Processor Spending/Income	**$244.1**	**$45.1**	**$27.0**	**$71.3**	**$172.9**
Labor	60.1	1.4	5.6	7.0	51.0
Tendering	11.4	1.8	3.9	5.7	5.7
Maintenance	31.9	2.4	0.8	2.4	29.5
Packaging	18.6	-	-	-	18.6
Fishermen's Support Services	19.8	3.0	3.0	5.9	13.9
Fixed & Variable Supplies	14.3	1.5	1.1	2.5	11.8
State & Local Taxes	19.7	14.7	7.1	21.8	-
Fuel & Utilities	15.7	15.7	-	15.7	-
Insurance	5.9	-	-	-	5.9
Food	5.1	0.5	-	0.5	4.6
Air Travel	7.7	2.6	2.5	5.1	2.6
Rents & Leases	1.3	1.3	-	1.3	-
Other & Returns to Investment	32.4	0.2	3.1	3.2	29.2
Fishermen Spending/Income	**$187.6**	**$22.8**	**$7.4**	**$30.2**	**$30.5**
Crew Shares	44.6	5.3	11.8	17.1	27.5
Maintenance	8.3	3.4	3.4	6.9	1.4
Vessel and Gear Replacement	19.3	2.6	1.1	3.7	15.6
Insurance	5.7	-	-	-	5.7
Fuel, Oil, and Lubricants	5.6	5.6	-	5.6	-
Miscellaneous Gear & Supplies	5.5	3.2	-	3.2	2.3
Transportation	5.6	1.1	1.7	2.8	2.8
Food	4.5	3.0	-	3.0	1.5
Moorage, Storage, & Haul-Out	3.3	3.3	-	3.3	-
Administrative Services	1.9	0.4	0.4	0.8	1.1
Property Tax & Permit/Lic. Fees	1.6	0.8	0.8	0.8	-
Retained by Permit Holders	79.2	12.4	20.0	32.4	46.8

Notes: See Glossary on page 4 for abbreviation definitions.

Source: Wink Research estimates, based on industry interviews and ISER 2013.

Spending on freight and handling was estimated based on processed production data and the author's knowledge about general freight costs. Air cargo shipments of fresh salmon (annual average of 5.2 million pounds) products were assumed to generate $1.50 of spending per pound, with $0.50 per pound going to the regional economy and $1.00 per pound going into the rest of the Alaska economy. Marine cargo shipments of frozen and canned salmon to domestic ports (annual average of 89.8 million pounds) were assumed to generate $0.30 of spending per pound, divided equally between the regional economy and rest of the Alaska economy. This split was done to capture residual impacts of marine cargo activity in the rest of Alaska.

Business spending and initial transportation costs were applied to sets of 2016 multipliers purchased from the U.S. Bureau of Economic Analysis (BEA). Specifically, the model applied spending to equivalent industry sectors to calculate Type II labor income and value-added impacts. Type II impacts include the indirect effects of changes in output (i.e. business spending) and the induced effects of household spending created by the original industry business spending.

Induced impacts stemming from direct-upstream household income had to be modeled separately. This household income was applied to household sector multipliers provided by BEA. Residency matters a great deal with it comes to the induced impacts. BEA multipliers are computed to adjust for study area residency patterns but if the sector in question varies significantly from the study area as a whole, the analysis can produce unrealistic results. Therefore, residency data from DOLWD was used to adjust BEA household multipliers for the Bristol Bay region and the State of Alaska. The adjustment produced a multiplier which was more accurate in capturing the induced impacts of resident household income. Resident income, at a regional and statewide level was then applied to the adjusted resident household multipliers. A conservative assumption about nonresident spending in the Bristol Bay region and Alaska economy was made, and also applied to the household multiplier. Original BEA household multipliers and the adjusted regional/Alaska resident multipliers are provided on the following page.

TABLE 32

BEA and Adjusted Household Multipliers Used in this Study

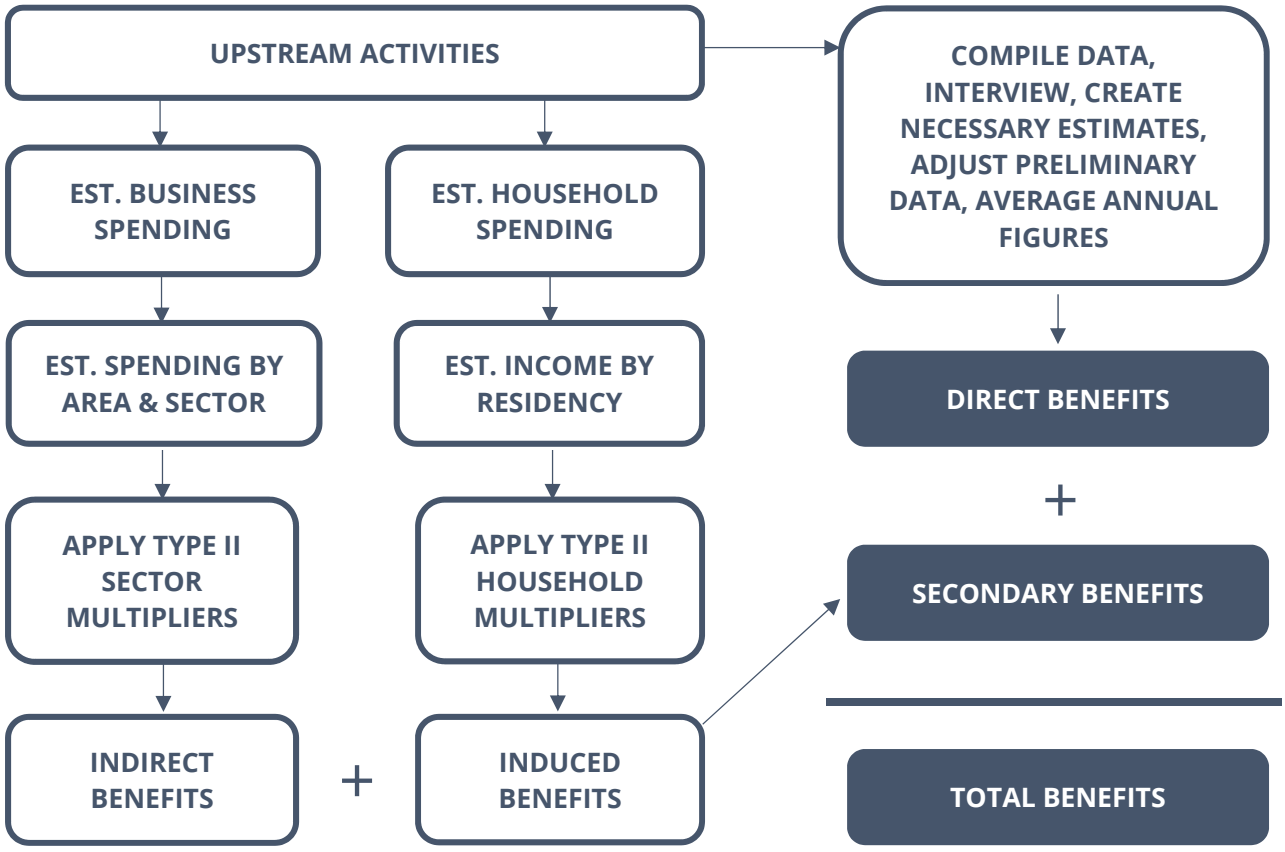
Changes in Metric (in $Millions) per $1 Million Change in Direct Income

	---------- BEA ----------		Pct.	------ ADJUSTED ------	
Study Area	Labor Income	Value Added	Nonres. $Wages	Labor Income	Value Added
Region (Bristol Bay)	0.1069	0.2577	62.4%	0.1714	0.4132
State (Alaska)	0.2812	0.5394	15.5%	0.3328	0.6383
Lower 48 States	0.5824	1.109	N/A	0.5824	1.109

Source: BEA, ADOWLD (Nonresidents Working in Alaska, 2016), and Wink Research estimates.

The process of quantifying and modeling upstream activities is straightforward, though can be difficult to explain through text or data alone. The diagram below conceptualizes the steps taken to quantify direct and secondary impacts created by upstream activities.

PROCESS OF QUANTIFYING DIRECT AND SECONDARY UPSTREAM ACTIVITIES



It was not assumed that all secondary jobs created in Bristol Bay or elsewhere in Alaska were filled by regional or Alaska residents. Residency assumptions pertaining to secondary economic benefits (indirect and induced) were based on 2016 nonresident wage and salary earnings versus total wage and salary earnings for the regional and statewide study areas. As shown above, nonresident earnings data was also used to make necessary adjustments to induced multipliers.

DOWNSTREAM IMPACTS

Bristol Bay salmon creates additional jobs in the U.S. economy based on secondary processing/manufacturing, shipping, and retailing (in grocery stores and restaurants). Downstream activities include domestic warehousing and product storage, transport from storage or port facilities, secondary processing, canned salmon labeling, distributing, and retailing. Downstream activities are not unique to Bristol Bay salmon and would likely exist in roughly the same scale if not for the fishery's production, assuming consumers chose to eat some other type of seafood.

An updated national supply chain model was created for this study to quantify the amount of Bristol Bay salmon which is sold at retail in the U.S. The supply chain model is a critical component of national estimates, as downstream activities involving shipping, secondary processing, and retailing (at grocery stores and food service operators) are the basis for many economic benefits derived from the resource. The amount of Bristol Bay salmon sold and consumed in the U.S. was estimated using statewide data on production of sockeye products, subtracting foreign exports of relevant products, and apportioning the remaining supply to the amount which likely came from Bristol Bay.

TABLE 33
Estimate of U.S. Market Supply of Bristol Bay Salmon Products
in Millions lbs.

	ISER 2013 (Study Year: 2010)	Wink Research (2013-2017 Avg.)
Total Processed Production	116.7	124.6
Exported Directly from Alaska	44.3	35.1
Shipped to Other States	72.4	89.6
Exported from Other States	52.2	39.0
Total Exports	96.5	74.1
Volume into the U.S. Market	**20.2**	**50.6**

Note: Pink and chum salmon caught in Bristol Bay are assumed to be exported while Chinook and coho salmon are assumed to be sold/consumed in the domestic market.
Source: ISER 2013 and Wink Research estimates.

Downstream economic benefits were quantified based on estimates about business spending and/or the amount of value added to each sector, as a result of Bristol Bay sockeye entering downstream sectors. Business spending and value-added amounts were applied to BEA RIMS II multipliers to calculate the total amount of direct and secondary labor income and residual economic output created by each activity (e.g. labeling canned salmon, retailing).

Downstream economic benefits primary stem from activity in the retailing and distribution sectors, secondary processing, trucking, and canned salmon labeling/warehousing. Estimates used to quantify economic benefits of Bristol Bay sockeye in these sectors are explained in greater detail below.

Labeling and Warehousing Canned Salmon

First wholesale data and foreign trade figures were used to estimate the value and volume of canned Bristol Bay salmon which is shipped to other places in the U.S. ISER 2013 estimates regarding warehousing and labeling costs were adjusted for inflation and volume and applied to the study period average. Inbound transportation costs were not tallied in this segment as they were already captured as part of upstream activities. The data was applied to multipliers for equivalent sectors in the BEA RIMS II database.

TABLE 34
Downstream Impacts Estimate: Warehousing & Labeling Canned Salmon
2013-2017 Annual Average

Estimated Canned Product Value Shipped to Other States ($Millions)	$99.6
Canned Production Shipped to Other States (Millions lbs.)	23.7
Handling & Storage Costs ($0.023/lb. x 23.7 M lbs.)	$686,867
Labeling & Ink Jetting Costs ($0.034/lb. x 23.7 M lbs.)	$1,010,641
Total Average Jobs (direct + secondary)	24
Total Estimated Labor Income (direct + secondary)	$1,274,770
Total Estimated Value Added (direct + secondary)	$2,167,409

Source: Wink Research estimates based on ISER 2013, ADF&G, and BEA RIMS II multipliers.

Truck Transportation

Virtually all Bristol Bay salmon consumed in the domestic market is transported to market via truck (even fresh fish flown in must be trucked to retail locations). Trucking costs vary depending on numerous factors: shipment volume, distance, refrigeration, and fuel prices. Creating a sophisticated model capable of reflecting actual product movement was outside the scope of this analysis and would be very difficult given the lack of available data. However, after surveying a variety of trucking rates and drawing on industry resources, it was estimated that $0.08 per pound would be a reasonable proxy for trucking costs. For some routes, this would appear to be a high figure; however, a great deal of product is shipped twice (once from port to warehouse and again from warehouse to customer). In addition, smaller shipments to customers typically incur higher transportation costs per pound.

TABLE 35
Downstream Impacts Estimate: Truck Transportation
2013-2017 Annual Average

Bristol Bay Salmon Products Sent into U.S. Market (in Millions lbs.)	50.6
Estimated Truck Transport Costs per Pound	$0.08
Estimated Total Truck Transportation Costs	$4,046,978
Total Average Jobs (direct + secondary)	68
Total Estimated Labor Income (direct + secondary)	$3,556,889
Total Estimated Value Added (direct + secondary)	$6,039,305

Source: Wink Research estimates based on ADF&G and BEA RIMS II multipliers.

Secondary Processing

It is estimated that 26.7 million pounds/year of fresh and frozen H&G sockeye was sent into the U.S. market during the study period. The vast majority of this fish is filleted and sold to retailers or restaurants, but a smaller portion is also smoked or used in a variety of consumer-packaged goods. Filleting and selling all this fish creates jobs in the domestic market. Again, estimates began with first wholesale data about fresh/frozen H&G production volume and value. The headed/gutted volume was converted into an equivalent fillet weight, then applied a price of $6.20/lb – a price reflected in study period averages. Filleting

headed/gutted salmon was used as a straightforward proxy for estimating total additional economic output.

TABLE 36
Downstream Impacts Estimate: Secondary Salmon Processing
2013-2017 Annual Average

Estimated Value of H&G Bristol Bay Salmon into U.S. Market (including freight costs to secondary processor, $Millions)	$97.3
Estimated Volume of H&G Bristol Bay Salmon into U.S. Market (Millions lbs.)	26.7
Estimated New Fillet Production Volume (Millions lbs.)	19.1
Estimated New Fillet Wholesale Value ($Millions)	$118.7
Total Average Jobs (direct + secondary)	341
Total Estimated Labor Income (direct + secondary, $Millions)	$17.9
Total Estimated Value Added (direct + secondary, $Millions)	$32.7

Source: Wink Research estimates based on ADF&G, ADOR, and BEA RIMS II multipliers.

Distribution & Retailing

Distributing, retailing, and serving tens of millions of pounds of Bristol Bay salmon to U.S. consumers each year creates a significant number of jobs. These impacts are widely dispersed within the domestic economy, as Bristol Bay sockeye may account for a small fraction of a fishmonger's revenue or comprise one of three dozen menu items at a restaurant. However, these sales form the basis for many direct and secondary jobs.

This analysis sought to estimate a wholesale CIF value (cost including insurance and freight) and applied a markup to account for operating costs and profit involved in distribution and retail. The markup amount (after debiting trucking costs) was used as a proxy for value added by the retail and distribution sector. It should be noted that, in this context, the term retail includes restaurants. A markup of 60 percent was used because it was believed to be an accurate representation of the difference between first wholesale prices and average grocery store prices. Unfortunately, it was not possible to ascertain how much Bristol Bay salmon is sold in grocery stores versus restaurants. The markup in restaurants is no doubt much higher; however, there are many more factors that go into creating the value of the product (i.e. menu item) as opposed to a grocery store. Therefore, all sales were applied to the food and beverage store sector. Further research would be needed to understand how

much Bristol Bay sockeye products are sold in grocery stores versus restaurants or other markets.

One final note, the multipliers used include the impacts of distributors. So even though no separate analysis was conducted to quantify their activities, they are included in the figures.

TABLE 37
Downstream Impacts Estimate: Distribution & Retailing
2013-2017 Annual Average

Estimated Wholesale Value of Bristol Bay Salmon Products Sold into the Domestic Market ($Millions)	$244.7
Estimated Trucking Costs (from above, $Millions)	$4.0
Estimated CIF* Value ($Millions)	$248.7
Estimated Retail Markup of 60% ($Millions)	$149.2
Total Average Jobs (direct + secondary)	2,374
Total Estimated Labor Income (direct + secondary, $Millions)	$125.0
Total Estimated Value Added (direct + secondary, $Millions)	$231.4

CIF = cost, insurance, and freight (generally, the total price/value of the product delivered to the buyer).
Source: Wink Research estimates based on ADF&G, ADOR, and BEA RIMS II multipliers.

Value Added vs. Economic Output

The methodology used in this analysis takes care not to double count economic output stemming from supply chain business activities. For instance, a value-added approach is used to quantify the effects of a fisherman's spending on boat maintenance. The output figure in this case represents the amount of value added, directly and secondarily, to the economy by the boat maintenance activities. Therefore, it does not include the fishermen's spending itself in the output figure, as that revenue was earned through ex-vessel payments and is already included in economic output of the commercial fishing sector. Due to differences in how economic output was handled in this study, the alternative approach to counting average jobs, and differences in economic models across years, the relationship between jobs, income, and output may differ somewhat in this report compared to previous years.

In 2013, economists from the University of Alaska-Anchorage's Institute of Social Economic Research (ISER) analyzed the economic impacts of the Bristol Bay salmon fishery. Despite some methodological differences, a few comparable ratios were found to be similar in this study versus the ISER analysis (see table on following page). These similarities suggest that

each study found a relatively consistent relationship between: 1) resource value and secondary labor income (i.e. multiplier impacts) created from upstream activities and 2) the total amount of labor income generate per pound of Bristol Bay salmon sold into the domestic market.

TABLE 38
Comparison of ISER and Wink Research Studies

Comparison	ISER 2013	Wink 2018
Total Labor Income to Ex-Vessel Value Ratio	2.01	2.49
Upstream Labor Income to Ex-Vessel Value Ratio	1.75	1.83
FW Value to Secondary Upstream Labor Income Ratio	0.69	0.71
Total Distribution/Retail Labor Income per Pound of Product Sold into Domestic Market*	$2.27	$2.47
Total Direct + Secondary Labor Income ($Millions)*	$542	$660

** ISER figure adjusted for inflation. Other ratios do not require inflation adjustment.*
Source: Wink Research and ISER 2013.

The differences which arise with respect to labor income ratios are largely due to more product being sold into the U.S. market versus 2010 (the base year of the ISER 2013 study) and inflationary effects. The amount of upstream impacts, relative to the resource value was found to be relatively consistent—roughly $1.80 of total upstream labor income created for each dollar of ex-vessel value. Total labor income figures are generally higher in this study due to the fact that more product is now being sold into the domestic distribution and retail sectors and real resource value was slightly higher during the 2013-2017 study period than 2010. In addition, this study uses a slightly higher value-added assumption for this sector than the ISER 2013 study (60% vs. 50%).

REFERENCE TABLES

Tables in this section provide additional detail for many of the statistics and findings contained in this report.

TABLE 39

Bristol Bay Salmon Commercial Fishery Statistics

2013-2017 Annual Average

Gear & Residency	Permits Fished	Est. Crew Members	Gross Earnings ($M)	Gross per Active Permit	Est. Labor Income ($M)
Driftnet Total	**1,529**	**3,631**	**$155.6**	**$101,757**	**$102.7**
Local Resident	297	N/A	$18.1	$61,078	$12.0
Alaska Resident	689	N/A	$57.2	$83,068	$37.8
Nonresident	840	N/A	$98.3	$117,082	$64.9
Setnet Total	**869**	**2,172**	**$32.0**	**$36,826**	**$23.0**
Local Resident	318	N/A	$11.2	$35,211	$8.1
Alaska Resident	558	N/A	$19.5	$35,005	$14.1
Nonresident	310	N/A	$12.4	$40,102	$9.0
Combined Total	**2,398**	**5,803**	**$187.6**	**$78,228**	**$125.7**
Local Resident	615	660*	$29.3	$47,699	$17.7
Alaska Resident	1,247	2,128	$76.8	$61,549	$49.5
Nonresident	1,150	3,428	$110.8	$96,311	$74.3

Note: Adjustments were made to preliminary 2017 CFEC data in order to reflect final totals, which were not available at the time of analysis.
**Figure sourced from crew member license database, other crew member figures are estimated based on crew factors & gross earnings by fishery/residency (see further explanation below).*
Source: CFEC and Wink Research estimates.

TABLE 40

Bristol Bay Salmon Commercial Fishery Assumptions

2013-2017 Annual Average

Estimated Driftnet Labor Income (as Pct. of Gross Earnings)	66%
Estimated Setnet Labor Income (as Pct. of Gross Earnings)	72%
Estimated Crew Members per Active Driftnet Permit*	2.375
Estimated Crew Members per Active Setnet Permit*	2.500
Estimated Crew Shares in Driftnet Fishery (as Pct. of Gross Earnings)	23.75%
Estimated Crew Shares in Setnet Fishery (as Pct. of Gross Earnings)	30.00%

** Crew factors were only used to calculate total crew. Local resident crew totals were based on adult crew license sales to local residents, with the assumption that all local residents who purchased crew licenses during the study period participated in the Bristol Bay salmon fishery. Crew estimates in other residency categories were estimated based on gross earnings by fishery/residency with the assumption that gross earnings by residency within each fishery is likely a good proxy for overall crew residency patterns. There is no way to link crew licenses sales to the fishery (or fisheries) in which they participate.*
Source: Wink Research estimates based on interviews with industry members.

TABLE 41

Bristol Bay Salmon Processing Sector Statistics & Assumptions

2013-2017 Annual Average

Regional Seafood Processing Workforce in July (Avg. Number of Workers)	5,176
Assumed Number of Workers at King Cove Plant*	424
Estimated Total Number of Salmon Processing Workers	5,600
Regional Seafood Processing Labor Income (including King Cove estimate, $M)	$58.0
Estimated Pct. of Labor Income earned by Local Residents	2.4%
Estimated Pct. of Labor Income earned by Other Alaska Residents	9.7%
Estimated Pct. of Labor Income earned by Nonresidents	87.9%
Estimated Number of Workers in Other Alaska Regions Processing BB Salmon	125
Estimated Labor Income ($M)	$1.30
Pct. Alaska Resident	50%

** The Peter Pan Seafoods plant in King Cove lies outside the Lake and Peninsula Borough but processes a significant volume of Bristol Bay salmon. Therefore, estimates about employment and labor income at the plant were added to processing sector data aggregated for the Bristol Bay Borough, Dillingham Census Area, and Lake and Peninsula Borough.*

Note: Residency percentages are based on past nonresident hire analyses performed by ADOLWD.

Source: Wink Research estimates based on ADOLWD.

TABLE 42

Bristol Bay Salmon Tendering Assumptions

2013-2017 Annual Average

Regional Salmon Tender Vessel Count (from ADF&G)	164.8
Estimated Daily Tender Vessel Rate	$1,900
Estimated Additional Fuel Costs per Boat/Day	$300
Estimated Active Days	30
Estimated Crew per Tender (Including Skipper)	4.0
Estimated Share of Daily Rate (not including fuel) Crew+Skipper / Boat Expenses	75% / 25%
Estimated Number of Tender Workers	659

Note: Tender residency percentages used in calculations were derived from 2017 CFEC vessel ownership file.

Source: Wink Research estimates based on ADF&G, CFEC, and industry interviews.

TABLE 43

U.S. Consumer Price Index, 1984-2017

Year	Monthly Index Average	Year	Monthly Index Average
1984	103.9	2001	177.1
1985	107.6	2002	179.9
1986	109.6	2003	184.0
1987	113.6	2004	188.9
1988	118.3	2005	195.3
1989	124.0	2006	201.6
1990	130.7	2007	207.3
1991	136.2	2008	215.3
1992	140.3	2009	214.5
1993	144.5	2010	218.1
1994	148.2	2011	224.9
1995	152.4	2012	229.6
1996	156.9	2013	233.0
1997	160.5	2014	236.7
1998	163.0	2015	237.0
1999	166.6	2016	240.0
2000	172.2	2017	245.1
2013-2017 Average: 238.4			

Note: All Urban Consumers Current Series, Monthly Average.
Source: U.S. Bureau of Labor Statistics.

TABLE 44

Permit Ownership by Gear Type & State of Residence, 2017

in Bristol Bay Commercial Salmon Fishery

State	Driftnet	Setnet	Total
TOTAL	**2,545**	**1,358**	**3,093**
AK	1,150	901	2,051
WA	841	182	1,023
CA	157	61	218
OR	137	48	185
MT	18	30	48
MN	23	21	44
CO	21	18	39
ID	27	12	39
UT	22	10	32
AZ	17	5	22
FL	16	4	20
HI	19	1	20
NC	13	1	14
MI	6	5	11
TX	10	1	11
NY	5	4	9
NV	6	2	8
WY	1	7	8
NM	3	4	7
SD	1	6	7
KY	2	5	7
MA	5	1	6
MD	1	5	6
PA	4	2	6
TN	3	3	6
VA	2	2	4
MO	3	1	4
ME	3	1	4
IN	2	2	4
WI	3	1	4
OH	1	3	4
NH	3	0	3
IL	1	2	3

GA	2	1	3
AL	3	0	3
DC	2	0	2
SC	1	1	2
CT	1	1	2
IA	1	0	1
NE	1	0	1
MS	0	1	1
OK	0	1	1
Unknown	8	2	10

Source: CFEC (2017 permit ownership file).

TABLE 45

Historical Bristol Bay Salmon Harvest Volume and Value, 1884- 2017

Year	Salmon Harvested (000s lbs.)	Estimated Real $EV ($Millions)	Year	Salmon Harvested (000s lbs.)	Estimated Real $EV ($Millions)
1884	4	<$0.05	1951	4,566	$26.0
1885	146	$0.3	1952	11,588	$65.5
1886	509	$0.9	1953	6,546	$35.9
1887	758	$1.3	1954	5,236	$29.9
1888	937	$1.6	1955	4,858	$29.8
1889	1,210	$2.1	1956	9,419	$64.3
1890	1,235	$2.1	1957	6,695	$49.0
1891	1,391	$2.4	1958	4,718	$30.3
1892	662	$1.1	1959	5,192	$41.5
1893	1,058	$11.8	1960	15,451	$128.1
1894	1,293	$13.3	1961	12,752	$97.4
1895	1,520	$15.8	1962	6,433	$48.7
1896	2,362	$29.9	1963	3,345	$28.7
1897	3,523	$35.9	1964	8,124	$60.7
1898	5,063	$51.2	1965	24,738	$215.4
1899	5,268	$54.1	1966	12,262	$87.3
1900	8,613	$88.4	1967	4,979	$40.7
1901	10,562	$107.4	1968	5,290	$18.0
1902	13,614	$136.5	1969	7,163	$62.2
1903	16,708	$169.0	1970	22,051	$174.7
1904	12,566	$126.2	1971	10,397	$84.0
1905	15,379	$155.6	1972	3,283	$23.9
1906	13,329	$122.7	1973	1,547	$19.0
1907	11,313	$112.3	1974	2,678	$32.4
1908	17,286	$171.4	1975	5,301	$53.2
1909	16,188	$163.8	1976	8,108	$94.7
1910	12,797	$125.3	1977	6,718	$108.2
1911	9,498	$96.1	1978	16,525	$208.0
1912	22,024	$210.6	1979	22,847	$446.9
1913	21,433	$212.6	1980	28,070	$249.6

Year	Salmon Harvested (000s lbs.)	Estimated Real $EV ($Millions)	Year	Salmon Harvested (000s lbs.)	Estimated Real $EV ($Millions)
1914	21,527	$212.7	1981	27,748	$358.1
1915	15,794	$158.9	1982	18,453	$200.6
1916	20,094	$192.7	1983	39,331	$351.1
1917	25,060	$253.1	1984	30,776	$244.0
1918	24,651	$242.6	1985	25,055	$270.6
1919	7,615	$80.5	1986	17,680	$316.3
1920	11,658	$103.4	1987	17,739	$299.5
1921	16,213	$164.1	1988	16,662	$399.7
1922	24,672	$246.2	1989	30,274	$413.4
1923	18,443	$186.9	1990	35,215	$400.6
1924	10,803	$108.5	1991	27,259	$207.2
1925	8,255	$84.4	1992	33,560	$363.5
1926	20,116	$201.1	1993	41,460	$283.0
1927	11,352	$115.5	1994	36,525	$325.6
1928	20,224	$203.4	1995	45,398	$315.4
1929	13,019	$131.7	1996	30,589	$237.2
1930	4,874	$48.6	1997	12,604	$105.0
1931	13,474	$133.8	1998	10,721	$106.9
1932	16,093	$158.0	1999	26,392	$168.4
1933	24,030	$242.6	2000	21,070	$120.1
1934	21,024	$211.4	2001	15,055	$56.6
1935	3,101	$31.0	2002	11,200	$43.6
1936	21,416	$211.6	2003	15,790	$64.5
1937	21,598	$217.4	2004	27,286	$100.4
1938	25,296	$253.7	2005	26,077	$122.9
1939	14,301	$140.2	2006	31,069	$136.2
1940	5,318	$50.6	2007	31,830	$139.5
1941	7,743	$76.2	2008	29,366	$137.9
1942	6,733	$66.3	2009	32,547	$169.3
1943	17,750	$178.3	2010	31,537	$185.7
1944	11,957	$119.1	2011	22,404	$173.2
1945	7,979	$77.8	2012	22,642	$152.3

Year	Salmon Harvested (000s lbs.)	Estimated Real $EV ($Millions)	Year	Salmon Harvested (000s lbs.)	Estimated Real $EV ($Millions)
1946	8,407	$84.0	2013	16,770	$159.3
1947	18,909	$190.8	2014	31,205	$229.4
1948	15,155	$151.2	2015	36,687	$129.4
1949	6,796	$68.4	2016	39,452	$196.5
1950	7,410	$33.4	2017	40,542	$247.4
		1884-2017 Total:		**2,069,961**	**$18,236.3**

Note: inflation adjustments were made using the U.S. Consumer Price Index for All Urban Consumers, Current Series, not seasonally adjusted.
*Sources: Harvest figures: non-sockeye 1884-1974: ADF&G 1989 Bristol Bay Comprehensive Salmon Plan, non-sockeye 1975-2017: ADF&G (COAR), sockeye 1894-2015: ADF&G (Personal communication with area biologist Tim Sands), sockeye 2016-2017: ADF&G (COAR); Estimated real ex-vessel value: 1884-1950: real average ex-vessel price/species from 1950-2000 * annual harvest volume, 1950-1975: real NMFS (OST) price by species * annual harvest volume, 1975-2017: ADF&G (COAR).*

TABLE 46

Participation in Bristol Bay Salmon Fisheries and Economic Value of Bristol Bay Sockeye, 2003-2017

Year	Active Driftnet Permits	Active Setnet Permits	Sockeye Harvest M-LBS.	Sockeye Ex-Vessel Value ($M)	Sockeye Average $EV Price ($$/LB.)	Sockeye First Wholesale Value ($M)
2003	1,424	760	93	$48	$0.51	$116
2004	1,411	795	148	$76	$0.51	$177
2005	1,447	829	155	$96	$0.62	$220
2006	1,475	844	164	$109	$0.66	$238
2007	1,468	835	173	$116	$0.67	$249
2008	1,469	850	159	$119	$0.75	$268
2009	1,444	843	183	$146	$0.80	$293
2010	1,494	861	170	$161	$1.07	$390
2011	1,524	878	135	$157	$1.17	$352
2012	1,513	883	119	$139	$1.18	$284
2013	1,488	847	92	$148	$1.61	$312
2014	1,541	875	162	$217	$1.35	$396
2015	1,545	885	193	$123	$0.64	$374
2016	1,538	858	201	$189	$0.94	$467
2017	1,532	879	*208*	$243	$1.17	$542

Note: All dollar figures are shown in nominal terms.
Source: CFEC & ADF&G (COAR).

TABLE 47

Historical Permit Value in Bristol Bay Commercial Salmon Fishery

Year	Driftnet Permit Value	Setnet Permit Value
1995	$195,000	$42,200
1996	$171,800	$41,100
1997	$153,800	$39,000
1998	$99,500	$30,400
1999	$89,700	$31,300
2000	$80,500	$32,400
2000	$34,700	$25,300
2001	$19,700	$12,100
2002	$29,300	$12,600
2003	$37,000	$14,300
2004	$51,200	$15,100
2005	$75,000	$22,400
2006	$79,400	$24,000
2007	$89,800	$27,400
2008	$78,300	$28,200
2009	$102,100	$28,700
2010	$143,900	$35,900
2011	$110,800	$40,300
2012	$100,400	$39,900
2013	$149,500	$38,600
2014	$148,200	$38,500
2015	$109,300	$33,700
2016	$133,300	$38,700
2017	$195,000	$42,200

Note: All dollar figures are shown in nominal terms.
Source: CFEC.

www.winkresearch.com
15527 Hampshire Ln, Savage, MN 55378
Phone: 907.209.2135