

Economic Impacts of Pacific Salmon Fisheries

Prepared for:

Pacific Salmon Commission
Vancouver Canada

Prepared by:

Gordon Gislason
Edna Lam

GSGislason & Associates Ltd.
Vancouver Canada

and

Gunnar Knapp
Mouhcine Guettabi

Institute of Social & Economic Research
University of Alaska Anchorage
Anchorage U.S.A.

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Preface

This report was prepared for the Pacific Salmon Commission by GSGislason and Associates Ltd. and the University of Alaska Anchorage Institute of Social & Economic Research. The purpose of the report is to provide a comprehensive analysis of economic impacts of commercial and recreational salmon fisheries in the Pacific Northwest region of Oregon, Washington, British Columbia and SE Alaska.

The consultants have benefited greatly from discussions with industry, government agencies and others. Notwithstanding this assistance, the consultants have final responsibility for the analyses and conclusions of the study.

The results and commentary have been revised very slightly from a prior version of the report.

Summary

- This study demonstrates the substantial economic importance of the Pacific Northwest commercial and recreational salmon fisheries in SE Alaska, British Columbia, Washington and Oregon.
- Over the 2012 to 2015 period, the contribution of the commercial and recreational sectors combined averaged (values in USD):
 - \$3,431 million in Output, \$1,996 million in Gross Domestic Product (GDP), \$1,229 million in Labor Income or Wages and 26,700 Full Time Equivalent (FTE) jobs to the United States economy
 - \$1,364 million in Output, \$850 million in Gross Domestic Product, \$485 million in Labor Income and 12,400 FTE jobs to the Canadian economy

Both the commercial and recreational salmon fishing sectors are major contributors to these economic impacts - see accompanying Exhibits. Both the United States and Canada receive substantial income and employment activity in the two sectors. Many of the jobs occur in rural coastal communities that do not have the alternative job opportunities of major urban centers.

For the two countries in total, the economic impacts are evenly split between commercial and recreational sectors. The commercial salmon sector is relatively more important in economic terms than the recreational salmon sector in the United States. The recreational salmon sector is relatively more important in economic terms than the commercial sector in Canada.

- The substantial economic impacts occur not only in the regions where the salmon fisheries occur. There is substantial spillover impacts on the whole North American economy through the selling of salmon in stores and restaurants across the continent and through the multiplier impacts from regional spending in both commercial and recreational sectors. Approximately 40% of U.S. impacts occur in states other than Alaska, Washington and Oregon. Approximately 25% of Canadian impacts occur in provinces other than British Columbia.

Seattle and Washington State are major economic beneficiaries of important inter-regional linkages in the commercial salmon industry, both within the U.S. and between the U.S. and Canada. The region is a major supply center to Alaskan fishing businesses and a major distribution point for Alaskan and British Columbian salmon.

- There is significant variation from year to year in income and employment impacts, variation that is primarily due to variability in commercial sector activity. For this reason, economic results are presented for each of the four years 2012 to 2015.

United States & Canada	Year				4 Year Average
	2012	2013	2014	2015	
\$ millions USD					
Output	4,197	5,296	5,314	4,370	4,795
GDP	2,467	3,168	3,208	2,541	2,846
Labor Income	1,499	1,906	1,894	1,552	1,714
Employment					
FTE Jobs*	33,410	41,720	43,740	37,480	39,090

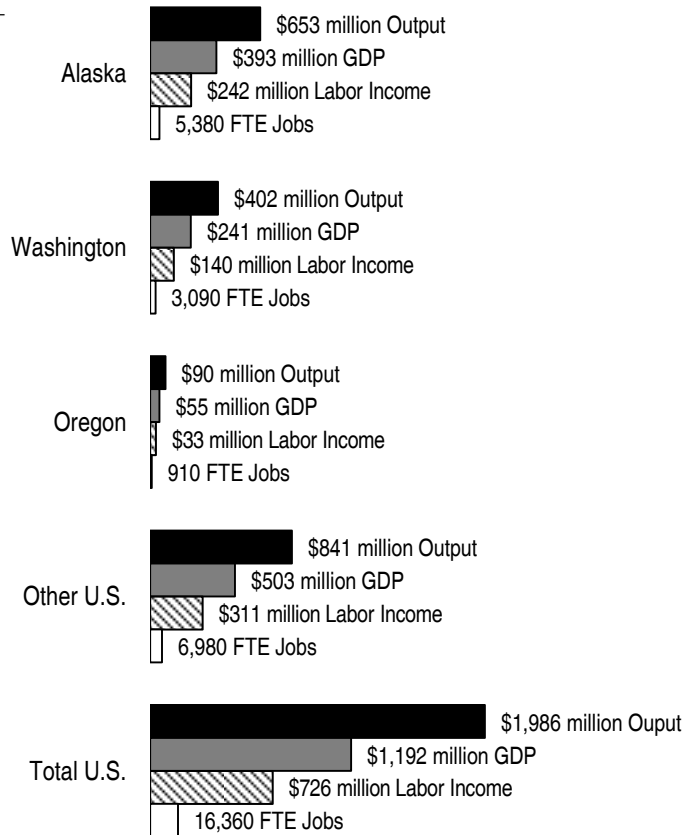
* Full Time Equivalent.

- This report can be used to convey the significance of salmon fisheries to the regional economies of the Pacific Northwest. However, the analysis in this report was not designed for and should not be used for allocation decisions between salmon fisheries or resource policy choices between salmon and other natural resources.
- In addition to their economic importance, salmon are especially important to the native peoples of the Pacific Northwest for whom salmon is not only an important food for sustenance but also a strong spiritual symbol and central to longstanding traditions and cultural expression.

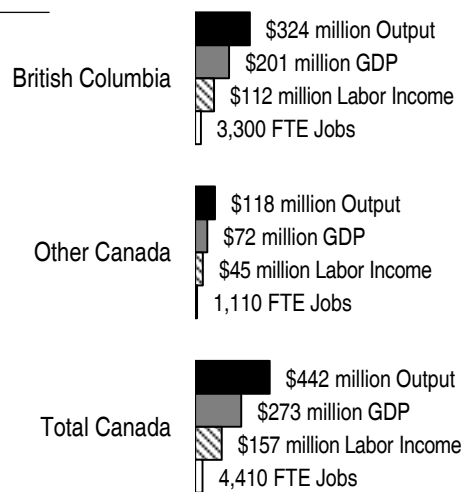
Beyond their significant economic importance, salmon are an iconic species of enormous cultural and ecological importance. It is critical to recognize the non-monetary values associated with salmon as well as those which can be measured in economic terms.

Exhibit A: Commercial Salmon Industry - Average 2012 to 2015 Economic Impacts*

United States



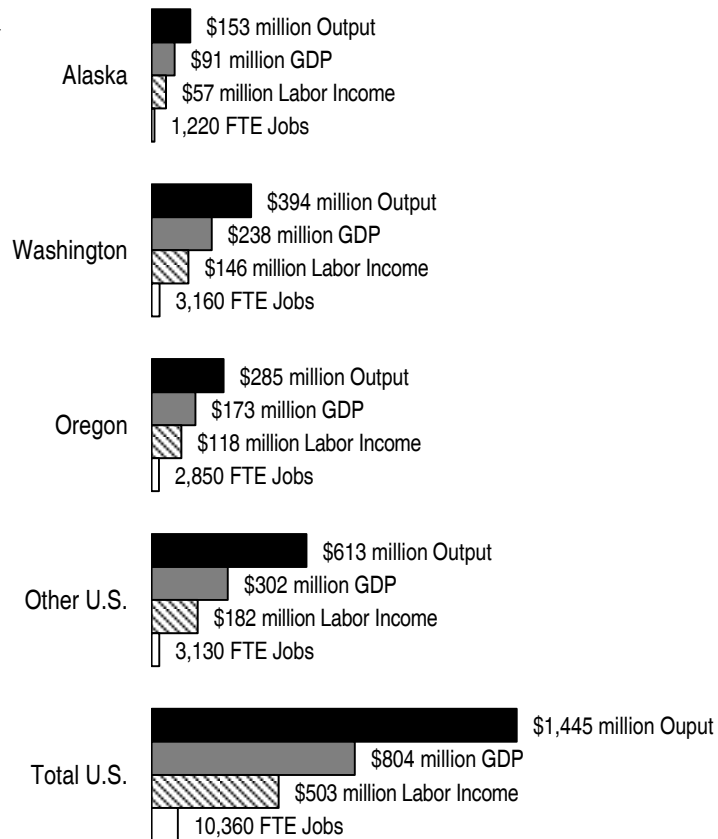
Canada



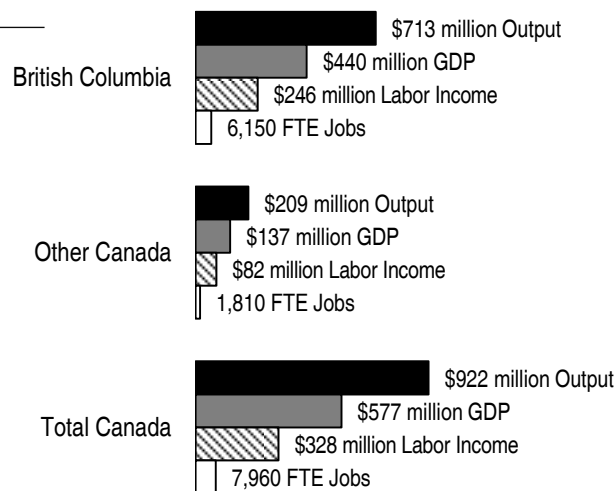
* Total impacts including direct industry, indirect supplier and induced consumer responding impacts for the regions in which the impacts occur (which may differ from where the fisheries occur). Values are expressed in USD.

Exhibit B: Recreational Salmon Industry - Average 2012 to 2015 Economic Impacts

United States



Canada



* Total impacts including direct industry, indirect supplier and induced consumer responding impacts for the regions in which the impacts occur (which may differ from where the fisheries occur). Values are expressed in USD.

Exhibit C: Commercial & Recreational Salmon Fisheries Economic Impacts - Averages for 2012 to 2015

Region of Impact	Total Impacts - Direct, Indirect & Induced			
	Output	GDP	Labor Income	Employment
	• • • •	\$ millions US	• • • •	FTEs
United States				
Commercial				
Alaska	653	393	242	5,380
Washington	402	241	140	3,090
Oregon	90	55	33	910
Other U.S.	<u>841</u>	<u>503</u>	<u>311</u>	<u>6,980</u>
Total U.S.	1,986	1,192	726	16,360
Recreational				
Alaska	153	91	57	1,220
Washington	394	238	146	3,160
Oregon	285	173	118	2,850
Other U.S.	<u>613</u>	<u>302</u>	<u>182</u>	<u>3,130</u>
Total U.S.	1,445	804	503	10,360
Total Commercial & Recreational	3,431	1,996	1,229	26,720
Canada				
Commercial				
British Columbia	324	201	112	3,300
Other Canada	<u>118</u>	<u>72</u>	<u>45</u>	<u>1,110</u>
Total Canada	442	273	157	4,410
Recreational				
British Columbia	713	440	246	6,150
Other Canada	<u>209</u>	<u>137</u>	<u>82</u>	<u>1,810</u>
Total Canada	922	577	328	7,960
Total Commercial & Recreational	1,364	850	485	12,370
Total United States & Canada				
Commercial	2,428	1,465	883	20,770
Recreational	<u>2,367</u>	<u>1,381</u>	<u>831</u>	<u>18,320</u>
Total	4,795	2,846	1,714	39,090

Acronyms

ADF&G	Alaska Department of Fish & Game
AK	Alaska
BC	British Columbia
CDN	Canadian
COAR	Commercial Operator Annual Report
EBITDA	Earnings Before Interest Taxes Depreciation & Amortization
EM	Employment (in FTEs)
EO	Economic Opportunity
ESSR	Escapement Surplus to Spawning Requirements
FEUS	Fisheries Economics of the United States
FN	First Nation
FTE	Full Time Equivalent
GDP	Gross Domestic Product
I-O	Input-Output
kg	kilogram
lb	pound (weight)
LI	Labor Income
MT	metric ton
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NWIFC	Northwest Indian Fisheries Commission
O/P	output
ODFW	Oregon Department of Fish and Wildlife
OR	Oregon
PFMC	Pacific Fisheries Management Council
PSC	Pacific Salmon Commission
PY	Person Year
RD	round (whole fish weight)
SEAK	Southeast Alaska
SYIR	Seafood Industry Year in Review
TAC	Total Allowable Catch
U.S.	United States
USD	United States dollars
WA	Washington
WDFW	Washington Department of Fish & Wildlife

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1.0 Introduction

Salmon are special to people of the Pacific Northwest region of North America. Salmon are part of the intrinsic identity of the region to both those who live there and those who visit from somewhere else.

Perhaps most compelling is the story of the salmon itself. The mystique that salmon generate through their ability to find their way home thousands of miles to their natal stream, only to spawn once and then die, is powerful and enduring. Children and adults alike are awed and touched by this remarkable struggle that plays out every year.

The stories of the human activities that depend on salmon are also compelling. Commercial fishing and processing have played a central role in the history of coastal communities and produce valuable seafood products prized worldwide. Recreational fishing provides a rare opportunity to commune with nature and to escape from the stresses of daily life. To native people, salmon are both a strong spiritual symbol and a focal point of traditional activities (Gislason et al. 1998).

1.1 The Salmon Resource, Salmon Management and the Treaty

Pacific salmon¹ are anadromous meaning they are born in freshwater rivers and streams and migrate to the ocean, where they spend one or more years. At maturity, the salmon return to spawn in their home waters. After spawning only once, they die. There are several thousand individual salmon spawning streams or rivers along the Pacific Coast of North America.

Many salmon populations traverse the waters of both Canada and the United States during their life cycle. Accordingly, salmon are subject to capture by commercial, recreational, and native fishermen in both saltwater and freshwater in a variety of jurisdictions.

Pacific salmon are managed and affected by regulations of states, the province of British Columbia and the federal governments of Canada and the U.S. Given the transboundary migration of salmon, there is a need for cooperative management and equitable sharing of Pacific salmon stocks between the two countries.

The Pacific Salmon Commission (PSC) is a treaty organization formed in 1985 between the United States and Canada. The 1985 Treaty replaced the predecessor International Pacific Salmon Fisheries Commission (IPSFC) formed in 1937 which was narrowly focused on sockeye and pink salmon in the Fraser River. The Pacific Salmon Commission administers the Pacific Salmon Treaty and provides technical advice through regional panels and joint technical committees. The Treaty covers all five species of salmon - sockeye, coho, pink, chum and chinook - and serves the region from Oregon north to Southeast (SE) Alaska.

¹ For the purpose of this report, "Pacific salmon" refers to five species native to the west coast of North America: Chinook (*Oncorhynchus tshawytscha*), coho (*Oncorhynchus kisutch*), chum (*Oncorhynchus keta*), pink (*Oncorhynchus gorbuscha*), and sockeye (*Oncorhynchus nerka*).

Although the importance of salmon to people in the Pacific Northwest is generally known, the substantial impacts of commercial and recreational salmon fisheries on the economies of the region and on the broader economies of the United States and Canada are not well known.

1.2 Study Need and Focus

This study represents the first comprehensive economic report on the salmon fisheries in the Pacific Northwest region². There are many economic studies of parts of the salmon-based economy but it is difficult to compare and aggregate them because of limited scope (geography and industry sector), as well as inconsistent methodologies and periods of time covered.

This project remedies this by providing a comprehensive economic analysis of salmon fisheries using consistent metrics and methodologies. The project will enable fishermen, managers, legislators and others to articulate clearly the importance of salmon to each country's economy, culture and infrastructure.

The study:

- analyses the income and employment impacts of salmon fisheries on the economies of Alaska, British Columbia, Washington State and Oregon and countries of the United States and Canada
- analyzes economic impacts of both commercial and recreational fisheries sectors including saltwater and freshwater components, and
- analyzes economic impacts for each of four years 2012 to 2015.

The study also describes the importance of subsistence fishing for salmon even though this activity is not susceptible to meaningful depiction in monetary terms. Although the focus of the study is the economic impacts of commercial and recreational salmon fisheries, one must recognize the great importance of subsistence fisheries.

The impacts of government expenditures on resource management, conservation and hatcheries are not included in the study.

1.3 Report Outline

The following sections of the report summarize the study methodology, impact estimates and key conclusions as follows:

Section	Topic
2	Approach and Methodology
3	Commercial Salmon Sector Impacts
4	Recreational Salmon Sector Impacts
5	The Importance of Subsistence Use of Salmon
6	Summary of Findings

² For the purpose of this study, the "Pacific Northwest Region" refers to the geographic area with salmon stocks that cross the U.S./Canadian border and are subject to management under the Pacific Salmon Treaty (PST): Oregon and Washington northward through British Columbia and Southeast Alaska.

To make the report as accessible as possible, we have kept the sections relatively short and focused on reporting key findings.

The Appendices provide additional documentation and analysis details for each of the four geographic regions (SE Alaska, British Columbia, Washington and Oregon). Note that there is significant variation among these regions in how the fisheries operate as well as in the available data.

Readers should note two disclaimers concerning the use of report results. First, the report is not intended for use in allocation decisions between sectors or in determining the relative societal value of one use or the other. Second, the report is not intended to value salmon and salmon habitat relative to other resource uses or developments.

2.0 Approach and Methodology

Commercial fisheries and recreational fisheries for salmon are very different in terms of their output or product, actual fish and the fishing experience respectively. This project analyses the impact of each type of fishing on the regional and national economies on a consistent basis.

2.1 Commercial vs Recreational Fisheries

Commercial and recreational fisheries differ in terms of the activities in which participants are engaged, the products which the fisheries produce, the typical output measures used to quantify what the industry produces, the kinds of producers engaged in producing these outputs, and the consumers of the products.

The commercial fishery is a resource extraction, processing and retailing industry that produces food products.

The recreational fishery is a form of outdoor recreation which is dependent on a natural resource base. The value of the angling experience is affected by fish availability and several non-fish related factors such as the environmental setting.

	Commercial	Recreational
Activity	<ul style="list-style-type: none"> • Resource Extraction • Fish Handling • Processing • Wholesaling • Retailing 	Outdoor Recreation
Product	Fish	Angling Experience <ul style="list-style-type: none"> • Catching Fish • Harvesting Fish • Aesthetics
Output	Tons	Angler-days
Producers	<ul style="list-style-type: none"> • Fishermen • Tenders/Unloaders etc. • Processors • Wholesalers • Retailers 	<ul style="list-style-type: none"> • Private Anglers • For-Hire Businesses
Consumers	Seafood Consumers	Anglers

The list of producers in the panel above is restricted to direct agents or entities that actually produce the product, fish and the fishing experience respectively (private anglers produce the product for their own consumption). Fuel, gear, insurance and other suppliers for both commercial and recreational fisheries are considered at the indirect economic impact stage as discussed below.

2.2 Impact Measures

Economic impact analysis converts or traces an initial expenditure into its impacts on sales, income and employment throughout the economy. An initial expenditure has a ripple effect through both the initial rise in income and the subsequent rounds of spending and income.

Direct impacts arise from the payments or returns to direct providers of capital and labor in salmon production activities, for example, wages and investment returns to commercial fishermen or fishing charter operators.

Indirect impacts arise in suppliers of goods and services downstream of the direct production process e.g., the fuel or gear that the commercial fishermen or the recreational angler purchases. *Induced impacts* result from the respending of labor incomes earned by direct and indirect workers on food, shelter, clothing and a myriad of other consumer items.

Total economic impacts are the sum of direct, indirect supplier and induced consumer spending impacts. Typically an Input-Output (I-O) model of the regional economy is used to estimate impacts - see Appendix E.

At the indirect and induced stages, expenditures can leak out of the regional economy e.g., the Alaskan commercial fishermen can buy gear from out-of-state or the Alaskan angler can buy a fishing rod from out-of-state. Hence the size of the economic impact depends not only on the size of the initial expenditures but also on the regional spending pattern and the structure of the regional economy. In the example above for Alaska, the impact of the commercial salmon fishery in SE Alaska will be greater on the U.S. economy than the impact on the Alaskan economy.

We employ four standard measures of economic impacts:

- Output - the value of output i.e., gross revenues
- Gross Domestic Product (GDP) or Value Added - the combined gross return to capital and labor before income taxes plus commodity taxes net of subsidy plus resource taxes, property taxes, license fees etc.
- Labor Income - wages and salaries plus benefits to workers paid in the fishery
- Employment - number of workers in Full Time Equivalent (FTE)

Since commercial fishing and recreational fishing for salmon are both seasonal, part-year activities we present job count estimates as well as FTE employment estimates to facilitate comparisons to other sectors of the economy.

Note also that we use what economists call the “domestic” concept in estimating impacts i.e., the impacts refer to economic activity from the activity or expenditures within the identified geographic region without concern as to the residence of those providing the capital and labor. This is the approach that statistical agencies at both the state/provincial and national levels use in measuring economic activity.

The distinction between the geographic region of economic activity and the region of residence of those providing capital and labor factors of production is less important for British Columbia, Washington and Oregon. The majority of those providing capital and labor for salmon fisheries in each of these regions also live in the region.

However, in the case of SE Alaska salmon fisheries the distinction is important as there are many out-of-state commercial fishermen, plant workers, and charter operators. Accordingly, in the case of Alaska, we provide commentary on the share of employment and capital returns going to Alaskan residents versus non-Alaskan residents.

Finally we note that economic impact analysis focuses on tracing cash transactions throughout the economy. Economic impact analysis, also sometimes called economic contribution analysis, assumes that marginal and average impacts are the same, that capital and labor do not have alternative uses, and that the structure of the economy does not vary significantly from year to year. Gross Domestic Product from economic impact analysis typically is how statistical agencies and governments measure the size of the economy and economic growth.

In contrast, economic value analysis, a completely different type of economic analysis, includes non-market costs and benefits and does account for alternative uses or opportunity costs of capital and labour in the economy i.e., it is not based only on cash transactions. One needs to be aware of the difference.

2.3 Consistency of Approach

The study uses a consistent approach to analyzing economic impacts across all fisheries sectors, regions, and countries.

Commercial and sport sectors are treated on a comparable and consistent basis. Recreational sector expenditures, such as when an angler hires a charter operator, are retail expenditures made by the end-consumer. Therefore the commercial sector analysis includes wholesale and retail sector markups or margins for salmon sold in North America to be comparable to recreational sector expenditures which are retail expenditures.

Employment is assessed on both a job count and year-round employment FTE (full time equivalent) basis to facilitate comparisons to other sectors of the economy.

Much of the commercial salmon fleet fishes non-salmon species, much of the salmon processing sector processes species other than salmon and much of the sport fishing fleet fishes other species as well as salmon. The project isolates revenues/expenditures and impacts from salmon fishing alone.

In the main text, we report all financial measures and impacts in USD. Catch weight is reported in round (whole fish) pounds. The Appendices provide separate analysis for each region. The Canadian impacts in the Appendix are given in Canadian dollars³.

2.4 Input-Output Models

We used results from the 2010 version of the regional impact model IMPLAN to estimate impacts for Alaska, Washington, Oregon and the total U.S. IMPLAN is widely used and accepted for regional economic impact analysis in the United States.

We used results from the 2010 version of the Statistics Canada Interprovincial Input-Output model to estimate impacts for British Columbia and for Canada. We used the Statistics Canada model rather than BC Stats Input-Output model because the BC Stats model does not provide impacts at the national level.

I-O models assume that the cost structure and returns to capital and labor per dollar business revenue do not vary significantly from year to year. This is not the case with the salmon fishery in the Pacific Northwest which is subject to wide annual swings in fish abundance and cyclical dominance for major stocks e.g., Fraser sockeye and Fraser pink salmon. Moreover, the cost structure of commercial fishing and seafood processing in I-O models are not specific to the salmon industry i.e., they refer to harvesting and processing of all fish species in each region.

Therefore, we developed our own cost structures or Income Statements to estimate direct industry impacts for commercial fish harvesting, handling and processing before using I-O results to estimate indirect and induced impacts. In our view, this approach produces a more credible result than simply running salmon revenue streams through available I-O models.

³ Bank of Canada U.S.: Canada annual exchange rates were used, namely 1.000 in 2012, 1.030 in 2013, 1.104 in 2014, and 1.279 in 2015.

2.5 Information Sources

Our research program included both primary (interview) and secondary (literature review) research:

- interviews with more than 50 individuals in industry, government agencies and others
- review of over 50 reports and publications (see Bibliography)

Conducting primary research through formal surveys was outside our Terms of Reference.

For our research, we used a wide variety of published and unpublished data provided by fisheries management agencies and by industry. Personnel of state, provincial and federal agencies and of seafood companies were generous with their time and assistance, and their cooperation was critical to the success of the project.

That said, there were information gaps and we had to rely on professional judgment in some analysis areas. For example, as there are no reliable figures for salmon processed prices in Washington and Oregon, we applied a standard \$ per lb markup to convert prices paid salmon fishermen to prices paid salmon processors for these two regions.

3.0 Commercial Salmon Sector Impacts

The commercial salmon sector is a renewable resource harvesting, processing and food distribution industry that produces a variety of protein products that are distributed throughout the world. The industry is diverse in terms of the species harvested, harvesting gear employed, products and domestic and export markets served.

3.1 The Value Chain for Salmon

It is useful to analyze the commercial salmon industry in terms of five activities - fishing, handling, processing, wholesaling and retailing - which constitute a “value chain” between the aquatic environment and the final consumer of salmon products. Each activity increases the value of the fish from the initial price paid to fishermen to the final retail price paid by consumers (see Exhibit I next page).

Fishing. The salmon harvesting sector targets the five salmon species using a variety of gear on vessels of different sizes and scale of operation. The main vessel types are seine, gillnet and troll vessels although setnets and other gear can be used.

The harvesting season runs mainly from early summer to late fall although troll vessels can fish throughout the winter. The vessels utilized can range from 20’ troll or gillnet skiffs to much larger 70’ seine vessels. A fisherman may work alone, for example on a small gillnet vessel, or comprise part of 5-6 person crew on a large seine vessel.

Commercial salmon vessels can participate in more than one type of fishery or in the salmon fishery in more than one state. For example, it is common for a salmon troll vessel to also fish halibut or tuna. Some Lower 48 salmon vessels fish off the coast of Alaska early in the spring or summer and then fish off the coasts of Washington and Oregon later in the year.

Salmon Harvesting Sectors			
SE Alaska	British Columbia	Washington	Oregon
<ul style="list-style-type: none"> • seine • drift gillnet • troll • terminal hatchery • other* 	<ul style="list-style-type: none"> • seine • gillnet • troll • transboundary • First Nation commercial 	<ul style="list-style-type: none"> • Columbia River • ocean troll • Puget Sound • other* 	<ul style="list-style-type: none"> • Columbia River • ocean troll

* a mix of several other fisheries

The commercial salmon catch in the study region is segmented by several gear types or harvesting subregions as displayed above.

Fish Handling. The fish handling component is an important but often overlooked component of the seafood value chain. The fish handling sector can involve three separate components - tendering or packing, offloading and trucking or transport.

Tenders are large vessels with holds that receive fish at sea from fishing vessels and then deliver the fish to port where it is unloaded. Fishing vessels can also land their catch directly at the dock. Fish then can be trucked or transported in situations where the landing location is not the processing plant.

Tendering is very common for seine and gillnet-caught fish but much less common for troll-caught fish (but two packers in SE Alaska operate in summer months to receive troll fish at sea for delivery to Sitka). SE Alaska has a very limited road network and almost all salmon is offloaded at the plant site. Trucking of salmon to the plant is common in BC where much of the catch is offloaded in Pt. Hardy on Vancouver Island or Prince Rupert on the North Coast and then trucked to Vancouver-area processing plants.

The fish handling sector can be involved in herring and other fisheries as well as salmon. Several tenders operate in both the Southeast and Bristol Bay salmon fisheries in Alaska.

Fish Processing. Fish processors convert raw salmon into a variety of fish, frozen, canned, smoked and other products. Roe is an important salmon product line especially for chum and pink salmon.

Due to its remoteness and lack of road network, SE Alaska salmon processors typically provide accommodation, food and transportation to the seasonal workforce in the plant. Due to perishability concerns and distance to markets, a greater share of Alaskan salmon is canned or frozen than for salmon from BC, Washington or Oregon.

Many salmon processors also process other species such as groundfish and herring.

The fishing, fish handling and fish processing activities usually occur in the same general area or jurisdiction e.g., Washington State salmon is processed in Washington State. This is not the case with fish wholesaling and fish retailing particularly for salmon from SE Alaska.

Fish Wholesaling. Fish processors manufacture food products and retailers sell them to end users or consumers. In between these functions are distributors or wholesalers that move the product from plant to market. Wholesaling activities can include transportation to and placement in cold storage, secondary processing, repackaging and labeling, and marketing and transportation to retailers.

Fish wholesalers typically wholesale several fish species and not just salmon, may wholesale salmon from more than one jurisdiction, and may wholesale food items other than fish and seafood.

The wholesale location may be completely different than the fish processing region. For example, the majority of salmon from SE Alaska is wholesaled from Seattle.

Fish Retailing. The two main end use markets for fish and seafood in the United States are restaurants (foodservice) and retail. The restaurant component predominates in total seafood sales with approximately 65-70% of fish consumed in the U.S. being purchased at restaurants (NOAA “Fisheries of the United States 2015” p.113).

Salmon can be sold at retail in a wide range of stores including but not limited to specialty fish markets, in grocery stores, and in “big box” chains such as Costco or Walmart. Typically both restaurants and stores will sell not only salmon but also other kinds of seafood and other foods.

Note also that this is important to express prices at each activity level on a comparable weight basis. For this study we express all prices in dollars per round (whole fish weight) pound.

Exhibit 2: Salmon Catch by Region - Commercial

	2012						2013						2014						2015						
	Sockeye	Coho	Pink	Chum	Chinook	All	Sockeye	Coho	Pink	Chum	Chinook	All	Sockeye	Coho	Pink	Chum	Chinook	All	Sockeye	Coho	Pink	Chum	Chinook	All	
Number Caught '000 Fish																									
SE Alaska	947	2,084	21,288	12,372	282	36,974	975	3,864	94,787	12,578	241	112,444	1,670	3,790	37,194	6,681	428	49,763	1,528	2,146	35,064	11,523	351	50,612	
BC	1,478	290	829	1,264	196	4,057	365	543	13,627	1,602	179	16,316	10,913	321	4,572	881	371	17,059	1,971	326	1,692	2,507	248	6,744	
Washington	175	549	1	1,176	358	2,259	31	500	5,888	1,735	477	8,631	745	658	1	1,189	515	3,107	99	104	967	1,201	531	2,902	
Oregon	1	14	0	0	137	152	0	37	0	0	230	267	1	185	0	0	328	515	2	27	0	0	213	242	
Total	2,601	2,937	22,119	14,812	973	43,442	1,371	4,943	114,301	15,915	1,127	137,657	13,329	4,953	41,767	8,751	1,642	70,444	3,600	2,604	37,722	15,231	1,342	60,499	
RD Weight Landed '000 lbs																									
SE Alaska	5,946	14,106	76,085	112,910	4,153	213,200	5,896	25,050	303,696	97,942	3,493	436,078	9,777	28,312	131,443	61,340	5,885	236,757	8,490	14,953	127,667	94,559	4,761	250,430	
BC	8,223	2,173	2,709	14,078	2,794	29,977	2,012	4,046	46,222	18,533	2,422	73,235	62,042	1,918	14,828	9,918	5,190	93,895	9,798	1,883	5,841	25,152	3,398	46,073	
Washington	877	3,668	5	10,549	4,717	19,816	168	3,301	24,258	15,237	6,464	49,428	4,302	4,768	5	11,553	7,405	28,033	454	612	2,919	10,090	7,399	21,474	
Oregon	3	103	0	0	1,816	1,922	1	275	0	0	3,227	3,502	4	1,536	0	0	4,839	6,379	7	184	0	0	2,948	3,139	
Total	15,049	20,050	78,799	137,537	13,480	264,915	8,077	32,672	374,176	131,712	15,606	562,243	76,125	36,534	146,276	82,811	23,319	365,064	18,749	17,632	136,427	129,801	18,506	321,116	
Ex-Vessel Values \$000 US																									
SE Alaska	8,057	18,831	35,532	109,895	15,905	188,220	10,081	34,895	127,856	61,018	14,899	248,749	16,377	37,061	37,067	45,330	22,952	158,787	9,152	12,261	25,533	46,429	17,755	111,130	
BC	16,035	4,563	1,003	8,447	10,897	40,944	5,470	9,231	15,258	10,796	10,580	51,336	92,726	2,953	4,164	8,085	16,923	124,851	15,705	3,387	1,233	14,749	13,284	48,357	
Washington	1,619	6,650	2	7,553	12,420	28,244	240	6,189	9,655	9,234	17,200	42,518	6,436	5,950	6	9,324	16,935	38,650	737	942	695	5,832	19,341	27,547	
Oregon	8	168	0	0	6,769	6,945	2	504	0	0	11,910	12,416	9	1,826	0	0	18,253	20,088	15	281	0	0	11,538	11,834	
Total	25,719	30,212	36,537	125,895	45,991	264,353	15,793	50,819	152,769	81,048	54,589	355,019	115,548	47,790	41,237	62,739	75,063	342,376	25,609	16,871	27,461	67,010	61,918	198,868	
Processed Value \$000 US																									
SE Alaska	19,920	38,085	106,519	186,302	20,971	371,797	18,571	67,635	303,696	122,428	18,515	530,845	29,332	69,365	157,731	92,010	30,309	378,747	18,677	35,139	140,434	122,927	23,330	340,507	
BC	35,359	8,474	4,471	24,636	14,669	87,609	10,549	15,320	51,607	34,187	15,988	127,652	210,741	6,861	17,461	17,967	23,034	276,064	24,898	6,995	6,622	35,397	15,409	89,321	
Washington	2,720	12,471	8	21,099	18,396	54,694	454	10,398	40,026	28,951	25,532	105,360	11,830	11,919	12	24,262	26,287	74,312	1,316	1,713	4,378	18,667	28,856	54,930	
Oregon	11	299	1	0	9,079	9,390	2	852	0	0	15,973	16,828	14	3,916	0	0	24,195	28,126	24	515	0	0	15,329	15,869	
Total	58,010	59,329	110,999	232,037	63,115	523,490	29,576	94,205	395,329	185,566	76,008	780,685	251,917	92,061	175,204	134,239	103,825	757,249	44,915	44,362	151,434	176,991	82,924	500,627	

Source: the 1st Exhibit of Appendices A, B, C, and D

The panel below illustrates the salmon value chain with its five key agents.

The Salmon Value Chain - Illustrative Example			
Activity	\$ per lb		
	Gross Revenue/Margin	Price/Value at Each Stage	
Fishing	\$1.80	\$1.80	Ex-Vessel Value
Fish Handling	.20	2.00	Delivered Plant Value
Fish Processing	2.00	4.00	Processed Value
Fish Wholesaling	.80	4.80	Wholesale Value
Fish Retailing	3.20	8.00	Retail Value

The margins and values for each activity are illustrative and may vary for different combinations of species, products and end market e.g., a perishable fresh product in a high end retail setting may have a higher retail margin.

The value of the product at the time of harvest, but before delivery to, and processing of the plant is “ex-vessel value”. The value of the product at the plant door is “delivered plant value”. The value of the product after processing is the “processed value”. The “wholesale value” is the delivered price or cost to retail whereas the “retail value” is the price that the consumer pays. When the product is exported from the region of production, then the retail margin and part of the wholesale markup does not accrue to the region. We use the term “market value” to capture the total regional value including regional wholesale and retail margins retained.

Trade margins, as illustrated above, can be half of total value for domestic sales. It is important therefore to analyze the distribution and markets for salmon in the economic analysis.

3.2 Commercial Salmon Catch Levels and Values

The commercial salmon catch on numbers of fish and weight by species for SE Alaska (SEAK), British Columbia (BC), Washington (WA) and Oregon (OR) are presented in Exhibit 2 and summarized below – additional regional details are given in the Appendices.

Total Pacific NW Fisheries	2012	2013	2014	2015
Catch millions of fish	43	138	70	60
Catch Weight million lbs	265	562	365	321
Ex-Vessel Value \$ millions U.S.	264	355	342	199
Processed Value \$ millions U.S.	526	781	757	501
Market Value* \$ millions U.S.	796	1,178	1,241	774

* Includes only wholesale markups and retail margins for fish sold in North America.

The catch figures include catch from test fisheries and catch from both tribal (U.S. tribes or Canadian First Nations) and non-tribal commercial fisheries. The catch figures also include catch from transboundary rivers in Northern BC and SE Alaska such as the Stikine and Taku.

Exhibit 3: Commercial Salmon Sector Economic Impacts - Regional & National Economies

Impacts on Regional Economies	Direct & Indirect				Total - Direct, Indirect & Induced			
	Output ● ● ●	GDP \$ millions US	Labor Income ● ● ●	Employment FTEs	Output ● ● ●	GDP \$ millions US	Labor Income ● ● ●	Employment FTEs
2012								
Alaska	474	279	180	3,800	600	357	222	4,790
BC	182	97	64	2,175	218	121	74	2,390
Washington	254	144	89	1,995	338	195	117	2,640
Oregon	50	29	19	560	68	40	25	720
2013								
Alaska	662	416	266	5,180	848	532	327	6,640
BC	249	142	89	2,440	298	175	103	2,740
Washington	376	230	131	2,705	499	306	172	3,660
Oregon	71	44	27	765	97	60	36	1,000
2014								
Alaska	485	285	178	4,055	610	363	219	5,030
BC	479	321	168	4,735	573	383	195	5,350
Washington	318	194	114	2,525	425	260	149	3,360
Oregon	85	54	31	840	115	72	41	1,110
2015								
Alaska	439	248	163	4,175	553	319	201	5,070
BC	170	101	65	2,440	207	125	75	2,710
Washington	259	148	92	2,035	346	201	121	2,710
Oregon	60	36	22	630	81	49	29	820
Impacts on National Economies*								
2012								
U.S.	1,040	628	409	9,205	1,707	1,012	624	13,950
Canada	<u>239</u>	<u>133</u>	<u>90</u>	<u>2,770</u>	<u>308</u>	<u>175</u>	<u>108</u>	<u>3,160</u>
Total	1,279	761	499	11,975	2,015	1,187	732	17,110
2013								
U.S.	1,485	943	594	12,740	2,454	1,501	906	19,630
Canada	<u>312</u>	<u>185</u>	<u>119</u>	<u>3,175</u>	<u>403</u>	<u>241</u>	<u>144</u>	<u>3,700</u>
Total	1,797	1,128	713	15,915	2,857	1,742	1,050	23,330
2014								
U.S.	1,271	803	500	11,705	2,087	1,273	763	17,510
Canada	<u>600</u>	<u>398</u>	<u>221</u>	<u>6,135</u>	<u>770</u>	<u>502</u>	<u>268</u>	<u>7,190</u>
Total	1,871	1,201	721	17,840	2,857	1,775	1,031	24,700
2015								
U.S.	1,045	607	399	9,730	1,696	982	609	14,360
Canada	<u>220</u>	<u>132</u>	<u>87</u>	<u>3,110</u>	<u>287</u>	<u>173</u>	<u>106</u>	<u>3,590</u>
Total	1,265	739	486	12,840	1,983	1,155	715	17,950

* includes impacts on other regions in addition to Alaska, British Columbia, Washington & Oregon

The catch is highly variable and the species mix varies by jurisdiction. The catch from Oregon is almost exclusively chinook and coho. SE Alaska has large pink and chum catches whereas BC is the most dependent region on sockeye. The variability in catch translates into substantial variability in gross and net returns to fishing, tendering and processing businesses due to high fixed costs of each activity. For this reason, we analyze economic impacts for more than one year, the 2012 to 2015 period.

SE Alaska comprises two thirds or more of the total catch in number of fish and catch weight. Pink and chum are much lower value species than sockeye, coho or chinook. As a result, the pink and chum share of catch weight is much greater than their share of ex-vessel value, processed value or market value.

3.3 Income and Employment Impacts

Income and employment impacts for the commercial salmon sector - Output, GDP, Labor Income and Employment - were estimated for each regional economy and the two national economies. Detailed regional results are presented in Appendix A through D and the methodology outlined in Appendix E. Exhibit 3 gives both regional and national results which are summarized below.

The impacts for the United States and Canada include impacts from salmon activity occurring in North America but outside Alaska, British Columbia, Washington or Oregon e.g., impacts from the retailing of SE Alaska salmon in Eastern North America are included.

Total Impacts	U.S.				Canada			
	2012	2013	2014	2015	2012	2013	2014	2015
Output \$ millions*	1,707	2,454	2,087	1,696	308	403	770	287
GDP \$ millions*	1,012	1,501	1,273	982	175	241	502	173
Labor Income \$ millions*	624	906	763	609	108	144	268	106
Employment FTEs	13,950	19,630	17,510	14,360	3,160	3,700	7,190	3,590

* US dollars (Canada results in Appendix B are CDN\$)

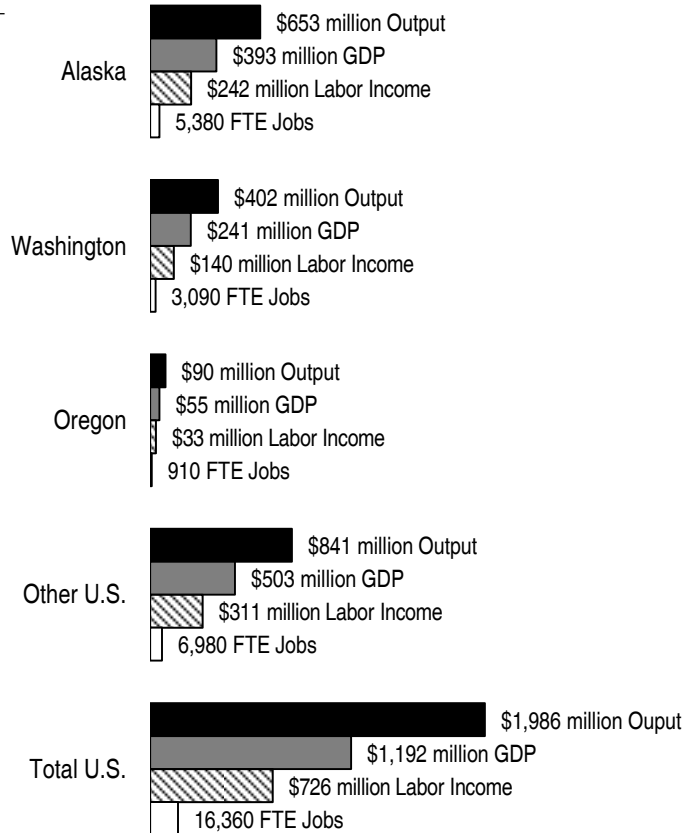
The income and employment impacts of the commercial salmon sector are very substantial. At the total North American level, total GDP ranged from \$1.2 billion to \$1.8 billion USD and Full Time Equivalent Employment ranged from 17,100 to 24,700 over the 4 year period 2012 to 2015. Variations at the regional level are even more pronounced e.g., British Columbia GDP varied by a factor of 3 over the period. The significant year-to-year variation underscores the need to assess impacts over several years.

There are important inter-regional linkages in the salmon industry, both within the U.S. and between the U.S. and Canada. The fishing activity in one region can have beneficial impacts on the economy of another region. Two key findings from Exhibit 3 and the more detailed results in the Appendices that reflect these linkages are:

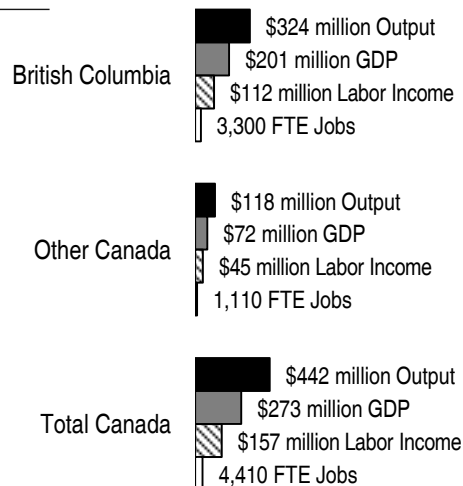
- the major U.S. region of impact - Alaska is the major U.S. region of impact when one focuses on direct & indirect impacts but Other U.S., defined as Total U.S. less Alaska, Washington & Oregon, is the major region of impact when one assesses total impacts i.e., including induced impacts - see Exhibit 4

Exhibit 4: Commercial Salmon Industry - Average 2012 to 2015 Economic Impacts*

United States



Canada



* Total impacts including direct industry, indirect supplier and induced consumer responding impacts for the regions in which the impacts occur (which may differ from where the fisheries occur). Values are expressed in USD.

- Washington State impacts - the state benefits more from out-of-state salmon fisheries activity than from in-state salmon fisheries, primarily due to Seattle being a major supply center to Alaskan businesses and being a major distribution point for out-of-state caught salmon (see details in Exhibit C.5)

That is, the commercial salmon industry provides a large stimulus to the total North American economy and not just to Pacific Northwest regional economies. Most of the income and employment impacts outside the Pacific Northwest result from wholesale and retail trade activities. There are some exceptions such as the California company that is a major supplier of cans for salmon canning operations in Alaska.

The salmon industry in terms of fishing, handling and processing is seasonal. The amount of Full Time Equivalent employment in these activities understates the number of individuals engaged.

	2012	2013	2014	2015
Primary/Secondary Salmon Employment*				
FTE Employment	5,010	6,630	6,765	5,580
Jobs	15,265	18,940	18,680	16,660

* Totals for Fishing, Handling & Processing for SE Alaska, BC, Washington and Oregon - see 2nd Exhibit in Appendices A, B, C & D

Our estimates suggest that the number of salmon jobs is 3 times the amount of Full Time Equivalent employment.

Many of these salmon jobs are in small coastal communities from Oregon up to Alaska, communities that do not have the alternative employment possibilities that major urban centers offer. The commercial salmon industry is an important and longstanding part of the social and economic fabric of these communities.

Finally, we note that a third or more of commercial salmon fishing jobs and salmon processing jobs in SE Alaska go to out-of-state workers, mainly workers from Washington State. This use of seasonal, out-of-state workers is a particular feature of the Alaska industry which does not occur to any great extent in the other jurisdictions.

4.0 Recreational Salmon Sector Impacts

Recreational fishing or angling is a form of outdoor recreation that is dependent on a healthy resource base. Although availability and access to fish are an important part of the recreation experience, fish do not define or represent the sector output as they do for the commercial sector. The aesthetic component is important. Evidence of this is that anglers can enjoy and value the angling experience even though they did not catch any fish or take home and eat the fish that they did catch.

4.1 Types of Recreational Fishing for Salmon

Recreational fishing for salmon can encompass a range of fishing techniques including trolling, mooching, and casting with bait, lures, and flies. Boats are commonly used but anglers may also fish from a pier, shore or beach.

Anglers create or produce a wide diversity of recreational experiences by combining equipment, services, time, location and other factors.

Significant differences in recreational experiences make it useful to segment salmon angling into two broad types:

- the for-hire angling experience - fishing activity that takes place on charter boats or on shore with a guide
- the independent private angling experience - fishing activity that the angler undertakes on his or her own account

The for-hire experience can range from an all-inclusive lodge package that includes accommodation and meals to a bare charter boat experience without these amenities.

The for-hire operator provides fishing knowledge and access to fish stocks, in essence selling the fishing experience to angler consumers. In contrast, the private angler produces the experience for his or her own immediate consumption. The two experiences are similar to the comparison of an individual who consumes a restaurant meal and an individual who prepares a meal at home. The latter is both a consumer and producer of the meal.

Recreational Salmon Sectors	
Freshwater	Saltwater
for-hire/charter	for-hire/charter
private/independent	private/independent

Recreational fishing activity in this study is segmented by freshwater vs saltwater and for-hire vs private components as displayed above - see details in Appendix A through D.

The for-hire sector is relatively more important in the SE Alaska recreational salmon fishery than in the recreational salmon fishery in British Columbia, Washington and Oregon. However, there can be localized fisheries, such as the Columbia River Estuary (Buoy 10) fishery in Oregon or lodges operating in Haida Gwaii British Columbia, where the for-hire sector is prominent in these other regions.

Exhibit 5: Recreational Salmon Sector Activity & Expenditures

	2012	2013	2014	2015
Salmon Angler-Days '000				
SE Alaska	305	353	361	382
BC	1,852	1,969	1,969	2,041
Washington	1,230	1,311	1,372	1,533
Oregon	<u>717</u>	<u>961</u>	<u>1,022</u>	<u>916</u>
Total	4,104	4,594	4,724	4,872
Salmon Expenditures \$ million US				
Alaska	105	120	125	132
BC	635	667	622	561
Washington	285	303	318	352
Oregon	<u>191</u>	<u>255</u>	<u>274</u>	<u>243</u>
Total	1,216	1,345	1,339	1,288

Source: the 7th Exhibits in Appendices A, B, C, and D (the expenditure figures for British Columbia in Appendix B have been converted to US dollars)

Many anglers will fish for other species, such as halibut, as well as salmon so we had to ensure that our recreational use statistics, in each of freshwater and saltwater, reflected activity directed at salmon. In some cases, this necessitated estimating the share of total angling activity attributable to salmon. This was especially important for freshwater fisheries throughout the study region.

4.2 Recreational Salmon Activity Levels and Expenditures

The recreational salmon angler-days and salmon angler expenditures for SE Alaska, British Columbia, Washington and Oregon are presented in Exhibit 5 and summarized below - additional regional details are given in the Appendices. Expenditures include both trip and durable or major purchases.

	2012	2013	2014	2015
Total Pacific NW Fisheries				
Salmon Angler Days '000	4,104	4,594	4,724	4,872
Salmon Angler Expenditures \$ million US	1,216	1,345	1,339	1,288

The focus is recreational fishing activity for salmon, specifically angler-days, and not salmon catch because as explained previously angler-days are the sector's output and the driver behind angler expenditures and economic impacts.

Sector activity and expenditures are variable but much less so than for the commercial salmon industry. The focus of salmon angling effort is coho and chinook although pink salmon catch can be large in odd numbered years - see information in the Appendices. British Columbia comprises about half of total activity and total expenditures. Note that the figures refer only to salmon angling and not total angling.

The decline in recreational salmon angling expenditures, expressed in USD, for British Columbia over the period reflects the weakening of the Canadian dollar.

4.3 Income and Employment Impacts

Income and employment impacts for the recreational salmon sector - Output, GDP, Labor Income and Employment - were estimated for each regional economy and the two national economies. Detailed regional results are presented in Appendix A through D and the methodology outlined in Appendix E. Exhibit 6 gives both regional and national results which are summarized below.

Total Impacts	U.S.				Canada			
	2012	2013	2014	2015	2012	2013	2014	2015
Output \$ millions*	1,241	1,449	1,534	1,554	941	990	923	833
GDP \$ millions*	691	806	855	864	589	620	578	522
Labor Income \$ millions*	432	504	535	541	335	352	328	296
Employment FTEs	8,890	10,370	11,020	11,140	7,410	8,020	8,020	8,390

* US dollars (Canada results in Appendix B are CDN\$)

Exhibit 6: Recreational Salmon Sector Economic Impacts - Regional & National Economies

Impacts on Regional Economies	Direct & Indirect				Total - Direct, Indirect & Induced			
	Output ● ● ●	GDP \$ millions US	Labor Income ● ● ●	Employment FTEs	Output ● ● ●	GDP \$ millions US	Labor Income ● ● ●	Employment FTEs
2012								
Alaska	105	62	40	845	134	79	50	1,070
BC	607	369	216	5,010	727	449	251	5,720
Washington	262	157	100	2,130	357	215	132	2,860
Oregon	159	96	71	1,655	226	137	93	2,260
2013								
Alaska	119	70	46	960	151	90	56	1,210
BC	638	388	227	5,430	765	472	264	6,200
Washington	279	167	107	2,265	379	229	140	3,040
Oregon	211	128	94	2,205	301	183	125	3,010
2014								
Alaska	125	73	48	995	158	94	59	1,260
BC	595	362	212	5,430	714	441	246	6,200
Washington	294	176	113	2,385	400	241	148	3,210
Oregon	229	138	102	2,380	325	197	134	3,250
2015								
Alaska	132	77	50	1,055	167	99	62	1,330
BC	537	327	191	5,675	644	398	222	6,480
Washington	324	194	124	2,635	441	266	163	3,540
Oregon	202	122	90	2,100	287	174	119	2,870
Impacts on National Economies*								
2012								
U.S.	779	425	283	5,615	1,241	691	432	8,890
Canada	<u>728</u>	<u>459</u>	<u>277</u>	<u>6,220</u>	<u>941</u>	<u>589</u>	<u>335</u>	<u>7,410</u>
Total	1,507	884	560	11,835	2,182	1,280	767	16,300
2013								
U.S.	910	496	330	6,545	1,449	806	504	10,370
Canada	<u>766</u>	<u>483</u>	<u>291</u>	<u>6,735</u>	<u>990</u>	<u>620</u>	<u>352</u>	<u>8,020</u>
Total	1,676	979	621	13,280	2,439	1,426	856	18,390
2014								
U.S.	962	525	350	6,950	1,534	855	535	11,020
Canada	<u>714</u>	<u>451</u>	<u>271</u>	<u>6,735</u>	<u>923</u>	<u>578</u>	<u>328</u>	<u>8,020</u>
Total	1,676	976	621	13,685	2,457	1,433	863	19,040
2015								
U.S.	976	531	354	7,030	1,554	864	541	11,140
Canada	<u>645</u>	<u>407</u>	<u>245</u>	<u>7,040</u>	<u>833</u>	<u>522</u>	<u>296</u>	<u>8,390</u>
Total	1,621	938	599	14,070	2,387	1,386	837	19,530

* includes impacts on other regions in addition to Alaska, British Columbia, Washington & Oregon

The income and employment impacts of the recreational salmon sector are very significant. At the total North American level, total GDP ranged from \$1.3 billion to \$1.4 billion USD and Full Time Equivalent Employment ranged from 16,300 to 19,500 over the 4 year period 2012 to 2015.

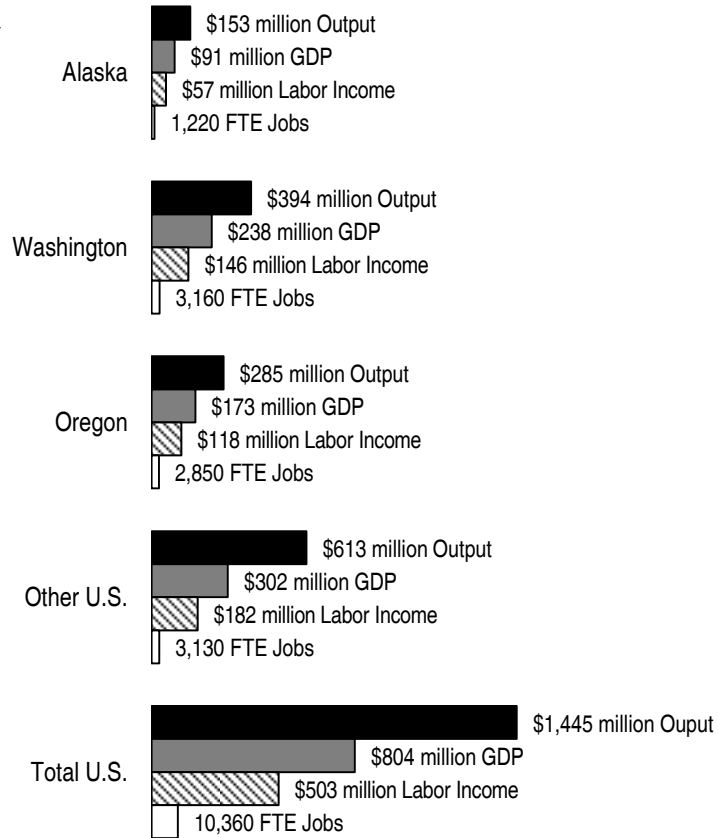
Akin to the commercial sector, recreational salmon sector jobs are seasonal. We suggest that the number of salmon jobs in the recreational sector is approximately 2.5 to 3 times the amount of Full Time Equivalent employment. Some of the seasonal jobs, such as those in for-hire sector, go to Lower 48 residents who work in Alaska during the summer tourist season.

Also akin to the commercial sector, recreational salmon fishing and recreational salmon fishing jobs have great value in addition to their contribution to the economy. Individuals place great non-monetary value on recreation opportunities in a pristine natural setting.

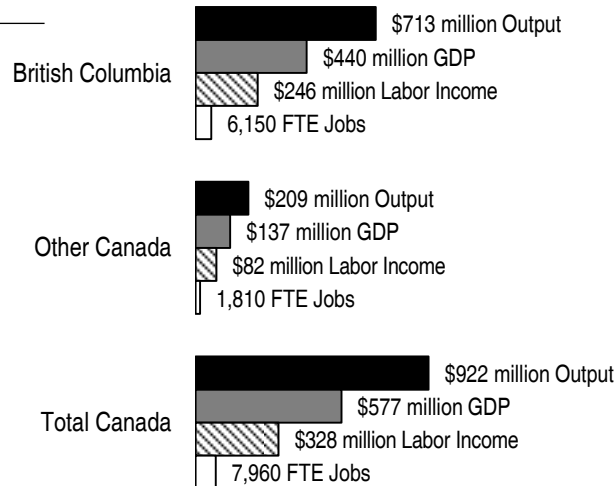
The economic impact estimates for the recreational sector are less precise than those for the commercial sector due to the lack of annual reporting on angler expenditures in general and on the share of angler activity and expenditures directed at salmon in particular. Note also that the recreational sector estimates includes only impacts from in-region expenditures. For example, an individual from say Toronto who flies to British Columbia for a for-hire salmon fishing experience would not have their airfare included in the expenditure levels and associated impacts.

Exhibit 7: Recreational Salmon Industry - Average 2012 to 2015 Economic Impacts*

United States



Canada



* Total impacts including direct industry, indirect supplier and induced consumer responding impacts for the regions in which the impacts occur (which may differ from where the fisheries occur). Values are expressed in USD.

5.0 Subsistence Use of Salmon and Native People

In this section we address in qualitative terms the utmost importance of salmon, both as a source of food and as a conduit for community values and cultural expression to tribes, First Nations and others in the study area. The rhythms of life, work and culture of native peoples over the year are tied to the salmon and salmon runs.

5.1 Background

We use the term “subsistence” throughout our commentary even though the phrase is not used uniformly throughout the study region. We find the following description helpful in understanding the concept:

Subsistence is a highly complex notion that includes vital economic, social, cultural and spiritual dimensions. The harvesting of renewable resources provides...food, nutrition, clothing, fuel, harvesting equipment and income. Subsistence means much more than mere survival or minimum living standards. It is a way of life that requires special skills, knowledge and resourcefulness. It enriches and sustains...communities in a manner that promotes cohesiveness, pride and sharing. It also provides an essential link to, and communications with, the natural world...(Langdon 2011).

In Alaska, rural residents (both native and non-native) can fish for subsistence. In British Columbia, Washington, and Oregon only native people can fish salmon for subsistence. The common term for such activity in British Columbia is “Food, Social, and Ceremonial (FSC)” harvesting, whereas in Washington and Oregon the typical term is “Ceremonial and Subsistence” harvesting.

The intent of this short section is to describe the extraordinary value of subsistence fishing for salmon even though this value is not susceptible to meaningful depiction in monetary terms. The narrative is based on interviews and a literature review.

5.2 Salmon is an Important Food Source

In precontact times, salmon was a staple food for almost all native societies that had access in the region. And salmon continues to be an important food source for many tribes and First Nations today. Tribes harvested a variety of species over a variety of streams or locations and over an extended spring to fall season. A variety of techniques was used including weirs, gaffs, nets, dipnets and basket traps. Salmon was eaten fresh, smoked or dried. Salmon was a significant food trade item among coastal and interior tribes.

That said, the harvests of salmon by tribes today pale in comparison to harvests from several hundred years ago due to the construction of dams on rivers such as the Columbia, habitat degradation, and harvests by other users. For example, in precontact times salmon constituted 40% of the nutritional intake of many tribes on the Columbia River Basin. However, salmon harvests for these tribes had declined by more than half by the mid 1850’s and had declined by over 90% by the year 2000 (Meyer 1999 p.74 & 223). This forced dietary change remains a significant challenge for tribes and First Nations throughout the region, and has not diminished the importance of securing adequate salmon harvests for those societies.

5.3 Salmon is Important Culturally

Salmon is an intrinsic part of the culture and cultural expressions of tribes and tribal communities. In fact, tribal communities often were located in areas that were remote but had access to salmon on their doorstep. Salmon were and are of major symbolic or cultural importance as well as nutritional importance. Specific examples of this cultural example are provided below.

Community Distribution. Salmon is shared among an extended family including elders and the community at large.

...sharing of harvests and products with family and other relatives is a strongly held moral value. Of highest importance is the sharing of products with elders and those unable to produce for themselves. A similar highly held value is that of meeting the social obligations of distribution at "parties" or potlatches (Langdon 2012 p.22).

The sharing and informal distribution of fish help to bind a community and provide a foundation of meaningful human interaction among native peoples (Bowhay 2017).

Cultural Expression and Ceremonial Use. Salmon is a key component of cultural ceremonies, language, art, stories and songs such as the "Salmon Boy" story by the Tlingit in SE Alaska (Langdon 2007).

First Nations do not consider salmon as separate from their culture and soul but rather an entity worthy of reverence. As one elder has said, "In order to understand how we treat salmon, you have to realize that we treat them like we would want to be treated" (Langdon 2007).

The "First Salmon Ceremony" by the Quinault and other tribes was marked by a formal ritual in preparation and eating (Suttles 1990 p.505, McKervill 1967 Chapter 1, Underhill 1945 p.17): 1) the first salmon caught was landed in the bank with the head facing upstream, 2) the fish was cut lengthwise using a mussel shell knife, 3) the head was left attached to the backbone, entrails removed and the heart burned in the fire, and 4) everyone in the village received a portion of the fish. It was only after the ceremony was completed that fishing the run could commence.

Salmon is not just the primary traditional food but also a food that represents to the Indian all that is his or her history, a spiritual connection to the resource, and a responsibility to that resource. It must be present at all traditional ceremonies and functions, and is served during naming ceremonies, funerals, during one-year memorials after a death, and when students are honored. No ceremony, no gathering, is complete if salmon is not present (Bowhay 2017).

Salmon is a cornerstone of feasts and gift giving at a variety of milestone events in native communities for example births, deaths, and marriages. Among the many ceremonies involving salmon, name-giving is one of the most important (Aguilar Sr. 2005 p.183). The ceremony establishes the genealogical identity for a family's child. Naming events can also occur when a person reaches young adulthood or is bestowed new responsibilities or titles in the community. Salmon is expected to be served at such events.

Socialization. Salmon harvesting, processing, and distribution helps to integrate young people into work roles, provides linkages to traditional lifestyles, and facilitates the intergenerational transfer of knowledge.

Adults born and reared during this period [the 1940s] remember being taught how to fish by elders. Some elders were still making nets and fish spears and passing the knowledge on to the youth. Indian people continued to cure and smoke fish and eat fish year round. Youth were expected to help in all chores connected with curing fish, including helping to hang the fish in the smokehouse and keeping the fires stoked in the smokehouse. Young people were taught to maneuver canoes in the rivers, and witnessed and participated in the expression of tribal value such as the distribution of catches to elders and other family members.

Youngsters, as in the past, are taught from an early age to fish and to understand that they, as tribal members, have a special responsibility to the salmon and the habitat in which it thrives. Indian fishermen and women take their children fishing and remember being taken fishing by relatives when they were growing up. When children fish with older friends and relatives, they not only learn the skills of taking and processing fish, but also hear the history and tradition of the tribes and are taught how to be a responsible member of the community. For example, beach seining is a multi-generational, group activity during which elders sit on beaches watching and advising while young people harvest the fish. During the work of fishing, everyone joins in conversations about the place, the salmon, and the history of salmon fishing, and youngsters listen to the stories shared by the elders.

Fishing is considered to be an activity that is a critical part of a tribal member's identity. No matter what else one does, learning to fish is part of one's education (Bowhay 2017).

The salmon therefore is central to longstanding native traditions, essential to cultural identity and distinctiveness. The harvesting, processing, and consuming of salmon involves unique rituals and processes and facilitates the intergenerational transfer of knowledge.

These cultural components of the subsistence use of salmon are very valuable but are not amenable to monetization. Subsistence use also has allocative priority in all study jurisdictions, a reflection of its importance historically and today.

Although the focus of this study for the Pacific Salmon Commission is the impacts of salmon fisheries on the economies within the study region, it is absolutely necessary to recognize the critical importance and non-monetary value of subsistence use of salmon.

6.0 Summary of Findings

This study demonstrates the substantial economic importance of the Pacific Northwest commercial and recreational salmon fisheries in SE Alaska, British Columbia, Washington and Oregon.

Over the 2012 to 2015 period, the contribution of both sectors combined averaged (values in USD):

- \$3,431 million in Output, \$1,996 million in Gross Domestic Product (GDP), \$1,229 million in Labor Income or Wages and 26,700 Full Time Equivalent (FTE) jobs to the United States economy
- \$1,364 million in Output, \$850 million in Gross Domestic Product, \$485 million in Labor Income and 12,400 FTE jobs to the Canadian economy

Both commercial and recreational salmon fishing sectors are major contributors to these economic impacts - see Summary Exhibit 8. Both the United States and Canada receive substantial income and employment activity in the two sectors. Many of the jobs occur in rural coastal communities that do not have the alternative job opportunities of major urban centers.

The substantial economic impacts occur not only in the regions where the salmon fisheries occur. There are substantial spillover impacts on the whole North American economy through the selling of salmon in stores and restaurants across the continent and through the multiplier impacts from regional spending in both commercial and recreational sectors. Approximately 40% of U.S. impacts occur in states other than Alaska, Washington and Oregon. Approximately 25% of Canadian impacts occur in provinces other than British Columbia.

Seattle and Washington State are major economic beneficiaries of important inter-regional linkages in the salmon industry, both within the U.S. and between the U.S. and Canada. The region is a major supply center to Alaskan fishing businesses and a major distribution point for Alaskan and British Columbian salmon.

The report can be used to convey the significance of salmon to the regional economies of the Pacific Northwest. However, the report and its results should not be used in allocation decisions between sectors or in determining the relative societal value of one use or the other.

The importance of salmon is not just through their contribution to the economy. Salmon are an iconic species and have enormous cultural and ecological importance.

Salmon are especially important to the native peoples of the Pacific Northwest, for whom salmon is not only an important food for sustenance but also central to longstanding traditions and cultural expression. Although this study focuses on economic impacts of salmon fisheries, it is critical to recognize the non-monetary values of salmon as well.

Exhibit 8: Commercial & Recreational Salmon Fisheries Impacts - Average 2012 to 2015

Region of Impact	Total Impacts - Direct, Indirect & Induced			
	Output	GDP	Labor Income	Employment
	• • • •	\$ millions US	• • • •	FTEs
United States				
Commercial				
Alaska	653	393	242	5,380
Washington	402	241	140	3,090
Oregon	90	55	33	910
Other U.S.	<u>841</u>	<u>503</u>	<u>311</u>	<u>6,980</u>
Total U.S.	1,986	1,192	726	16,360
Recreational				
Alaska	153	91	57	1,220
Washington	394	238	146	3,160
Oregon	285	173	118	2,850
Other U.S.	<u>613</u>	<u>302</u>	<u>182</u>	<u>3,130</u>
Total U.S.	1,445	804	503	10,360
Total Commercial & Recreational	3,431	1,996	1,229	26,720
Canada				
Commercial				
British Columbia	324	201	112	3,300
Other Canada	<u>118</u>	<u>72</u>	<u>45</u>	<u>1,110</u>
Total Canada	442	273	157	4,410
Recreational				
British Columbia	713	440	246	6,150
Other Canada	<u>209</u>	<u>137</u>	<u>82</u>	<u>1,810</u>
Total Canada	922	577	328	7,960
Total Commercial & Recreational	1,364	850	485	12,370
Total United States & Canada				
Commercial	2,428	1,465	883	20,770
Recreational	<u>2,367</u>	<u>1,381</u>	<u>831</u>	<u>18,320</u>
Total	4,795	2,846	1,714	39,090

Bibliography

- Aguilar Sr., George W. "When the River Ran Wild: Indian Traditions on the Mid-Columbia and the Warm Springs Reservation", Oregon Historical Society Press, Seattle, 2005.
- Alaska Department of Revenue. "Annual Report 2016", Tax Division.
- Alexie, Sherman et al. "First Fish First People: Salmon Tales of the North Pacific Rim", UBC Press, 1998.
- Bailey, Megan and U. Rashid Sumaila. "Freshwater Angling and the BC Economy", Report Prepared for Freshwater Fisheries Society of BC, 2013.
- Barber, Katrine. "Death of Celilo Falls", Centre for the Study of the Pacific Northwest & University of Washington Press, 2005.
- BC Ministry of Agriculture. "British Columbia Fish Processing Employment Survey Results", Occasional.
- BC Ministry of Agriculture. "British Columbia Seafood Industry Year in Review", Annual.
- Bowhay, Craig. "Treaty Indian Ceremonial and Subsistence Salmon Uses", Northwest Indian Fisheries Commission (NWIFC) pers. comm. 6 February 2017.
- Canada Fisheries & Oceans. "Survey of Recreational Fishing in Canada 2010", 2012.
- Conrad, Sara and Dan Gray. "Overview of the Southeast Alaska and Yukatut Commercial, Personal Use, and Subsistence Salmon Fisheries", Fishery Management Report (FMR), Annual.
- Counterpoint Consulting. "Financial Analysis of Commercial Salmon Fisheries - Marine & Inland Fisheries", Prepared for Pacific Salmon Foundation and Canada Fisheries & Oceans, April 2014.
- Counterpoint Consulting. "Economic Dimensions of British Columbia's Pacific Salmon Resource", Prepared for Pacific Salmon Foundation, June 2014.
- Emmons, George Thornton. "The Tlingit Indians", American Museum of National History, 1991.
- Gislason, Gordon. "Economic Valuation of Commercial and Recreational Fisheries - A Framework", Paper Presented to International Council for the Exploration of the Sea (ICES), Reykjavik Iceland, September 2013.
- Gislason, Gordon, Edna Lam, Julie Paul and Ellen Battle. "The Economic Value of Salmon - Chinook and Coho in British Columbia", Report Prepared for Canada Fisheries & Oceans, February 1996.
- Gislason, Gordon, Marilyn Mohan, Edna Lam, Simon Anderson and Ellen Battle. "Fishing for Money - Challenges and Opportunities in the BC Salmon Fishery", Report Prepared for the BC Job Protection Commission, June 1998.
- GSGislason & Associates Ltd et al. "The Queen Charlotte Islands Fishing Lodge Industry", Prepared for BC Ministry of Agriculture, Food & Fisheries, December 2003.
- GSGislason & Associates Ltd. "The British Columbia Salmon Fleet Financial Profile 2009", Prepared for Canada Fisheries & Oceans, April 2011.

GSGislason & Associates Ltd. “Freshwater Sport Fishing in British Columbia: Sending Ripples Through the Provincial Economy”, Report Prepared for the Freshwater Fisheries Society of BC, October 2009.

Hartman, Jeff. “Economic Impact Analysis of the Seafood Industry in Southeast Alaska: Importance, Personal Income, and Employment in 1994”, Regional Information Report No. 5J02-07 Alaska Department of Fish & Game, October 2002.

Kanji, Riyaz and Jane Steadman, Kanji & Katzen PLLC. “Comments on Environmental Protection Agency Docket No. EPA-HQ-OAR-2009-0234 - Supplemental Finding That It Is Appropriate to Regulate Hazardous Air Pollutants from Coal - and Oil - Fired Electric Utility Steam Generated Units”, Letter to Environmental Protection Agency, 15 January 2016.

Knapp, Gunnar, Mouhcine Guettabi and Scott Goldsmith. “The Economic Importance of the Bristol Bay Salmon Industry”, Prepared for Bristol Bay Seafood Development Corporation, April 2013.

Kraig, Eric. “Washington State Sport Catch Report”, Washington Department of Fish & Wildlife, Annual.

Langdon, Steve J. “Sustaining a Relationship: Inquiry into the Emergence of a Logic of Engagement with Salmon Among the Southern Tlingits” Chapter 10 in Native American and the Environment, January 2007.

Langdon, Steve J. “Economic and Cultural Value of Subsistence Activity: Concepts, Methods and Issues”, Prepared for Tetratich: Economic Value of Subsistence Activity, Diomedes Island, January 2011.

Langdon, Steve J. “Subsistence Sockeye Salmon Production, Distribution, Exchange and Customary Trade in Southeast Alaska”, Prepared for Central Council of Tlingit and Haida Indians of Alaska, September 2012.

Leonard, Jerry. “The Role of Recreational Charter Boats in Coastal Communities: An Economic and Social Analysis in Oregon and Washington”, NOAA Fisheries, January 2014.

Leonard, Jerry. “Washington and Oregon Charter Vessel Survey - Methodology and Results”, NOAA Technical Memorandum NMFS-NWFSC-134, October 2016.

Lew, Daniel K. et al. “Costs, Earnings, and Employment in the Alaska Saltwater Sport Fishing Charter Sector, 2011-2013”, NOAA Technical Memorandum NMFS-AFSC-299, May 2015.

Lovell, Sabrina J. et al. “The Economic Contribution of Marine Angler Expenditures in the United States 2011”, NOAA Technical Memorandum NMFS-F/SPO-134, September 2013.

Lovell, Sabrina J. et al. “The Economic Contribution of Marine Angler Expenditures on Durable Goods in the United States 2014”, NOAA Technical Memorandum NMFS-F/SPO-165, September 2016.

Meyer Resources Inc. “Tribal Circumstances and Impacts of the Lower Snake River Project on the Nez Perce, Yakama, Umatilla, Warm Springs and Shoshone Bannock Tribes”, Prepared for the Columbia River Inter-Tribal Fish Commission, April, 1999.

McDowell Group. “Economic Impact Analysis - Southeast Alaska Transboundary Watersheds”, Prepared for Salmon State, October 2016.

McDowell Group. "Ties That Bind - The Enduring Economic Impact of Alaska on the Puget Sound Region", Prepared for Seattle Metropolitan Chamber of Commerce, February 2015.

McKervill, Hugh W. "The Salmon People", Gray's Publishing Ltd., Vancouver, 1967.

Nelson Bros Fisheries. "Pacific Commercial Fishing Fleet Financial Profiles for 2009", Prepared for Canada Department of Fisheries & Oceans, 2011.

NOAA. "Fisheries Economics of the United States (FEUS)", Annual, Economics & Social Analysis Division, National Marine Fisheries Service.

NOAA. "Fisheries of the United States 2015", U.S. Department of Commerce, August 2016.

NOAA. "Imports and Exports of Fisheries Products Annual Summary", Annual.

NOAA. "Annual Commercial Landings Statistics", Fisheries Statistics Division.

Oregon Department of Fish & Wildlife (ODFW). "Pounds and Values of Commercially-Caught Fish and Shellfish Landed in Oregon", Annual.

Pacific Fisheries Management Council (PFMC). "Review of 2015 Ocean Salmon Fisheries", February 2016.

Powers, Bob and Dora Sigurdsson. "Participation, Effort and Harvest in the Sport Fish Business/Guide Licencing and Logbook Program", Alaska Department of Fish & Game, Annual.

Roos, John E. "Restoring Fraser River Salmon", The Pacific Salmon Commission, 1991.

Southwick Associates et al. "Economic Impacts and Contributions of Sport Fishing in Alaska 2007", Prepared for Alaska Department of Fish & Game, December 2008.

Suttles, Wayne Volume Editor. "Handbook of North American Indians: Northwest Coast, Volume 7", Smithsonian Institution, Washington, 1990.

TCW Economics. "Economic Analysis of the Non-Treaty Commercial and Recreational Fisheries in Washington State". Prepared for Washington Department of Fish & Wildlife, December 2008.

TCW Economics. "Economic Contributions and Impacts of Salmonid Resources in Southeast Alaska", Prepared for Trout Unlimited Alaska Program, July 2010.

The Research Group, LLC. "Oregon Marine Recreational Fisheries Economic Contributions in 2013 and 2014", Prepared for Oregon Department of Fish and Wildlife and Oregon Coastal Zone Management Association, September 2015.

Transboundary Technical Committee. "Preliminary Estimates of Transboundary River Salmon Production, Harvest and Escapement and a Review of Joint Enhancement Activities", Prepared for Pacific Salmon Commission, Annual.

Underhill, Ruth. "Indians of the Pacific Northwest", Sheridan Institute Press, Riverside CA, 1945.

Appendix A

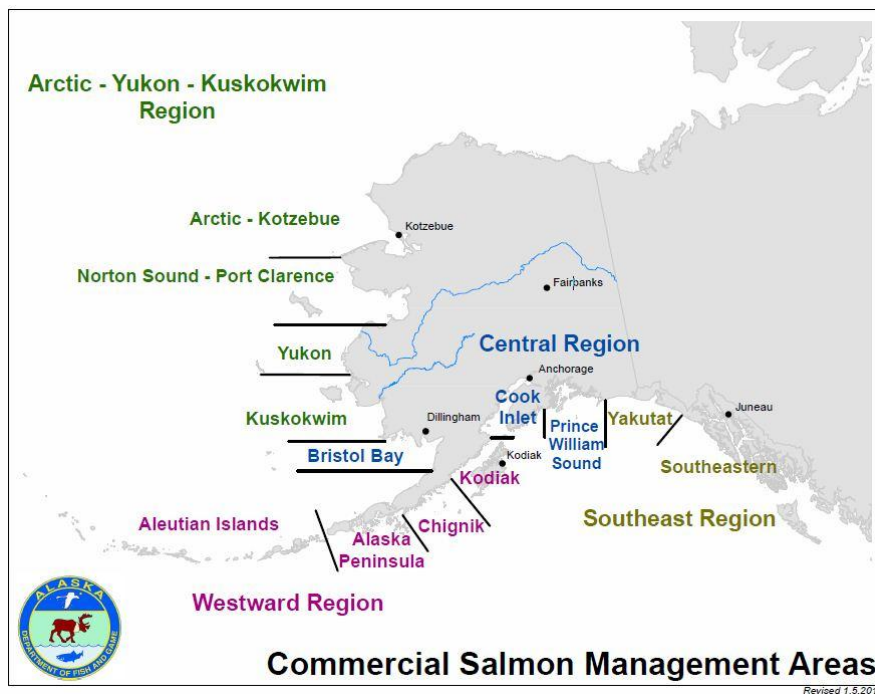
Commercial & Recreational Salmon Impacts - SE Alaska

Appendix A: Commercial & Recreational Salmon Impacts - SE Alaska

This Appendix provides background information and data sources underlying the estimates of economic impacts of the SE Alaska commercial and recreational salmon sectors.

The geographic definition of the SE Alaska study region corresponds to the “Southeast Region” as defined by Alaska Department of Fish & Game, which in turn consists of the “Southeastern” and “Yukutat” management areas.

Alaska Commercial Salmon Management Areas



Source: Alaska Department of Fish and Game,

First we describe estimation procedures for the commercial sector and present Exhibits A.1 to A.5 that give data, assumptions, and results for the SE Alaska commercial salmon sector. Then we describe estimation procedures for the recreational sector and present Exhibits A.6 to A.8 that give data, assumptions, and results for the SE Alaska recreational salmon sector. Finally we present Exhibit A.9 which summarizes the commercial and recreational sector impacts.

A.1 Commercial Sector

Commercial sector activity and impacts are driven by catch in number of pieces of salmon caught by species by gear/type of fishery - see Exhibit A.1.

These catch figures summed over all fishery types then are translated into values at different stages of the salmon value chain.

Indicator	Formula
Catch Weight	no. of pieces x average weight
Ex-Vessel Value	catch weight x ex-vessel price
Delivered Value to Plant	catch weight x handling to plant cost/price
Processed Value	catch weight x processed price
Wholesale Value	processed value x (1 + % wholesale markup)
Retail Value	wholesale value / (1-% retail margin)

Income Statements are estimated for the first three stages in the value chain - Fishing, Fish Handling and Fish Processing - to identify costs and returns. The financial measure EBITDA (Earnings Before Interest Taxes Depreciation & Amortization) represents the financial business return (see Exhibit A.2). Returns can vary widely from year to year depending on the catch level and revenue base. For wholesale and retail trade, we use the cost structures embedded in the IMPLAN Input-Output model for Wholesale Trade and for Retail Trade - Food & Beverage.

We estimate the shares of total wholesale markup and retail margin that go to each of seven jurisdictions - Alaska, Washington, Oregon, Other U.S., BC, Other Canada, and Offshore.

Finally we employ IMPLAN Input-Output ratios or multipliers to convert revenue/cost streams into the four economic impact measures - Output, Gross Domestic Product (GDP), Labor Income and Employment.

Catch Numbers. The catch numbers in pieces of fish by species were taken from the ADF&G publication - Sara Conrad and Dan Gray “Overview of the Southeast Alaska and Yukatut Commercial, Personal Use, and Subsistence Salmon Fisheries”, Fisheries Management Report (FMR) Annual.

Average Weight. Average weights in lbs round whole fish weight were taken from a fish ticket special compilation by ADF&G Division of Commercial Fisheries. The ADF&G FMR reports do have catch weight data but it is a mix of round weight for net-caught fish and head-off weight for troll fish - so we had ADF&G provide unpublished round weight data.

Ex-Vessel Prices. ADF&G Division of Commercial Fisheries also provided ex-vessel prices in \$ per round lb.

Handling Cost/Price. This potentially includes three components - tendering, unloading at dock, and transport to plant. Due to the isolation and lack of road network of SE Alaska, the transport to plant function is not applicable as almost no product is trucked from the dock to the plant. Tenders are pervasive and fish typically is pumped from the tender to offload, a low unit cost activity.

The handling cost therefore is predominantly the cost of the tender - this can vary on a unit cost basis depending on the catch. We used a constant \$0.15 per lb figure for each of the four years (this figure may be low in low catch volume years).

Processed Price. We based processed prices on the Commercial Operator Annual Report (COAR) produced annually by ADF&G - the COAR data gives processed quantities and values FOB plant for fish processed in each region of Alaska including Southeast.

Prior to 2014 some buyers/processors were exempt from COAR reporting. Some small amount of SE Alaska salmon is processed outside SE Alaska and some non-SE Alaska salmon is processed within SE Alaska.

We used the COAR data as a guide to estimating \$ per lb processed price.

Wholesale Trade. Our discussions with industry indicated that the typical wholesale markup on seafood in general was in the order of 20%. This figure corresponds closely with the Wholesale Trade markup embedded in the IMPLAN Input-Output model.

Retail Trade. We used a 40% margin on retail price as the retail margin. Again this was based on interviews and this was generally consistent with the Retail Trade-Food & Beverage margin embedded in IMPLAN.

Income Statements - Fishing, Handling, Processing. No formal data were available for SE Alaska or even Alaska as a whole.

Therefore, we used professional judgment after discussions with industry and after review of other work e.g., Knapp et al. 2013.

Regional Sourcing. We developed regional expenditures sourcing assumptions for fishermen, fish handlers, and fish processors based on professional judgment and selected industry interviews e.g., a SE Alaska processor that produces canned salmon indicated that the cans come from a California supplier.

For each of the three value chain activities we bundled expenditure into three components - fuel/utilities, other variable and fixed - and then developed assumptions re regional expenditure patterns (see Exhibit A.4).

Regional Trade. We developed regional allocations of wholesale trade markups and of retail margins based on: 1) NOAA export statistics on values FOB export port, 2) the aforementioned COAR data which give values FOB plant, 3) the distribution of population among regions/states, 4) industry interviews, and 5) professional judgment.

Note that the data in Exhibit A.3 gives the assumed regional distribution of final sales of SE Alaskan salmon - the distribution for sockeye, for example, is 3% Alaska, 9% Washington State, 3% Oregon, 35% Rest of U.S., 5% BC, 10% Rest of Canada and 35% offshore.

Impact Analysis. Impact coefficients from the IMPLAN I-O model for Alaska were used to develop the impact estimates in Exhibit A.5. Appendix E gives details on the use of the IMPLAN model.

Exhibit A.1: Commercial Sector Catch & Value - SE Alaska Salmon Fishery

	2012						2013					
	Sockeye	Coho	Pink	Chum	Chinook	All	Sockeye	Coho	Pink	Chum	Chinook	All
No. of Fish '000												
Purse Seine	170	275	19,173	4,835	22	24,475	282	546	88,764	5,802	25	95,419
Drift Gillnet	498	265	939	3,518	26	5,246	456	442	1,664	3,422	35	6,019
Troll	3	1,201	169	476	209	2,058	5	2,392	685	1,055	150	4,286
Hatchery Cost Recovery	126	200	137	3,055	20	3,537	50	272	968	2,100	30	3,420
Other	<u>150</u>	<u>143</u>	<u>871</u>	<u>488</u>	<u>4</u>	<u>1,657</u>	<u>182</u>	<u>212</u>	<u>2,706</u>	<u>198</u>	<u>3</u>	<u>3,301</u>
Total	947	2,084	21,288	12,372	282	36,974	975	3,864	94,787	12,578	241	112,444
Total Catch												
No. of Fish '000	947	2,084	21,288	12,372	282	36,974	975	3,864	94,787	12,578	241	112,444
Weight '000 lbs	5,946	14,106	76,085	112,910	4,153	213,200	5,896	25,050	303,696	97,942	3,493	436,078
Value												
Ex-Vessel \$000 US	8,057	18,831	35,532	109,895	15,905	188,220	10,081	34,895	127,856	61,018	14,899	248,749
Processed \$000 US	19,920	38,085	106,519	186,302	20,971	371,797	18,571	67,635	303,696	122,428	18,515	530,845

	2014						2015					
	Sockeye	Coho	Pink	Chum	Chinook	All	Sockeye	Coho	Pink	Chum	Chinook	All
No. of Fish '000												
Purse Seine	901	389	33,472	2,384	28	37,174	908	284	32,157	4,817	30	38,197
Drift Gillnet	498	554	1,417	2,381	28	4,879	390	251	1,373	3,287	29	5,330
Troll	7	2,244	75	200	355	2,881	7	1,240	259	424	270	2,201
Hatchery Cost Recovery	123	388	236	1,577	13	2,338	111	204	305	2,277	17	2,915
Other	<u>141</u>	<u>215</u>	<u>1,993</u>	<u>139</u>	<u>4</u>	<u>2,491</u>	<u>112</u>	<u>167</u>	<u>970</u>	<u>717</u>	<u>4</u>	<u>1,970</u>
Total	1,670	3,790	37,194	6,681	428	49,763	1,528	2,146	35,064	11,523	351	50,612
Total Catch												
No. of Fish '000	1,670	3,790	37,194	6,681	428	49,763	1,528	2,146	35,064	11,523	351	50,612
Weight '000 lbs	9,777	28,312	131,443	61,340	5,885	236,757	8,490	14,953	127,667	94,559	4,761	250,430
Value												
Ex-Vessel \$000 US	16,377	37,061	37,067	45,330	22,952	158,787	9,152	12,261	25,533	46,429	17,755	111,130
Processed \$000 US	29,332	69,365	157,731	92,010	30,309	378,747	18,677	35,139	140,434	122,927	23,330	340,507

Exhibit A.2: Commercial Sector Income Statements - SE Alaska Salmon Fishery

	2012	2013	2014	2015
Fishing \$000 US				
Fishing Revenues	188,220	248,749	158,787	111,130
Expenses				
Crew Wages inc. Skipper	67,288	87,488	55,359	37,268
Fisheries Taxes	5,647	7,462	4,764	3,334
Fuel	10,000	14,820	10,090	7,630
Other Variable	10,000	15,210	10,300	10,330
Licenses, Permits, Property Taxes	700	700	700	700
Other Fixed	50,000	50,700	51,500	51,650
Subtotal	143,635	176,380	132,713	110,912
EBITDA	44,585	72,369	26,074	(218)
Fish Handling \$000 US				
Tendering, Offloading, Trucking Revenues	31,980	65,412	35,514	37,564
Expenses				
Crew Wages inc. Skipper	12,792	26,165	14,205	15,026
Fuel	5,000	7,410	5,045	3,815
Other Variable	3,000	4,563	3,090	3,099
Licenses, Permits, Property Taxes	300	300	300	300
Other Fixed	8,000	8,112	8,240	8,264
Subtotal	29,092	46,550	30,880	30,504
EBITDA	2,888	18,862	4,633	7,061
Fish Processing \$000 US				
Processing Revenues	371,797	530,845	378,747	340,507
Fishing Payments	188,220	248,749	158,787	111,130
Tendering etc.	31,980	65,412	35,514	37,564
Processing Margin	151,597	216,684	184,446	191,813
Expenses				
Wages & Salaries	63,960	109,019	71,027	75,129
Purchase Burden	-	-	-	-
Fisheries Taxes	8,447	11,369	7,452	5,593
Fuel & Utilities	8,000	16,167	8,964	7,170
Other Variable	30,000	45,000	30,000	30,000
Licenses, Permits, Property Taxes	1,000	1,000	1,000	1,000
Other Fixed	25,000	25,350	25,750	25,825
Subtotal	136,407	207,897	144,192	144,716
EBITDA	15,190	8,787	40,254	47,097
Employment FTEs/Jobs				
Fishing	1,275 / 4,150	1,475 / 4,775	1,325 / 4,200	1,325 / 4,150
Fish Handling	250 / 800	500 / 1,200	250 / 800	300 / 900
Fish Processing	1,600 / 4,000	2,400 / 5,400	1,775 / 4,400	1,875 / 4,650

Exhibit A.3: Commercial Sector Wholesale & Retail Trade - SE Alaska Salmon Fishery

	Sockeye	Coho	Pink	Chum	Chinook
Assumptions					
Wholesale Markup*	20%	20%	20%	20%	20%
Retail Margin**	40%	40%	40%	40%	40%
% Wholesale Markup to Regions					
Alaska	6%	4%	2%	2%	10%
Washington	41%	34%	40%	35%	45%
Oregon	3%	2%	3%	3%	5%
Rest of U.S.	20%	30%	20%	20%	30%
BC	10%	5%	3%	2%	3%
Rest of Canada	5%	5%	2%	3%	2%
Offshore	<u>15%</u>	<u>20%</u>	<u>30%</u>	<u>35%</u>	<u>5%</u>
All	100%	100%	100%	100%	100%
% Retail Margin to Regions					
Alaska	3%	2%	1%	1%	5%
Washington	9%	6%	6%	6%	10%
Oregon	3%	2%	3%	3%	5%
Rest of U.S.	35%	40%	25%	15%	65%
BC	5%	4%	2%	1%	2%
Rest of Canada	10%	6%	3%	4%	3%
Offshore	<u>35%</u>	<u>40%</u>	<u>60%</u>	<u>70%</u>	<u>10%</u>
All	100%	100%	100%	100%	100%

* % markup on processed price

** % margins on retail price

Exhibit A.4: Commercial Sector Regional Supply Purchases - SE Alaska Salmon Fishery

	% Region of Purchase							
	AK	WA	OR	Rest of U.S.	BC	Rest of Canada	Offshore	All
Fishing								
Fuel	90%	7%	2%	1%	-	-	-	100%
Other Variable ¹	75%	20%	3%	2%	-	-	-	100%
Fixed ²	50%	40%	7%	3%				100%
Fish Handling								
Fuel	90%	7%	2%	1%	-	-	-	100%
Other Variable	75%	20%	3%	2%	-	-	-	100%
Fixed	50%	40%	7%	3%				100%
Fish Processing								
Fuel	80%	20%	-	-	-	-	-	100%
Other Variable ³	20%	40%	5%	35%	-	-	-	100%
Fixed ²	40%	45%	5%	5%	-	-	5%	100%

1 Mainly food

2 40% Repairs & Maintenance, 10% Insurance, 20% Supplies/Materials/Gear, 30% Business Services/Other

3 Includes packaging

Exhibit A.5: Commercial Salmon Sector Economic Impacts - Alaska

Impacts from SE Alaska Fishing*	Alaska Revenues \$ millions US	Alaska - Direct & Indirect				U.S. - Direct & Indirect			
		Output	GDP	Labor Income	Em- ployment	Output	GDP	Labor Income	Em- ployment
		● ● ● \$ millions US	● ● ● \$ millions US	● ● ●	FTEs	● ● ● \$ millions US	● ● ●	● ● ●	FTEs
2012									
Fishing	188.2	242.5	146.9	86.4	1,640	257.9	155.3	93.2	1,840
Handling & Processing	183.6	223.8	126.9	89.7	2,070	237.3	133.8	94.6	2,190
Trade	<u>6.4</u>	<u>7.6</u>	<u>5.5</u>	<u>3.5</u>	<u>90</u>	<u>8.7</u>	<u>6.2</u>	<u>3.9</u>	<u>95</u>
All	378.2	473.9	279.3	179.6	3,800	503.9	295.3	191.7	4,125
2013									
Fishing	248.7	314.7	201.9	109.4	1,895	333.1	212.1	117.4	2,130
Handling & Processing	282.1	337.2	206.8	151.6	3,165	355.2	216.1	157.9	3,310
Trade	<u>8.5</u>	<u>10.1</u>	<u>7.4</u>	<u>4.6</u>	<u>120</u>	<u>11.6</u>	<u>8.3</u>	<u>5.2</u>	<u>130</u>
All	539.3	662.0	416.1	265.6	5,180	697.9	436.5	280.5	5,570
2014									
Fishing	158.8	214.5	116.4	75.0	1,700	230.2	125.0	82.0	1,905
Handling & Processing	220.0	261.7	162.2	98.6	2,250	275.4	169.3	103.7	2,375
Trade	<u>7.5</u>	<u>8.9</u>	<u>6.5</u>	<u>4.1</u>	<u>105</u>	<u>10.2</u>	<u>7.3</u>	<u>4.6</u>	<u>115</u>
All	386.3	485.1	285.1	177.7	4,055	515.8	301.6	190.3	4,395
2015									
Fishing	111.1	163.8	70.0	56.4	1,695	179.3	78.4	63.3	1,895
Handling & Processing	229.4	268.0	172.8	102.9	2,395	281.5	179.7	107.9	2,520
Trade	<u>6.1</u>	<u>7.2</u>	<u>5.3</u>	<u>3.3</u>	<u>85</u>	<u>8.3</u>	<u>5.9</u>	<u>3.7</u>	<u>90</u>
All	346.6	439.0	248.1	162.6	4,175	469.1	264.0	174.9	4,505
Impacts from Other Region Fishing**									
2012									
Supply Expenditures	0	0	0	0	0	0	0	0	0
Trade	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
All	0	0	0	0	0	0	0	0	0
2013									
Supply Expenditures	0	0	0	0	0	0	0	0	0
Trade	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
All	0	0	0	0	0	0	0	0	0
2014									
Supply Expenditures	0	0	0	0	0	0	0	0	0
Trade	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
All	0	0	0	0	0	0	0	0	0
2015									
Supply Expenditures	0	0	0	0	0	0	0	0	0
Trade	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
All	0	0	0	0	0	0	0	0	0

* Alaskan impacts from salmon harvests within Alaska

** Alaskan impacts from salmon harvests outside Alaska (assumed to be zero)

A.2 Recreational Sector

Recreational sector revenue and expenditures are driven by activity in angler-days by type of angling - see Exhibit A.7 (Exhibit A.6 gives estimated recreational catch of salmon but recreational catch does not drive the economic impact estimates).

These activity measures then are translated into angler expenditures for each type of angling.

Indicator	Formula
Freshwater - For-Hire	no. of days x \$ per day
- Private	no. of days x \$ per day
Saltwater - For-Hire	no. of days x \$ per day
- Private	no. of days x \$ per day

Angler-Days. Aggregate angler-days, segmented by for-hire and private components and by freshwater vs saltwater, are available from ADF&G for SE Alaska.

The ADF&G Annual Survey of saltwater charter operators gives charter angler-days identified by three categories - salmon, groundfish, combination. Based on this information, we estimated that 55% of total charter angler-days were directed at salmon (days directed at salmon plus half of combination days). Based on professional judgment and discussions with ADF&G Division of Sport Fish personnel, we estimated that 70% of private angling in saltwater is directed at salmon.

The freshwater charter/guiding sector is very small. The ADF&G annual charter report does not give directed effort by species in freshwater but, based on the species catch distribution, we estimate that 100% of freshwater charter days are directed at salmon. Based on professional judgment, we assume that 50% of freshwater private angler-days are directed at salmon.

Salmon Angler Expenditures. ADF&G has not conducted any comprehensive work on the economics of the SE Alaska recreational fishery since the 2007 fishing year (Southwick et al. 2008). NOAA periodically conducts economic impact studies of recreational fishing on coastal states (Lovell et al. 2013, NOAA "FEUS" Annual).

Based on this information and professional judgment, we developed per angler-day expenditure levels - \$320 per day freshwater for-hire, \$160 per day freshwater private, \$600 per day saltwater for-hire, and \$300 per day saltwater private.

Expenditures include both trip expenditures plus durable expenditures.

Angler-day and angler expenditure estimates are given in Exhibit A.7.

Impact Estimates. Impact coefficients from the IMPLAN I-O model for Alaska, as reported in the NOAA FEUS reports, were used to develop the impact estimates in Exhibit A.8. Appendix E gives details on the use of the IMPLAN model.

Exhibit A.6: Recreational Sector Catch - SE Alaska Salmon Fishery

	2012						2013					
	Sockeye	Coho	Pink	Chum	Chinook	All	Sockeye	Coho	Pink	Chum	Chinook	All
No. of Fish Kept '000												
Freshwater	9	28	7	1	1	46	11	29	12	1	1	54
Saltwater	<u>6</u>	<u>180</u>	<u>50</u>	<u>9</u>	<u>46</u>	<u>291</u>	<u>10</u>	<u>311</u>	<u>87</u>	<u>22</u>	<u>55</u>	<u>485</u>
Total	15	208	57	10	47	337	21	340	99	23	56	539

	2014						2015					
	Sockeye	Coho	Pink	Chum	Chinook	All	Sockeye	Coho	Pink	Chum	Chinook	All
No. of Fish Kept '000												
Freshwater	13	33	4	1	1	52	12	32	7	1	1	53
Saltwater	<u>6</u>	<u>260</u>	<u>47</u>	<u>9</u>	<u>86</u>	<u>408</u>	<u>8</u>	<u>271</u>	<u>82</u>	<u>10</u>	<u>79</u>	<u>450</u>
Total	19	293	51	10	87	460	20	303	89	11	80	503

Source: ADF&G

Exhibit A.7: Recreational Sector Activity & Expenditures - SE Alaska Salmon Fishery

	2012	2013	2014	2015
Salmon Angler-Days '000				
Freshwater - For-Hire	9.9	10.0	10.3	10.5
- Private	<u>40.5</u>	<u>36.9</u>	<u>42.4</u>	<u>41.4</u>
- All	50.4	46.9	52.7	51.9
Saltwater - For-Hire	61.9	65.6	72.6	75.7
- Private	<u>192.8</u>	<u>240.1</u>	<u>236.1</u>	<u>254.5</u>
- All	254.7	305.7	308.7	330.2
Total State - For-Hire	71.8	75.6	82.9	86.2
- Private	<u>233.3</u>	<u>277.0</u>	<u>278.5</u>	<u>295.9</u>
- All	305.1	352.6	361.4	382.1
Salmon Angling Expenditures \$ millions US				
Freshwater - For-Hire	3.2	3.2	3.3	3.4
- Private	<u>6.5</u>	<u>5.9</u>	<u>6.8</u>	<u>6.6</u>
- All	9.7	9.1	10.1	10.0
Saltwater - For-Hire	37.1	39.4	43.6	45.4
- Private	<u>57.8</u>	<u>72.0</u>	<u>70.8</u>	<u>76.4</u>
- All	94.9	111.4	114.4	121.8
Total State - For-Hire	40.3	42.6	46.9	48.8
- Private	<u>64.3</u>	<u>77.9</u>	<u>77.6</u>	<u>83.0</u>
- All	104.6	120.5	124.5	131.8

Note: expenditures = days x \$ per day

Exhibit A.8: Recreational Salmon Sector Economic Impacts - Alaska

Impacts from SE Alaska Fishing	Alaska Expenditures \$ millions US	Alaska - Direct & Indirect				U.S. - Direct & Indirect			
		Output	GDP	Labor Income	Em- ployment	Output	GDP	Labor Income	Em- ployment
		● ● ● \$ millions US	● ● ● \$ millions US	● ● ●	FTEs	● ● ● \$ millions US	● ● ●	● ● ●	FTEs
2012									
For-Hire	40.3	52.4	28.3	20.3	390	57.6	33.7	25.6	485
Private Anglers	<u>64.3</u>	<u>52.9</u>	<u>33.4</u>	<u>19.9</u>	<u>455</u>	<u>85.2</u>	<u>45.7</u>	<u>29.4</u>	<u>590</u>
All	104.6	105.3	61.7	40.2	845	142.8	79.4	55.0	1,075
2013									
For-Hire	42.6	55.4	29.9	21.5	410	60.9	35.6	27.1	510
Private Anglers	<u>77.9</u>	<u>64.0</u>	<u>40.4</u>	<u>24.1</u>	<u>550</u>	<u>103.2</u>	<u>55.4</u>	<u>35.7</u>	<u>715</u>
All	120.5	119.4	70.3	45.6	960	164.1	91.0	62.8	1,225
2014									
For-Hire	46.9	61.0	33.0	23.6	450	67.1	39.2	29.8	565
Private Anglers	<u>77.6</u>	<u>63.8</u>	<u>40.3</u>	<u>24.1</u>	<u>545</u>	<u>102.8</u>	<u>55.2</u>	<u>35.5</u>	<u>715</u>
All	124.5	124.8	73.3	47.7	995	169.9	94.4	65.3	1,280
2015									
For-Hire	48.8	63.4	34.3	24.6	470	69.8	40.8	31.0	585
Private Anglers	<u>83.0</u>	<u>68.2</u>	<u>43.1</u>	<u>25.7</u>	<u>585</u>	<u>110.0</u>	<u>59.0</u>	<u>38.0</u>	<u>765</u>
All	131.8	131.6	77.4	50.3	1,055	179.8	99.8	69.0	1,350

Source: Exhibit A.7 plus IMPLAN multipliers as embodied in NOAA FEUS reports (see Appendix E)

A.3 Commercial and Recreational Sectors - Summary

The summary Exhibit A.9 provides total - direct, indirect & induced - economic impacts on the Alaska economy from commercial and recreational salmon activity, revenues and expenditures. The Exhibit also presents impacts on the U.S. economy associated with this Alaska activity, revenues and expenditures.

The induced impact coefficients in Appendix E were used to convert the information in Exhibit A.5 for the commercial sector and in Exhibit A.8 for the recreational sector into total impact measures. The impact measures for the commercial and recreational sectors are consistent.

The commercial and recreational sector impacts in Exhibit A.9 for Alaska are the same as those presented in Sections 3 and 4 respectively of the Main Text. The recreational sector impacts for the United States in the Main Text are the sum of U.S. impacts from recreational fishing activity in Alaska, Washington and Oregon (as presented in the 8th Exhibit in each Appendix).

However, the commercial sector impacts for the United States in the Main Text are larger than the simple sum of U.S. impacts from commercial fishing activity occurring in Alaska, Washington and Oregon. The reason is that commercial sector U.S. impacts in the Main Text include salmon sector activity occurring in the U.S. but outside Alaska, Washington or Oregon e.g., the impacts on the U.S. economy of Alaskan salmon retailed in the Eastern U.S. This Appendix focusses solely on economic activity originating in Alaska.

Exhibit A.9: Salmon Sector Economic Impacts Summary - Alaska

	Alaska - Total Impacts*				United States - Total Impacts*			
	Output ● ● ●	GDP \$ millions US	Labor Income ● ● ●	Employment FTEs	Output ● ● ●	GDP \$ millions US	Labor Income ● ● ●	Employment FTEs
Commercial								
2012	599.8	357.6	221.1	4,790	816.8	475.5	292.5	6,350
2013	848.2	531.9	327.0	6,640	1,155.7	700.2	428.0	8,820
2014	609.7	362.6	218.7	5,030	826.4	480.5	290.4	6,600
2015	553.0	319.0	200.2	5,070	754.5	428.4	266.9	6,530
Recreational								
2012	133.5	79.2	49.5	1,070	232.6	131.1	83.9	1,710
2013	151.4	90.2	56.1	1,210	266.6	150.0	95.8	1,950
2014	158.2	94.1	58.7	1,260	276.2	155.8	99.6	2,040
2015	166.9	99.3	61.9	1,330	292.4	164.7	105.3	2,150
Total								
2012	733.3	436.8	270.6	5,860	1,049.4	606.6	376.4	8,060
2013	999.6	622.1	383.1	7,850	1,422.3	850.2	523.8	10,770
2014	767.9	456.7	277.4	6,290	1,102.6	636.3	390.0	8,640
2015	719.9	418.3	262.1	6,400	1,046.9	593.1	372.2	8,680

* Direct, indirect plus induced impacts

Note: United States impacts - impacts on national economy from salmon sector activity/expenditures occurring in Alaska

Appendix B

Commercial & Recreational Salmon Impacts - British Columbia

Appendix B: Commercial & Recreational Salmon Impacts - British Columbia

This Appendix provides background information and data sources underlying the estimates of economic impacts of British Columbia commercial and recreational salmon sectors.

The financial information in this Appendix is given in Canadian dollars whereas the financial information on the Canadian fishery in the main text is given in U.S. dollars. Bank of Canada US:Canada exchange rates were used, namely 1.000 in 2012, 1.030 in 2013, 1.104 in 2014 and 1.279 in 2015.

First we describe estimation procedures for the commercial sector and present Exhibits B.1 to B.5 that give data, assumptions, and results on the British Columbia commercial salmon sector. Then we describe estimation procedures for the recreational sector and present Exhibits B.6 to B.8 that give data, assumptions, and results on the British Columbia recreational salmon sector. Finally we present Exhibit B.9 which summarizes the commercial and recreational sector impacts.

B.1 Commercial Sector

Commercial sector activity and impacts are driven by catch in number of pieces of salmon caught by species by gear/type of fishery - see Exhibit B.1.

These catch figures summed over all fishery types then are translated into values at different stages of the salmon value chain.

<u>Indicator</u>	<u>Formula</u>
Catch Weight	no. of pieces x average weight
Ex-Vessel Value	catch weight x ex-vessel price
Delivered Value to Plant	catch weight x handling to plant cost/price
Processed Value	catch weight x processed price
Wholesale Value	processed value x (1 + % wholesale markup)
Retail Value	wholesale value / (1 - % retail margin)

Income Statements are estimated for the first three stages in the value chain - Fishing, Fish Handling and Fish Processing - to identify costs and returns. The financial measure EBITDA (Earnings Before Interest Taxes Depreciation & Amortization) represents the financial business return (see Exhibit B.2). Returns can vary widely from year to year depending on the catch level and revenue base. For wholesale and retail trade, we use the cost structures embedded in the Statistics Canada Interprovincial Input-Output model for Wholesale Trade and for Retail Trade - Food & Beverage.

We estimate the shares of total wholesale markup and retail margin that go to each of seven jurisdictions - Alaska, Washington, Oregon, Other U.S., BC, Other Canada, and Offshore.

Finally we employ Statistics Canada Input-Output ratios or multipliers to convert revenue/cost streams into the four economic impact measures - Output, Gross Domestic Product (GDP), Labor Income and Employment.

Catch Numbers. The catch in numbers of pieces of fish by species for both the conventional marine fishery - seine, gillnet, troll - and the First Nation (aboriginal) commercial fishery were provided by DFO Planning & Policy. The First Nation catch includes a variety of Economic Opportunity (EO), Escapement Surplus to Spawning requirements (ESSR), Demonstration and other fisheries.

Catch for transboundary rivers of Stikine and Taku came from the annual publication Transboundary Technical Committee, “Preliminary Estimates of Transboundary River Salmon Production, Harvest and Escapement and a Review of Joint Enhancement Activities”.

Average Weight. There is average weight data for the conventional marine fishery, some average weight data for the transboundary fisheries, and no average weight data for First Nation commercial fisheries. In some years, Barkley Sound sockeye, a sockeye small in size, predominate in the conventional coastwide marine catch of sockeye - it is not a good indication of average size in other BC regions.

Therefore, we used the available DFO data on average size as a guideline but, in some cases, used professional judgment to adjust.

Ex-Vessel Prices. We basically used BC Ministry of Agriculture, “British Columbia Seafood Industry Year in Review (SYIR)” total ex-vessel average prices by salmon species.

Note that: 1) the annual SYIR document profiles the commercial fishery for the past 3 years, and 2) figures for the first 2 years of the time series can be revised from those in the previous SYIR document. The 2014 and 2015 figures for catch weights and ex-vessel values in this report are consistent with those in the latest SYIR document covering the 2014 to 2016 years - but the 2012 and 2013 figures in this report may differ from previously published SYIR figures (the SYIR does not present revised figures for years prior to the current 3 year reporting period).

Handling Cost/Price. Tenders or packers are used for seine and gillnet fish but not for troll fish. However, much of the troll fish is trucked from landing point to processing plant. The majority of chinook and coho are caught by trollers whereas the major of sockeye, pink and chum are caught by seine and gillnet vessels.

For this study, we use a handling cost \$0.15 per lb for chinook and coho and \$0.25 per lb for sockeye, pink and chum (handling costs for chinook and coho are lower because these species are mainly caught by trollers who do not offload to packers).

Processed Price. We based processed prices on BC Ministry of Agriculture, “British Columbia Seafood Industry Year in Review” information.

Wholesale Trade. Our discussions with industry indicated that the typical wholesale markup on seafood in general was in the order of 20%. This figure corresponds closely with the Wholesale Trade markup embedded in the Input-Output model.

Retail Trade. We used a 40% margin on retail price as the retail margin. Again this was based on interviews and this was generally consistent with the Retail Trade - Food & Beverage margin embedded in the Statistics Canada I-O model.

Income Statements - Fishing, Handling, Processing. No formal annual data were available for British Columbia.

Therefore, we used professional judgment after discussions with industry and after review of other work e.g., GSGislason 2011, Nelson Bros 2011, Counterpoint Consulting 2014, BC Ministry of Agriculture Occasional.

Regional Sourcing. We developed regional expenditures sourcing assumptions for fishermen, fish handlers, and fish processors based on professional judgment and selected industry interviews.

For each of the three value chain activities we bundled expenditure into three components - fuel/utilities, other variable and fixed - and then developed assumptions re regional expenditure patterns (see Exhibit B.4).

Regional Trade. We developed regional allocations of wholesale trade markups and of retail margins based on: 1) Statistics Canada export statistics on values FOB export port, 2) the aforementioned BC Ministry of Agriculture data which give values FOB plant, 3) the distribution of population among regions/states, 4) industry interviews, and 5) professional judgment.

Note that the data in Exhibit B.3 gives the assumed regional distribution of final sales of British Columbia salmon - the regional distribution for sockeye, for example, is 0% Alaska, 8% Washington State, 2% Oregon, 30% Rest of U.S., 20% BC, 20% Rest of Canada and 20% Offshore.

Impact Analysis. Impact coefficients from the Statistics Canada I-O Model for British Columbia were used to develop the impact estimates in Exhibit B.5. Appendix E gives details on the use of the Statistics Canada I-O model.

Exhibit B.1: Commercial Sector Catch & Value - British Columbia Salmon Fishery

	2012						2013					
	Sockeye	Coho	Pink	Chum	Chinook	All	Sockeye	Coho	Pink	Chum	Chinook	All
No. of Fish '000												
Seine (Areas A,B)	210	0	610	540	0	1,360	24	43	11,559	652	0	12,278
Gillnet (Areas C,D,E)	630	0	85	462	15	1,193	152	6	345	665	16	1,184
Troll (Areas F,G,H)	2	218	65	28	140	453	0	405	111	43	103	662
Transboundary	61	20	0	0	9	90	54	18	0	0	5	78
First Nation Commercial	<u>576</u>	<u>51</u>	<u>69</u>	<u>233</u>	<u>33</u>	<u>961</u>	<u>135</u>	<u>70</u>	<u>1,611</u>	<u>243</u>	<u>54</u>	<u>2,114</u>
Total	1,478	290	829	1,264	196	4,057	365	543	13,627	1,602	179	16,316
Total Catch												
No. of Fish '000	1,478	290	829	1,264	196	4,057	365	543	13,627	1,602	179	16,316
Weight '000 lbs	8,223	2,173	2,709	14,078	2,794	29,977	2,012	4,046	46,222	18,533	2,422	73,235
Value												
Ex-Vessel \$000 CDN	16,035	4,563	1,003	8,447	10,897	40,944	5,634	9,508	15,716	11,120	10,898	52,876
Processed \$000 CDN	35,359	8,474	4,471	24,636	14,669	87,609	10,866	15,780	53,156	35,213	16,468	131,482

	2014						2015					
	Sockeye	Coho	Pink	Chum	Chinook	All	Sockeye	Coho	Pink	Chum	Chinook	All
No. of Fish '000												
Seine (Areas A,B)	5,228	29	3,597	422	0	9,277	600	10	1,196	1,304	0	3,109
Gillnet (Areas C,D,E)	3,451	12	540	249	30	4,282	540	13	195	939	23	1,710
Troll (Areas F,G,H)	388	212	38	3	280	920	3	262	47	50	161	522
Transboundary	51	22	0	0	6	79	74	16	0	0	7	96
First Nation Commercial	<u>1,796</u>	<u>45</u>	<u>397</u>	<u>207</u>	<u>55</u>	<u>2,500</u>	<u>755</u>	<u>26</u>	<u>254</u>	<u>214</u>	<u>57</u>	<u>1,307</u>
Total	10,913	321	4,572	881	371	17,059	1,971	326	1,692	2,507	248	6,744
Total Catch												
No. of Fish '000	10,913	321	4,572	881	371	17,059	1,971	326	1,692	2,507	248	6,744
Weight '000 lbs	62,042	1,918	14,828	9,918	5,190	93,895	9,798	1,883	5,841	25,152	3,398	46,073
Value												
Ex-Vessel \$000 CDN	102,369	3,260	4,597	8,926	18,683	137,835	20,087	4,332	1,577	18,864	16,990	61,849
Processed \$000 CDN	232,658	7,575	19,277	19,836	25,430	304,775	31,844	8,946	8,470	45,273	19,708	114,242

Exhibit B.2: Commercial Sector Income Statements - British Columbia Salmon Fishery

	2012	2013	2014	2015
Fishing \$000 CDN				
Fishing Revenues	40,944	52,876	137,835	61,849
Expenses				
Crew Wages inc. Skipper	12,778	17,888	48,557	21,310
Fisheries Taxes	438	657	1,524	571
Fuel	6,000	5,432	10,886	5,298
Other Variable	3,000	2,724	5,557	3,276
Licenses, Permits, Property Taxes	1,000	1,000	1,000	1,000
Other Fixed	15,000	15,000	20,000	15,000
Subtotal	38,216	42,701	87,524	46,455
EBITDA	2,728	10,175	50,311	15,394
Fish Handling \$000 CDN				
Tendering, Offloading, Trucking Revenues	6,998	17,662	22,763	10,990
Expenses				
Crew Wages inc. Skipper	2,799	7,065	9,105	4,396
Fuel	1,200	1,086	2,177	1,060
Other Variable	600	545	1,000	655
Licenses, Permits, Property Taxes	50	50	50	50
Other Fixed	3,200	2,220	2,264	2,288
Subtotal	684	10,966	14,708	8,449
EBITDA	149	6,696	8,055	2,541
Fish Processing \$000 CDN				
Processing Revenues	87,609	131,482	304,775	114,242
Fishing Payments	40,944	52,876	137,835	61,849
Tendering etc.	6,998	17,662	22,763	10,990
Processing Margin	39,667	60,944	144,176	41,403
Expenses				
Wages & Salaries	13,490	21,971	42,253	18,429
Purchase Burden	2,047	2,644	6,892	3,092
Fisheries Taxes	-	-	-	-
Fuel & Utilities	5,000	8,000	12,000	6,000
Other Variable	7,500	15,000	20,000	7,500
Licenses, Permits, Property Taxes	400	400	400	400
Other Fixed	5,000	5,000	10,000	5,000
Subtotal	33,437	53,015	91,545	40,422
EBITDA	6,230	7,929	52,631	981
Employment FTEs/Jobs				
Fishing	1,000 / 2,500	800 / 2,300	1,500 / 3,000	1,000 / 2,400
Fish Handling	50 / 150	140 / 425	180 / 450	90 / 275
Fish Processing	325 / 1,000	500 / 1,500	1,050 / 2,500	450 / 1,350

Exhibit B.3: Commercial Sector Wholesale & Retail Trade - British Columbia Salmon Fishery

	Sockeye	Coho	Pink	Chum	Chinook
Assumptions					
Wholesale Markup*	20%	20%	20%	20%	20%
Retail Margin**	40%	40%	40%	40%	40%
% Wholesale Markup to Regions					
Alaska	0%	0%	0%	0%	0%
Washington	5%	5%	2%	2%	5%
Oregon	1%	1%	1%	1%	1%
Rest of U.S.	14%	9%	2%	2%	19%
BC	60%	55%	52%	52%	50%
Rest of Canada	10%	10%	3%	3%	10%
Offshore	<u>10%</u>	<u>20%</u>	<u>40%</u>	<u>40%</u>	<u>15%</u>
All	100%	100%	100%	100%	100%
% Retail Margin to Regions					
Alaska	0%	0%	0%	0%	0%
Washington	8%	8%	4%	4%	5%
Oregon	2%	2%	1%	1%	2%
Rest of U.S.	30%	20%	5%	5%	23%
BC	20%	10%	5%	5%	20%
Rest of Canada	20%	20%	10%	10%	20%
Offshore	<u>20%</u>	<u>40%</u>	<u>75%</u>	<u>75%</u>	<u>30%</u>
All	100%	100%	100%	100%	100%

* % markup on processed price

** % margins on retail price

Exhibit B.4: Commercial Sector Regional Supply Purchases - British Columbia Salmon Fishery

	% Region of Purchase							
	AK	WA	OR	Rest of U.S.	BC	Rest of Canada	Offshore	All
Fishing								
Fuel	-	-	-	-	100%	-	-	100%
Other Variable ¹	-	-	-	-	100%	-	-	100%
Fixed ²	-	5%	-	3%	90%	2%	-	100%
Fish Handling								
Fuel	-	-	-	-	100%	-	-	100%
Other Variable	-	-	-	-	100%	-	-	100%
Fixed	-	5%	-	3%	90%	2%	-	100%
Fish Processing								
Fuel	-	-	-	-	100%	-	-	100%
Other Variable ³	-	5%	-	10%	80%	5%	-	100%
Fixed ²	-	5%	-	-	80%	10%	5%	100%

1 Mainly food

2 40% Repairs & Maintenance, 10% Insurance, 20% Supplies/Materials/Gear, 30% Business Services/Other

3 Includes packaging

Exhibit B.5: Commercial Salmon Sector Economic Impacts - British Columbia

Impacts from British Columbia Fishing*	BC Revenues \$ millions CDN	British Columbia - Direct & Indirect				Canada - Direct & Indirect			
		Output	GDP	Labor Income	Em- ployment	Output	GDP	Labor Income	Em- ployment
		● ● ● \$ millions CDN	● ● ● \$ millions CDN	● ● ●	FTEs	● ● ● \$ millions CDN	● ● ●	● ● ●	FTEs
2012									
Fishing	40.9	72.0	32.6	22.3	1,210	79.5	37.0	26.1	1,260
Handling & Processing	46.7	71.0	38.5	23.9	515	75.1	40.6	25.8	540
Trade	<u>19.5</u>	<u>25.8</u>	<u>16.9</u>	<u>11.4</u>	<u>285</u>	<u>28.4</u>	<u>18.3</u>	<u>12.2</u>	<u>295</u>
All	107.1	168.8	88.0	57.6	2,010	183.0	95.9	64.1	2,095
2013									
Fishing	52.9	82.8	44.9	27.2	1,005	89.8	49.0	30.9	1,050
Handling & Processing	78.6	113.9	65.8	39.9	830	119.9	68.7	42.2	860
Trade	<u>23.0</u>	<u>30.5</u>	<u>19.8</u>	<u>13.2</u>	<u>320</u>	<u>33.7</u>	<u>21.5</u>	<u>14.2</u>	<u>335</u>
All	154.5	227.2	130.5	80.3	2,155	243.4	139.2	87.3	2,245
2014									
Fishing	137.8	185.6	124.8	62.4	1,805	198.1	132.3	68.0	1,875
Handling & Processing	166.9	219.9	148.3	67.7	1,520	229.1	152.8	71.3	1,565
Trade	<u>78.8</u>	<u>104.0</u>	<u>68.4</u>	<u>46.6</u>	<u>1,175</u>	<u>114.4</u>	<u>73.8</u>	<u>49.6</u>	<u>1,225</u>
All	383.5	509.5	341.5	176.7	4,500	541.6	358.9	188.9	4,665
2015									
Fishing	61.8	92.4	53.8	30.9	1,215	99.5	58.0	34.6	1,260
Handling & Processing	52.4	77.9	44.2	30.7	685	82.1	46.3	32.7	710
Trade	<u>23.5</u>	<u>31.0</u>	<u>20.3</u>	<u>13.7</u>	<u>340</u>	<u>34.2</u>	<u>21.9</u>	<u>14.6</u>	<u>355</u>
All	137.7	201.3	118.3	75.3	2,240	215.8	126.2	81.9	2,325
Impacts from Other Region Fishing**									
2012									
Supply Expenditures	0	0	0	0	0	0	0	0	0
Trade	<u>10.2</u>	<u>13.4</u>	<u>8.9</u>	<u>6.2</u>	<u>165</u>	<u>14.7</u>	<u>9.6</u>	<u>6.6</u>	<u>170</u>
All	10.2	13.4	8.9	6.2	165	14.7	9.6	6.6	170
2013									
Supply Expenditures	0	0	0	0	0	0	0	0	0
Trade	<u>17.8</u>	<u>28.8</u>	<u>15.6</u>	<u>10.9</u>	<u>285</u>	<u>25.6</u>	<u>16.8</u>	<u>11.5</u>	<u>295</u>
All	17.8	28.8	15.6	10.9	285	25.6	16.8	11.5	295
2014									
Supply Expenditures	0	0	0	0	0	0	0	0	0
Trade	<u>14.5</u>	<u>19.0</u>	<u>12.7</u>	<u>8.9</u>	<u>235</u>	<u>20.8</u>	<u>13.6</u>	<u>9.4</u>	<u>240</u>
All	14.5	19.0	12.7	8.9	235	20.8	13.6	9.4	240
2015									
Supply Expenditures	0	0	0	0	0	0	0	0	0
Trade	<u>12.6</u>	<u>16.6</u>	<u>11.0</u>	<u>7.7</u>	<u>200</u>	<u>18.1</u>	<u>11.9</u>	<u>8.1</u>	<u>210</u>
All	12.6	16.6	11.0	7.7	200	18.1	11.9	8.1	210

* BC impacts from salmon harvests within British Columbia

** BC impacts from salmon harvests outside British Columbia

B.2 Recreational Sector

Recreational sector revenue and expenditures are driven by activity in angler-days by type of angling - see Exhibit B.7 (Exhibit B.6 gives estimated recreational catch of salmon but recreational catch does not drive the economic impact estimates).

These activities measures then are translated into angler expenditures for each type of angling.

Indicator	Formula
Freshwater - For-Hire	no. of days x \$ per day
- Private	no. of days x \$ per day
Saltwater - For-Hire	no. of days x \$ per day
- Private	no. of days x \$ per day

Angler-Days. DFO does not have any official annual statistics on saltwater (tidal or marine) angler-days. The only information at the provincial level for the freshwater fishery comes from the quinquennial (every 5 years) freshwater survey conducted by DFO. DFO also conducts this quinquennial survey for saltwater angling.

Since mid 2012 DFO has conducted a pilot monthly internet-based survey of licensed anglers, the so-called “iREC Survey”. This survey appears to give activity estimates lower than the 5-year survey.

For this study, we estimated directly freshwater angler-days for salmon and kept them constant over the four years. We estimated 2012 saltwater angler-days for salmon in 2012 and escalated the figure for later years based on the preliminary iREC results.

Salmon Angler Expenditures. The only information on angler expenditures is derived from the quinquennial DFO survey results, the most recent of which refer to the year 2010.

Some economic impact analysis based on the freshwater survey results is available e.g., GSGislason 2009, Bailey & Sumaila 2013. Some admittedly dated economic work on the saltwater recreational fishery also is available e.g., Gislason et al. 1996, GSGislason et al. 2004.

Based on available information and professional judgment, we developed per day angler expenditure levels - \$350 per day freshwater for-hire, \$175 per day freshwater private, \$800 per day saltwater for-hire, and \$400 per day saltwater private.

Expenditures include both direct expenditures plus expenditures on major equipment and assets wholly attributable to fishing.

Angler-day and angler expenditure estimates in Canadian dollars are given in Exhibit B.7.

Impact Estimates. Impact coefficients from previous studies and the Statistics Canada I-O model for British Columbia were used to develop the impact estimates in Exhibit B.8. Appendix E gives details on the use of the Statistics Canada model.

Exhibit B.6: Recreational Sector Catch - British Columbia Salmon Fishery

	2012						2013					
	Sockeye	Coho	Pink	Chum	Chinook	All	Sockeye	Coho	Pink	Chum	Chinook	All
No. of Fish Kept '000												
Freshwater	85	90	-	-	50	225	85	90	-	-	50	225
Saltwater	<u>2</u>	<u>309</u>	<u>48</u>	<u>13</u>	<u>256</u>	<u>628</u>	<u>16</u>	<u>367</u>	<u>226</u>	<u>18</u>	<u>288</u>	<u>915</u>
Total	87	399	48	13	306	853	101	457	226	18	338	1,140

	2014						2015					
	Sockeye	Coho	Pink	Chum	Chinook	All	Sockeye	Coho	Pink	Chum	Chinook	All
No. of Fish Kept '000												
Freshwater	172	90	-	-	50	312	85	90	-	-	50	225
Saltwater	<u>146</u>	<u>345</u>	<u>71</u>	<u>13</u>	<u>394</u>	<u>969</u>	<u>78</u>	<u>278</u>	<u>260</u>	<u>18</u>	<u>407</u>	<u>1,041</u>
Total	318	435	71	13	444	1,281	163	369	260	18	457	1,266

Source: *freshwater - estimates*
saltwater - derived from DFO iREC survey results

Exhibit B.7: Recreational Sector Activity & Expenditures - BC Salmon Fishery

	2012	2013	2014	2015
Salmon Angler-Days '000				
Freshwater - For-Hire	20.0	20.0	20.0	20.0
- Private	<u>675.0</u>	<u>675.0</u>	<u>675.0</u>	<u>675.0</u>
- All	695.0	695.0	695.0	695.0
Saltwater - For-Hire	117.0	130.0	130.0	136.5
- Private	<u>1,040.0</u>	<u>1,440.0</u>	<u>1,144.0</u>	<u>1,209.0</u>
- All	1,157.0	1,274.0	1,274.0	1,345.5
Total State - For-Hire	137.0	150.0	150.0	156.5
- Private	<u>1,715.0</u>	<u>1,819.0</u>	<u>1,819.0</u>	<u>1,884.0</u>
- All	1,852.0	1,969.0	1,969.0	2,040.5
Salmon Angling Expenditures \$ millions CDN				
Freshwater - For-Hire	7.0	7.0	7.0	7.0
- Private	<u>118.1</u>	<u>118.1</u>	<u>118.1</u>	<u>118.1</u>
- All	125.1	125.1	125.1	125.1
Saltwater - For-Hire	93.6	104.0	104.0	109.2
- Private	<u>416.0</u>	<u>457.6</u>	<u>457.6</u>	<u>483.6</u>
- All	509.6	561.6	561.6	592.8
Total State - For-Hire	100.6	111.0	111.0	116.2
- Private	<u>534.1</u>	<u>575.7</u>	<u>575.7</u>	<u>601.7</u>
- All	634.7	686.7	686.7	717.9

Note: expenditures = days x \$ per day

Exhibit B.8: Recreational Salmon Sector Economic Impacts - British Columbia

Impacts from British Columbia Fishing	BC Expenditures \$ millions CDN	British Columbia - Direct & Indirect				Canada - Direct & Indirect			
		Output	GDP	Labor Income	Em- ployment	Output	GDP	Labor Income	Em- ployment
		• • • \$ millions CDN	• • •	• • •	FTEs	• • • \$ millions CDN	• • •	• • •	FTEs
2012									
For-Hire	100.6	125.8	75.5	45.3	1,005	140.8	85.5	52.3	1,145
Private Anglers	<u>534.1</u>	<u>480.7</u>	<u>293.8</u>	<u>170.9</u>	<u>4,005</u>	<u>587.5</u>	<u>373.9</u>	<u>224.3</u>	<u>5,075</u>
All	634.7	606.5	369.3	216.2	5,010	728.3	459.4	276.6	6,220
2013									
For-Hire	111.0	138.8	83.3	50.0	1,110	155.4	94.4	57.7	1,265
Private Anglers	<u>575.7</u>	<u>518.1</u>	<u>316.6</u>	<u>184.2</u>	<u>4,320</u>	<u>633.3</u>	<u>403.0</u>	<u>241.8</u>	<u>5,470</u>
All	686.7	656.9	399.9	234.2	5,430	788.7	497.4	299.5	6,735
2014									
For-Hire	111.0	138.8	83.3	50.0	1,110	155.4	94.4	57.7	1,265
Private Anglers	<u>575.7</u>	<u>518.1</u>	<u>316.6</u>	<u>184.2</u>	<u>4,320</u>	<u>633.3</u>	<u>403.0</u>	<u>241.8</u>	<u>5,470</u>
All	686.7	656.9	399.9	234.2	5,430	788.7	497.4	299.5	6,735
2015									
For-Hire	116.2	145.3	87.2	52.3	1,160	162.7	98.8	60.4	1,325
Private Anglers	<u>601.7</u>	<u>541.5</u>	<u>330.9</u>	<u>192.5</u>	<u>4,515</u>	<u>661.9</u>	<u>421.2</u>	<u>252.7</u>	<u>5,715</u>
All	717.9	686.8	418.1	244.8	5,675	824.6	520.0	313.1	7,040

Source: Exhibit B.7 plus previous studies and the Statistics Canada Interprovincial Input-Output Model (see Appendix E)

B.3 Commercial and Recreational Sectors - Summary

The summary Exhibit B.9 provides total - direct, indirect & induced - economic impacts on the BC economy from commercial and recreational salmon activity, revenues and expenditures. The Exhibit also presents impacts on the Canadian economy associated with this BC activity, revenues and expenditures.

The induced impact coefficients in Appendix E were used to convert the information in Exhibit B.5 for the commercial sector and in Exhibit B.8 for the recreational sector into total impact measures. The impact measures for the commercial and recreational sectors are consistent.

The recreational sector impact estimates for BC and Canada are the same as those presented in Section 4 of the Main Text (after conversion to USD). The commercial sector impact estimates for BC are the same as those presented in Section 3 of the Main Text (again after conversion to USD).

However, the commercial sector impacts for Canada in the Main Text are larger than those presented here because the impact measures in the Main Text include commercial salmon sector activity occurring in Canada but outside BC whereas Exhibit B.9 does not e.g., the impacts on the Canadian economy of Alaskan salmon retailed in Eastern Canada are included in the Canada impacts in the Main Text but are not included in Exhibit B.9. This Appendix focuses solely on economic activity originating in British Columbia.

Exhibit B.9: Salmon Sector Economic Impacts Summary - British Columbia

	British Columbia - Total Impacts*				Canada - Total Impacts*			
	Output ● ● ●	GDP \$ millions CDN	Labor Income ● ● ●	Employment FTEs	Output ● ● ●	GDP \$ millions CDN	Labor Income ● ● ●	Employment FTEs
Commercial								
2012	217.9	120.5	74.0	2,390	252.1	138.7	85.5	2,570
2013	307.1	179.8	105.8	2,740	345.1	202.4	119.5	2,960
2014	632.4	422.9	215.3	5,350	715.1	465.7	239.9	5,760
2015	264.4	160.0	96.3	2,710	303.1	180.4	108.9	2,920
Recreational								
2012	727.0	449.3	250.8	5,720	941.3	589.4	334.7	7,410
2013	788.1	486.6	271.7	6,200	1,019.3	638.2	362.4	8,020
2014	788.1	486.6	271.7	6,200	1,019.3	638.2	362.4	8,020
2015	823.9	508.7	284.0	6,480	1,065.7	667.2	378.9	8,390
Total								
2012	944.9	569.8	324.8	8,110	1,193.4	728.1	420.2	9,980
2013	1,095.2	666.4	377.5	8,940	1,364.4	840.6	481.9	10,980
2014	1,420.5	909.5	487.0	11,550	1,734.4	1,103.9	602.3	13,780
2015	1,088.3	668.7	380.3	9,190	1,368.8	847.6	487.8	11,310

* Direct, indirect plus induced impacts

Note: Canada impacts - impacts on national economy for salmon sector activity/expenditures occurring in British Columbia

Appendix C

Commercial & Recreational Salmon Impacts - Washington

Appendix C: Commercial & Recreational Salmon Impacts - Washington

This Appendix provides background information and data sources underlying the estimates of economic impacts of the Washington commercial and recreational salmon sectors.

First we describe estimation procedures for the commercial sector and present Exhibits C.1 to C.5 that give data, assumptions, and results on the Washington commercial salmon sector. Then we describe estimation procedures for the recreational sector and present Exhibits C.6 to C.8 that give data, assumptions, and results on the Washington recreational salmon sector. Finally we present Exhibit C.9 which summarizes the commercial and recreational sector impacts.

C.1 Commercial Sector

Commercial sector activity and impacts are driven by catch in number of pieces of salmon caught by species by gear/type of fishery - see Exhibit C.1. Note that catch figures refer to where the fish is landed i.e., Washington State.

These catch figures summed over all fishery types then are translated into values at different stages of the salmon value chain.

<u>Indicator</u>	<u>Formula</u>
Catch Weight	no. of pieces x average weight
Ex-Vessel Value	catch weight x ex-vessel price
Delivered Value to Plant	catch weight x handling to plant cost/price
Processed Value	catch weight x processed price
Wholesale Value	processed value x (1 + % wholesale markup)
Retail Value	wholesale value / (1-% retail margin)

Income Statements are estimated for the first three stages in the value chain - Fishing, Fish Handling and Fish Processing - to identify costs and returns. The financial measure EBITDA (Earnings Before Interest Taxes Depreciation & Amortization) represents the financial business return (see Exhibit C.2). Returns can vary widely from year to year depending on the catch level and revenue base. For wholesale and retail trade, we use the cost structures embedded in the IMPLAN Input-Output model for Wholesale Trade and for Retail Trade - Food & Beverage.

We estimate the shares of total wholesale markup and retail margin that go to each of seven jurisdictions - Alaska, Washington, Oregon, Other U.S., BC, Other Canada, and Offshore.

Finally we employ IMPLAN Input-Output ratios or multipliers to convert revenue/cost streams into the four economic impact measures - Output, Gross Domestic Product (GDP), Labor Income and Employment.

Catch Numbers. The catch numbers in pieces of fish by species were provided by Washington Department of Fish & Wildlife (WDFW) personnel as no published information exists.

Average Weight. WDFW personnel also provided the data to calculate average size of fish in round lbs per fish.

Ex-Vessel Prices. Ex-vessel prices in \$ per round lb came from NOAA (NOAA, “Annual Commercial Landings Statistics”).

Handling Cost/Price. This potentially comprise three components - tendering, unloading at dock, and transport to plant. Tenders are used in the marine seine and gillnet fisheries. Some fish is trucked from landing location to plant. We used a constant \$0.20 per lb figure for each of the four years.

Processed Price. There is no reliable information on salmon processed prices in Washington. Using professional judgment, we estimated processed prices based on a \$1.25 per lb difference between ex-vessel price and processed price.

Wholesale Trade. Our discussions with industry indicated that the typical wholesale markup on seafood in general was in the order of 20%. This figure corresponds closely with the Wholesale Trade markup embedded in the IMPLAN Input-Output model.

Retail Trade. We used a 40% margin on retail price as the retail margin. Again this was based on interviews and this was generally consistent with the Retail Trade-Food & Beverage margin embedded in IMPLAN.

Income Statements - Fishing, Handling, Processing. No data were available for the Washington or commercial salmon fishery. We used professional judgment, based in part on the mix of gear types utilized, in estimating costs and returns.

Regional Sourcing. We developed regional expenditures sourcing assumptions for fishermen, fish handlers, and fish processors based on professional judgment and selected industry interviews. An interview with a Washington fisheries association indicated that there was a substantial network of Washington suppliers and that little supply purchases were made out-of-state.

For each of the three value chain activities we bundled expenditure into three components - fuel/utilities, other variable and fixed - and then developed assumptions re regional expenditure patterns (see Exhibit C.4).

Regional Trade. We developed regional allocations of wholesale trade markups and of retail margins based on: 1) NOAA export statistics on values FOB export port, 2) the aforementioned processed value estimates, 3) the distribution of population among regions/states, and 4) professional judgment.

Note that the data in Exhibit C.3 gives the assumed regional distribution of final sales of Washington salmon - the distribution for sockeye, for example, is 0% Alaska, 53% Washington State, 2% Oregon, 20% Rest of U.S., 5% BC, 5% Rest of Canada and 15% offshore.

Impact Analysis. Impact coefficients from the IMPLAN I-O model for Washington we used to develop the impact estimates in Exhibit C.5. Appendix E gives details on the use of the IMPLAN model.

Exhibit C.1: Commercial Sector Catch & Value - Washington Salmon Fishery

	2012						2013					
	Sockeye	Coho	Pink	Chum	Chinook	All	Sockeye	Coho	Pink	Chum	Chinook	All
No. of Fish '000												
Columbia River	20	11	0	0	104	134	4	21	0	0	213	237
Ocean Troll	0	40	0	0	90	130	0	53	0	0	84	138
Puget Sound MAs	127	256	1	996	87	1,468	27	199	5,486	1,579	92	7,384
Other	<u>28</u>	<u>242</u>	<u>0</u>	<u>179</u>	<u>78</u>	<u>527</u>	<u>0</u>	<u>227</u>	<u>401</u>	<u>156</u>	<u>87</u>	<u>871</u>
Total	175	549	1	1,176	358	2,259	31	500	5,888	1,735	477	8,631
Total Catch												
No. of Fish '000	175	549	1	1,176	358	2,259	31	500	5,888	1,735	477	8,631
Weight '000 lbs	877	3,668	5	10,549	4,717	19,816	168	3,301	24,258	15,237	6,464	49,428
Value												
Ex-Vessel \$000 US	1,619	6,650	2	7,553	12,420	28,244	240	6,189	9,655	9,234	17,200	42,518
Processed \$000 US	2,720	12,471	8	21,099	18,396	54,694	454	10,398	40,026	28,951	25,532	105,360

	2014						2015					
	Sockeye	Coho	Pink	Chum	Chinook	All	Sockeye	Coho	Pink	Chum	Chinook	All
No. of Fish '000												
Columbia River	20	98	0	0	281	400	21	9	0	0	293	324
Ocean Troll	0	71	0	0	97	168	0	6	0	0	106	113
Puget Sound MAs	721	135	1	1,050	48	1,954	54	35	925	1,081	56	2,152
Other	<u>3</u>	<u>353</u>	<u>0</u>	<u>140</u>	<u>89</u>	<u>585</u>	<u>24</u>	<u>54</u>	<u>41</u>	<u>120</u>	<u>75</u>	<u>313</u>
Total	745	658	1	1,189	515	3,107	99	104	967	1,201	531	2,902
Total Catch												
No. of Fish '000	745	658	1	1,189	515	3,107	99	104	967	1,201	531	2,902
Weight '000 lbs	4,302	4,768	5	11,553	7,405	28,033	454	612	2,919	10,090	7,399	21,474
Value												
Ex-Vessel \$000 US	6,436	5,950	6	9,324	16,935	38,650	737	942	695	5,832	19,341	27,547
Processed \$000 US	11,830	11,919	12	24,262	26,287	74,312	1,316	1,713	4,378	18,667	28,856	54,930

Exhibit C.2: Commercial Sector Income Statements - Washington Salmon Fishery

	2012	2013	2014	2015
Fishing \$000 US				
Fishing Revenues	28,244	42,518	38,650	27,547
Expenses				
Crew Wages inc. Skipper	9,098	14,807	13,219	9,070
Fisheries Taxes	-	-	-	-
Fuel	3,000	2,964	3,027	2,289
Other Variable	2,500	2,535	2,575	2,583
Licenses, Permits, Property Taxes	500	500	500	500
Other Fixed	10,000	10,140	10,300	10,330
Subtotal	25,098	30,946	29,621	24,772
EBITDA	3,147	11,571	9,029	2,775
Fish Handling \$000 US				
Tendering, Offloading, Trucking Revenues	3,963	9,886	5,607	4,295
Expenses				
Crew Wages inc. Skipper	1,585	3,954	2,243	1,718
Fuel	1,000	988	1,009	763
Other Variable	500	507	515	517
Licenses, Permits, Property Taxes	5	5	5	5
Other Fixed	800	811	824	826
Subtotal	3,890	6,265	4,596	3,829
EBITDA	73	3,620	1,011	466
Fish Processing \$000 US				
Processing Revenues	54,694	105,360	74,312	54,930
Fishing Payments	28,244	42,518	38,650	27,547
Tendering etc.	3,963	9,886	5,607	4,295
Processing Margin	22,487	52,957	30,054	23,088
Expenses				
Wages & Salaries	4,954	12,357	7,008	5,368
Purchase Burden	-	-	-	-
Fisheries Taxes	1,449	2,024	1,895	1,416
Fuel & Utilities	3,000	7,393	4,282	2,480
Other Variable	4,000	10,117	5,828	4,478
Licenses, Permits, Property Taxes	100	100	100	100
Other Fixed	5,000	5,070	5,150	5,165
Subtotal	18,503	37,061	24,263	19,007
EBITDA	3,984	15,895	5,792	4,081
Employment FTEs/Jobs				
Fishing	225 / 900	300 / 900	250 / 900	225 / 900
Fish Handling	40 / 160	60 / 240	50 / 200	40 / 160
Fish Processing	125 / 500	300 / 900	175 / 700	125 / 500

Exhibit C.3: Commercial Sector Wholesale & Retail Trade - Washington Salmon Fishery

	Sockeye	Coho	Pink	Chum	Chinook
Assumptions					
Wholesale Markup*	20%	20%	20%	20%	20%
Retail Margin**	40%	40%	40%	40%	40%
% Wholesale Markup to Regions					
Alaska	0%	0%	0%	0%	0%
Washington	53%	48%	47%	42%	60%
Oregon	2%	2%	3%	3%	5%
Rest of U.S.	20%	20%	15%	15%	25%
BC	5%	5%	5%	5%	3%
Rest of Canada	5%	5%	0%	0%	2%
Offshore	<u>15%</u>	<u>20%</u>	<u>30%</u>	<u>35%</u>	<u>5%</u>
All	100%	100%	100%	100%	100%
% Retail Margin to Regions					
Alaska	0%	0%	0%	0%	0%
Washington	18%	13%	7%	7%	30%
Oregon	2%	2%	3%	3%	5%
Rest of U.S.	35%	35%	25%	15%	50%
BC	5%	5%	5%	5%	3%
Rest of Canada	5%	5%	0%	0%	2%
Offshore	<u>35%</u>	<u>40%</u>	<u>60%</u>	<u>70%</u>	<u>10%</u>
All	100%	100%	100%	100%	100%

* % markup on processed price

** % margins on retail price

Exhibit C.4: Commercial Sector Regional Supply Purchases - Washington Salmon Fishery

	% Region of Purchase							
	AK	WA	OR	Rest of U.S.	BC	Rest of Canada	Offshore	All
Fishing								
Fuel	-	95%	5%	-	-	-	-	100%
Other Variable ¹	-	95%	5%	-	-	-	-	100%
Fixed ²	-	90%	5%	5%	-	-	-	100%
Fish Handling								
Fuel	-	95%	5%	-	-	-	-	100%
Other Variable	-	95%	5%	-	-	-	-	100%
Fixed	-	95%	5%	5%	-	-	-	100%
Fish Processing								
Fuel	-	100%	-	-	-	-	-	100%
Other Variable ³	-	90%	5%	5%	-	-	-	100%
Fixed ²	-	85%	5%	5%	-	-	5%	100%

1 Mainly food

2 40% Repairs & Maintenance, 10% Insurance, 20% Supplies/Materials/Gear, 30% Business Services/Other

3 Includes packaging

Exhibit C.5: Commercial Salmon Sector Economic Impacts - Washington

Impacts from Washington Fishing*	Washington Revenues \$ millions US	Washington - Direct & Indirect				U.S. Direct & Indirect			
		Output ● ● ● \$ millions US	GDP ● ● ● \$ millions US	Labor Income ● ● ●	Em- ployment FTEs	Output ● ● ● \$ millions US	GDP ● ● ● \$ millions US	Labor Income ● ● ●	Em- ployment FTEs
2012									
Fishing	28.2	48.9	22.9	15.3	370	52.1	27.0	18.1	425
Handling & Processing	26.5	44.0	21.3	11.5	265	47.2	23.7	13.6	295
Trade	<u>12.8</u>	<u>15.6</u>	<u>11.4</u>	<u>7.1</u>	<u>165</u>	<u>17.3</u>	<u>12.4</u>	<u>7.7</u>	<u>175</u>
All	67.5	108.5	55.6	33.9	800	116.6	63.1	39.4	895
2013									
Fishing	42.5	63.4	37.2	21.1	445	66.6	41.5	23.9	500
Handling & Processing	62.8	92.7	53.8	24.3	430	99.0	58.1	27.8	545
Trade	<u>21.4</u>	<u>26.2</u>	<u>19.2</u>	<u>11.8</u>	<u>265</u>	<u>29.0</u>	<u>20.9</u>	<u>12.9</u>	<u>285</u>
All	126.7	182.3	110.2	57.2	1,140	194.6	120.5	64.6	1,330
2014									
Fishing	38.7	59.9	33.2	19.6	400	63.1	37.5	22.5	455
Handling & Processing	35.7	57.1	29.3	15.2	340	61.2	32.3	17.7	375
Trade	<u>18.2</u>	<u>22.3</u>	<u>16.3</u>	<u>10.1</u>	<u>235</u>	<u>24.7</u>	<u>17.7</u>	<u>11.0</u>	<u>250</u>
All	92.6	139.3	78.8	44.9	975	149.0	87.5	51.2	1,080
2015									
Fishing	27.5	48.0	22.6	15.4	370	51.0	26.5	18.1	425
Handling & Processing	27.4	45.0	22.1	12.1	265	48.3	24.6	14.3	300
Trade	<u>14.3</u>	<u>17.6</u>	<u>12.9</u>	<u>8.0</u>	<u>185</u>	<u>19.4</u>	<u>13.9</u>	<u>8.7</u>	<u>200</u>
All	69.2	110.6	57.6	35.5	820	118.7	65.0	41.1	925
Impacts from Other Region Fishing**									
2012									
Supply Expenditures	54.8	79.0	39.2	24.9	550	91.2	49.1	35.9	735
Trade	<u>54.3</u>	<u>66.2</u>	<u>48.8</u>	<u>29.8</u>	<u>640</u>	<u>73.1</u>	<u>52.9</u>	<u>32.3</u>	<u>690</u>
All	109.1	145.2	88.0	54.7	1,190	164.3	102.0	68.2	1,425
2013									
Supply Expenditures	64.2	92.9	45.5	28.6	620	109.1	58.0	41.4	825
Trade	<u>82.6</u>	<u>100.5</u>	<u>74.2</u>	<u>45.0</u>	<u>945</u>	<u>111.0</u>	<u>80.4</u>	<u>48.9</u>	<u>1,025</u>
All	146.8	193.4	119.7	73.6	1,565	220.1	138.4	90.3	1,850
2014									
Supply Expenditures	56.2	82.6	41.0	26.0	575	94.2	62.3	37.5	770
Trade	<u>78.6</u>	<u>96.1</u>	<u>74.6</u>	<u>43.5</u>	<u>975</u>	<u>106.2</u>	<u>76.5</u>	<u>47.2</u>	<u>1,045</u>
All	134.8	178.7	115.6	69.5	1,550	200.4	138.8	84.7	1,815
2015									
Supply Expenditures	54.4	80.2	39.9	25.4	560	91.3	49.8	36.6	755
Trade	<u>56.1</u>	<u>68.3</u>	<u>50.4</u>	<u>30.6</u>	<u>650</u>	<u>75.5</u>	<u>53.7</u>	<u>33.3</u>	<u>705</u>
All	110.5	148.5	90.3	56.0	1,210	166.8	103.5	69.9	1,460

* Washington impacts from salmon harvests within Washington

** Washington impacts from salmon harvests outside Washington

C.2 Recreational Sector

Recreational sector revenue and expenditures are driven by activity in angler-days by type of angling - see Exhibit C.7 (Exhibit C.6 gives estimated recreational catch of salmon but recreational catch does not drive the economic impact estimates).

These activity measures then are translated into angler expenditures for each type of angling.

Indicator	Formula
Freshwater - For-Hire	no. of days x \$ per day
- Private	no. of days x \$ per day
Saltwater - For-Hire	no. of days x \$ per day
- Private	no. of days x \$ per day

Angler-Days. Aggregate salmon angler-days for saltwater are available from WDFW (Erik Kraig, “Washington State Sport Catch Report”, Annual). We used PFMC data on saltwater charter or for-hire days for salmon - private angler days for salmon then were calculated by subtraction.

There is no information on salmon angler-days in freshwater. We used professional judgment to estimate freshwater angler-days for salmon and assumed that 6% of total freshwater salmon days were for-hire.

Salmon Angler Expenditures. NOAA periodically conducts economic impact studies of recreational fishing on coastal states (Lovell et al. 2013, NOAA “FEUS” Annual). Some analysis specific to Washington State has been conducted (TCW Economics 2008). This work is not specific to salmon angling.

Based on this information and professional judgment, we developed per angler-day expenditure levels - \$320 per day freshwater for-hire, \$160 per day freshwater private, \$600 per day saltwater for-hire, and \$300 per day saltwater private.

Expenditures include both trip expenditures plus durable expenditures.

Angler-day and angler expenditure estimates are given in Exhibit C.7.

Impact Estimates. Impact coefficients from the IMPLAN I-O model for Washington, as reported in the NOAA FEUS reports, were used to develop the impact estimates in Exhibit C.8. Appendix E gives details on the use of the IMPLAN model.

Exhibit C.6: Recreational Sector Catch - Washington Salmon Fishery

	2012						2013					
	Sockeye	Coho	Pink	Chum	Chinook	All	Sockeye	Coho	Pink	Chum	Chinook	All
No. of Fish Kept '000												
Freshwater	61	75	-	10	143	289	24	125	380	19	193	741
Saltwater	<u>-</u>	<u>209</u>	<u>-</u>	<u>3</u>	<u>82</u>	<u>294</u>	<u>-</u>	<u>165</u>	<u>135</u>	<u>3</u>	<u>74</u>	<u>377</u>
Total	61	284	0	13	225	583	24	290	515	22	267	1,118

	2014						2015					
	Sockeye	Coho	Pink	Chum	Chinook	All	Sockeye	Coho	Pink	Chum	Chinook	All
No. of Fish Kept '000												
Freshwater	56	146	-	9	143	354	65	60	208	11	189	533
Saltwater	<u>-</u>	<u>266</u>	<u>-</u>	<u>3</u>	<u>76</u>	<u>345</u>	<u>4</u>	<u>225</u>	<u>199</u>	<u>3</u>	<u>79</u>	<u>510</u>
Total	56	412	0	12	219	699	69	285	407	14	268	1,043

Source: Erik Kraig, "Washington State Sport Catch Report", Annual

Exhibit C.7: Recreational Sector Activity & Expenditures - Washington Salmon Fishery

	2012	2013	2014	2015
Salmon Angler-Days '000				
Freshwater - For-Hire	42.0	45.0	48.0	54.0
- Private	<u>658.0</u>	<u>705.0</u>	<u>752.0</u>	<u>846.0</u>
- All	700.0	750.0	800.0	900.0
Saltwater - For-Hire	24.5	24.7	34.6	30.6
- Private	<u>505.0</u>	<u>536.3</u>	<u>537.0</u>	<u>602.4</u>
- All	529.5	561.0	571.6	633.0
Total State - For-Hire	66.5	69.7	82.6	84.6
- Private	<u>1,163.0</u>	<u>1,241.3</u>	<u>1,289.0</u>	<u>1,448.4</u>
- All	1,229.5	1,311.0	1,371.6	1,533.0
Salmon Angling Expenditures \$ millions US				
Freshwater - For-Hire	13.4	14.4	15.4	17.3
- Private	<u>105.3</u>	<u>112.8</u>	<u>120.3</u>	<u>135.4</u>
- All	118.7	127.2	135.7	152.7
Saltwater - For-Hire	14.7	14.8	20.8	18.4
- Private	<u>151.5</u>	<u>160.9</u>	<u>161.1</u>	<u>180.7</u>
- All	166.2	175.7	181.9	199.1
Total State - For-Hire	28.1	29.2	36.2	35.7
- Private	<u>256.8</u>	<u>273.7</u>	<u>281.4</u>	<u>316.1</u>
- All	284.9	302.9	317.6	351.8

Note: expenditures = days x \$ per day

Exhibit C.8: Recreational Salmon Sector Economic Impacts - Washington

Impacts from Washington Fishing	Washington Expenditures \$ millions US	Washington - Direct & Indirect				U.S. - Direct & Indirect			
		Output	GDP	Labor Income	Em- ployment	Output	GDP	Labor Income	Em- ployment
		● ● ● \$ millions US	● ● ● \$ millions US	● ● ●	FTEs	● ● ● \$ millions US	● ● ●	● ● ●	FTEs
2012									
For-Hire	28.1	34.3	19.1	13.8	260	40.2	23.5	17.9	335
Private Anglers	<u>256.8</u>	<u>228.0</u>	<u>138.2</u>	<u>86.5</u>	<u>1,870</u>	<u>340.3</u>	<u>182.6</u>	<u>117.6</u>	<u>2,365</u>
All	284.9	262.3	157.3	100.3	2,130	380.5	206.1	135.5	2,700
2013									
For-Hire	29.2	35.7	19.8	14.3	270	41.8	24.4	18.6	350
Private Anglers	<u>273.7</u>	<u>243.0</u>	<u>147.3</u>	<u>92.2</u>	<u>1,995</u>	<u>362.7</u>	<u>194.6</u>	<u>125.4</u>	<u>2,520</u>
All	302.9	278.7	167.1	106.5	2,265	404.5	219.0	144.0	2,870
2014									
For-Hire	36.2	44.2	24.6	17.7	335	51.8	30.3	23.0	435
Private Anglers	<u>281.4</u>	<u>249.9</u>	<u>151.4</u>	<u>94.8</u>	<u>2,050</u>	<u>372.9</u>	<u>200.1</u>	<u>128.9</u>	<u>2,590</u>
All	317.6	294.1	176.0	112.5	2,385	424.7	230.4	151.9	3,025
2015									
For-Hire	35.7	43.6	24.2	17.5	330	51.1	29.8	22.7	430
Private Anglers	<u>316.1</u>	<u>280.7</u>	<u>170.1</u>	<u>106.5</u>	<u>2,305</u>	<u>420.0</u>	<u>224.7</u>	<u>144.8</u>	<u>2,910</u>
All	351.8	324.3	194.3	124.0	2,635	471.1	254.5	167.5	3,340

Source: Exhibit C.7 plus IMPLAN multipliers as embodied in NOAA FEUS reports (see Appendix E)

C.3 Commercial and Recreational Sectors - Summary

The summary Exhibit C.9 provides total - direct, indirect & induced - economic impacts on the Washington economy from commercial and recreational salmon activity, revenues and expenditures. The Exhibit also presents impacts on the U.S. economy associated with this Washington activity, revenues and expenditures.

The induced impact coefficients in Appendix E were used to convert the information in Exhibit C.5 for the commercial sector and in Exhibit C.8 for the recreational sector into total impact measures. The impact measures for the commercial and recreational sectors are consistent.

The commercial and recreational sector impacts in Exhibit C.9 for Washington are the same as those presented in sections 3 and 4 respectively of the Main Text. The recreational sector impacts for the United States in the Main Text are the sum of U.S. impacts from recreational fishing activity in Alaska, Washington and Oregon (as presented in the 8th Exhibit in each Appendix).

However, the commercial sector impacts for the United States in the Main Text are larger than the simple sum of U.S. impacts from commercial fishing activity occurring in Alaska, Washington and Oregon. The reason is that commercial sector U.S. impacts in the Main Text include salmon sector activity occurring in the U. S. but outside Alaska, Washington or Oregon e.g., the impacts on the U.S. economy of Washington salmon retailed in the Eastern U.S. This Appendix focuses solely on economic activity originating in Washington.

Exhibit C.9: Salmon Sector Economic Impacts Summary - Washington

	Washington - Total Impacts*				United States - Total Impacts*			
	Output ● ● ●	GDP \$ millions US	Labor Income ● ● ●	Employment FTEs	Output ● ● ●	GDP \$ millions US	Labor Income ● ● ●	Employment FTEs
Commercial								
2012	337.1	194.7	116.2	2,640	456.5	266.2	164.2	3,570
2013	498.8	305.4	171.5	3,660	667.5	404.5	236.4	4,980
2014	425.7	260.4	150.0	3,360	571.2	354.0	207.4	4,470
2015	345.2	200.7	120.0	2,700	466.7	272.8	169.4	3,670
Recreational								
2012	356.7	215.2	131.5	2,860	601.6	333.5	206.8	4,270
2013	378.9	228.6	139.6	3,040	639.5	354.4	219.7	4,540
2014	400.0	240.9	147.5	3,210	672.6	373.2	231.8	4,790
2015	441.0	265.8	162.6	3,540	744.5	412.0	255.6	5,280
Total								
2012	693.8	409.9	247.7	5,500	1,058.1	599.7	371.0	7,840
2013	877.7	534.0	311.1	6,700	1,307.0	758.9	456.1	9,520
2014	825.7	501.3	297.5	6,570	1,243.8	727.2	439.2	9,260
2015	786.2	466.5	282.6	6,240	1,211.2	684.8	425.0	8,950

* Direct, indirect plus induced impacts

Note: United States impacts - impacts on national economy from salmon sector activity/expenditures occurring in Washington

Appendix D

Commercial & Recreational Salmon Impacts - Oregon

Appendix D: Commercial & Recreational Salmon Impacts - Oregon

This Appendix provides background information and data sources underlying the estimates of economic impacts of the Oregon commercial and recreational salmon sectors.

First we describe estimation procedures for the commercial sector and present Exhibits D.1 to D.5 that give data, assumptions, and results on the Oregon commercial salmon sector. Then we describe estimation procedures for the recreational sector and present Exhibits D.6 to C.8 that give data, assumptions, and results on the Oregon recreational salmon sector. Finally we present Exhibit D.9 which summarizes the commercial and recreational sector impacts.

D.1 Commercial Sector

Commercial sector activity and impacts are driven by catch in number of pieces of salmon caught by species by gear/type of fishery - see Exhibit D.1. Note that catch figures refer to where the fish is landed i.e., Oregon.

These catch figures summed over all fishery types then are translated into values at different stages of the salmon value chain.

<u>Indicator</u>	<u>Formula</u>
Catch Weight	no. of pieces x average weight
Ex-Vessel Value	catch weight x ex-vessel price
Delivered Value to Plant	catch weight x handling to plant cost/price
Processed Value	catch weight x processed price
Wholesale Value	processed value x (1 + % wholesale markup)
Retail Value	wholesale value / (1-% retail margin)

Income Statements are estimated for the first three stages in the value chain - Fishing, Fish Handling and Fish Processing - to identify costs and returns. The financial measure EBITDA (Earnings Before Interest Taxes Depreciation & Amortization) represents the financial business return (see Exhibit D.2). Returns can vary widely from year to year depending on the catch level and revenue base. For wholesale and retail trade, we use the cost structures embedded in the IMPLAN Input-Output model for Wholesale Trade and for Retail Trade - Food & Beverage.

We estimate the shares of total wholesale markup and retail margin that go to each of seven jurisdictions - Alaska, Washington, Oregon, Other U.S., BC, Other Canada, and Offshore.

Finally we employ IMPLAN Input-Output ratios or multipliers to convert revenue/cost streams into the four economic impact measures - Output, Gross Domestic Product (GDP), Labor Income and Employment.

Catch Numbers. The catch numbers in pieces of fish by species were provided by ODFW.

Average Weight. Average weights in lbs round whole fish weight were derived from the above piece counts and ex-vessel weight available from ODFW in an annual reporting, namely “Pounds and Values of Commercially-Caught Fish and Shellfish Landed in Oregon”.

Ex-Vessel Prices. The ODFW annual report also provided ex-vessel prices in \$ per round lb.

Handling Cost/Price. This potentially includes three components - tendering, unloading at dock, and transport to plant. There are essentially no tenders in the Oregon fishery - but some trucking from landing site to plant site location is done. We used a constant \$0.15 per lb figure for each of the four years.

Processed Price. There is no reliable information on salmon processed prices in Oregon. Using professional judgment, we estimated processed prices based on a \$1.25 per lb difference between ex-vessel price and processed price.

Wholesale Trade. Our discussions with industry indicated that the typical wholesale markup on seafood in general was in the order of 20%. This figure corresponds closely with the Wholesale Trade markup embedded in the IMPLAN Input-Output model.

Retail Trade. We used a 40% margin on retail price as the retail margin. Again this was based on interviews and this was generally consistent with the Retail Trade-Food & Beverage margin embedded in IMPLAN.

Income Statements - Fishing, Handling, Processing. No data were available for the Oregon commercial salmon fishery. We used professional judgment, based in part on the mix of gear types utilized, in estimating costs and returns.

Regional Sourcing. We developed regional expenditures sourcing assumptions for fishermen, fish handlers, and fish processors based on professional judgment.

For each of the three value chain activities we bundled expenditure into three components - fuel/utilities, other variable and fixed - and then developed assumptions re regional expenditure patterns (see Exhibit D.4).

Regional Trade. We developed regional allocations of wholesale trade markups and of retail margins based on: 1) NOAA export statistics on values FOB export port, 2) the aforementioned processed value estimates, 3) the distribution of population among regions/states, and 4) professional judgment.

Note that the data in Exhibit D.3 gives the assumed regional distribution of final sales of Oregon salmon - the distribution for coho, for example, is 0% Alaska, 25% Washington State, 25% Oregon, 50% Rest of U.S., 0% BC, 0% Rest of Canada and 0% offshore.

Impact Analysis. Impact coefficients from the IMPLAN I-O model for Oregon were used to develop the impact estimates in Exhibit D.5. Appendix E gives details on the use of the IMPLAN model.

Exhibit D.1: Commercial Sector Catch & Value - Oregon Salmon Fishery

	2012						2013					
	Sockeye	Coho	Pink	Chum	Chinook	All	Sockeye	Coho	Pink	Chum	Chinook	All
No. of Fish '000												
Columbia River	1	13	0	0	64	78	0	36	0	0	117	153
Ocean Troll	<u>0</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>73</u>	<u>74</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>113</u>	<u>113</u>
Total	1	14	0	0	137	152	0	37	0	0	230	267
Total Catch												
No. of Fish '000	1	14	0	0	137	152	0	37	0	0	230	267
Weight '000 lbs	3	103	0	0	1,816	1,922	1	275	0	0	3,227	3,502
Value												
Ex-Vessel \$000 US	8	168	0	0	6,769	6,945	2	504	0	0	11,910	12,416
Processed \$000 US	11	299	1	0	9,079	9,390	2	852	0	0	15,973	16,828

	2014						2015					
	Sockeye	Coho	Pink	Chum	Chinook	All	Sockeye	Coho	Pink	Chum	Chinook	All
No. of Fish '000												
Columbia River	1	174	0	0	120	296	2	25	0	0	109	136
Ocean Troll	<u>0</u>	<u>11</u>	<u>0</u>	<u>0</u>	<u>208</u>	<u>219</u>	<u>0</u>	<u>2</u>	<u>0</u>	<u>0</u>	<u>104</u>	<u>106</u>
Total	1	185	0	0	328	515	2	27	0	0	213	242
Total Catch												
No. of Fish '000	1	185	0	0	328	515	2	27	0	0	213	242
Weight '000 lbs	4	1,536	0	0	4,839	6,379	7	184	0	0	2,948	3,139
Value												
Ex-Vessel \$000 US	9	1,826	0	0	18,253	20,088	15	281	0	0	11,538	11,834
Processed \$000 US	14	3,916	0	0	24,195	28,126	24	515	0	0	15,329	15,869

Exhibit D.2: Commercial Sector Income Statements - Oregon Salmon Fishery

	2012	2013	2014	2015
Fishing \$000 US				
Fishing Revenues	6,945	12,416	20,088	11,834
Expenses				
Crew Wages inc. Skipper	1,544	2,968	5,090	2,871
Fisheries Taxes	-	-	-	-
Fuel	900	1,245	1,544	961
Other Variable	900	1,278	1,576	1,302
Licenses, Permits, Property Taxes	400	400	400	400
Other Fixed	2,500	2,789	3,476	3,357
Subtotal	6,244	8,679	12,086	8,892
EBITDA	702	3,737	8,001	2,943
Fish Handling \$000 US				
Tendering, Offloading, Trucking Revenues	288	525	957	471
Expenses				
Crew Wages inc. Skipper	115	210	383	188
Fuel	50	69	86	53
Other Variable	50	72	88	72
Licenses, Permits, Property Taxes	5	5	5	5
Other Fixed	50	51	52	53
Subtotal	270	406	613	371
EBITDA	18	119	344	100
Fish Processing \$000 US				
Processing Revenues	9,390	16,828	28,116	15,869
Fishing Payments	6,945	12,416	20,088	11,834
Tendering etc.	288	525	957	471
Processing Margin	2,156	3,887	7,081	3,564
Expenses				
Wages & Salaries	673	1,226	2,233	1,099
Purchase Burden	-	-	-	-
Fisheries Taxes	-	-	-	-
Fuel & Utilities	100	180	335	125
Other Variable	200	370	684	337
Licenses, Permits, Property Taxes	10	10	10	10
Other Fixed	500	507	515	517
Subtotal	1,483	2,292	3,776	2,087
EBITDA	673	1,594	3,305	1,477
Employment FTEs/Jobs				
Fishing	100 / 1,000	120 / 1,100	150 / 1,200	120 / 1,200
Fish Handling	3 / 30	5 / 50	10 / 80	5 / 50
Fish Processing	15 / 75	30 / 150	50 / 250	25 / 125

Exhibit D.3: Commercial Sector Wholesale & Retail Trade - Oregon Salmon Fishery

	Sockeye	Coho	Pink	Chum	Chinook
Assumptions					
Wholesale Markup*	20%	20%	20%	20%	20%
Retail Margin**	40%	40%	40%	40%	40%
% Wholesale Markup to Regions					
Alaska	0%	0%	0%	0%	0%
Washington	0%	40%	0%	0%	40%
Oregon	100%	35%	100%	100%	35%
Rest of U.S.	0%	25%	0%	0%	25%
BC	0%	0%	0%	0%	0%
Rest of Canada	0%	0%	0%	0%	0%
Offshore	<u>0%</u>	<u>0%</u>	<u>0%</u>	<u>0%</u>	<u>0%</u>
All	100%	100%	100%	100%	100%
% Retail Margin to Regions					
Alaska	0%	0%	0%	0%	0%
Washington	0%	25%	0%	0%	25%
Oregon	100%	25%	100%	100%	25%
Rest of U.S.	0%	50%	0%	0%	50%
BC	0%	0%	0%	0%	0%
Rest of Canada	0%	0%	0%	0%	0%
Offshore	<u>0%</u>	<u>0%</u>	<u>0%</u>	<u>0%</u>	<u>0%</u>
All	100%	100%	100%	100%	100%

* % markup on processed price

** % margins on retail price

Exhibit D.4: Commercial Sector Regional Supply Purchases - Oregon Salmon Fishery

	% Region of Purchase							
	AK	WA	OR	Rest of U.S.	BC	Rest of Canada	Offshore	All
Fishing								
Fuel	-	5%	95%	-	-	-	-	100%
Other Variable ¹	-	5%	95%	-	-	-	-	100%
Fixed ²	-	15%	80%	5%	-	-	-	100%
Fish Handling								
Fuel	-	5%	95%	-	-	-	-	100%
Other Variable	-	5%	95%	-	-	-	-	100%
Fixed	-	15%	80%	5%	-	-	-	100%
Fish Processing								
Fuel	-	-	100%	-	-	-	-	100%
Other Variable ³	-	10%	80%	10%	-	-	-	100%
Fixed ²	-	10%	75%	10%	-	-	5%	100%

1 Mainly food

2 40% Repairs & Maintenance, 10% Insurance, 20% Supplies/Materials/Gear, 30% Business Services/Other

3 Includes packaging

Exhibit D.5: Commercial Salmon Sector Economic Impacts - Oregon

Impacts from Oregon Fishing*	Oregon Revenues \$ millions US	Oregon - Direct & Indirect				U.S. Direct & Indirect			
		Output	GDP	Labour Income	Em- ployment	Output	GDP	Labour Income	Em- ployment
		● ● ● \$ millions US	● ● ● \$ millions US	● ● ●	FTEs	● ● ● \$ millions US	● ● ●	● ● ●	FTEs
2012									
Fishing	6.9	12.1	5.3	3.3	140	13.2	6.0	3.8	150
Handling & Processing	2.4	3.5	2.1	1.2	25	3.7	2.2	1.3	30
Trade	<u>2.5</u>	<u>3.2</u>	<u>2.3</u>	<u>1.5</u>	<u>40</u>	<u>3.5</u>	<u>2.5</u>	<u>1.6</u>	<u>45</u>
All	11.8	18.8	9.7	6.0	205	20.4	10.7	6.7	225
2013									
Fishing	12.4	18.8	10.3	5.1	170	20.2	11.2	5.7	180
Handling & Processing	4.4	5.8	3.9	1.9	45	6.1	4.1	2.0	45
Trade	<u>4.5</u>	<u>5.7</u>	<u>4.1</u>	<u>2.6</u>	<u>75</u>	<u>6.2</u>	<u>4.4</u>	<u>2.8</u>	<u>80</u>
All	21.3	30.3	18.3	9.6	290	32.5	19.7	10.5	305
2014									
Fishing	20.1	28.9	17.5	7.7	210	29.8	18.6	8.5	230
Handling & Processing	8.0	10.0	7.3	3.2	70	10.4	7.6	3.4	75
Trade	<u>7.6</u>	<u>9.5</u>	<u>6.9</u>	<u>4.4</u>	<u>125</u>	<u>10.4</u>	<u>7.4</u>	<u>4.7</u>	<u>130</u>
All	35.7	48.4	31.7	15.3	405	50.6	33.6	16.6	435
2015									
Fishing	11.8	18.6	9.7	5.2	175	20.0	10.6	5.9	190
Handling & Processing	4.0	5.3	3.6	1.7	40	5.6	3.7	1.8	40
Trade	<u>4.3</u>	<u>5.4</u>	<u>3.9</u>	<u>2.5</u>	<u>70</u>	<u>5.9</u>	<u>4.2</u>	<u>2.7</u>	<u>75</u>
All	20.1	29.3	17.2	9.4	285	31.5	18.5	10.4	305
Impacts from Other Region Fishing**									
2012									
Supply Expenditures	9.4	13.0	6.9	4.9	105	15.9	8.5	6.3	130
Trade	<u>14.4</u>	<u>17.8</u>	<u>12.1</u>	<u>8.4</u>	<u>250</u>	<u>19.7</u>	<u>14.0</u>	<u>9.0</u>	<u>260</u>
All	23.8	30.8	19.0	13.3	355	35.6	22.5	15.3	390
2013									
Supply Expenditures	10.9	15.2	8.0	5.6	115	18.7	9.8	7.2	155
Trade	<u>20.8</u>	<u>25.9</u>	<u>17.4</u>	<u>12.1</u>	<u>360</u>	<u>28.5</u>	<u>20.3</u>	<u>12.9</u>	<u>370</u>
All	31.7	41.1	25.4	17.7	475	47.2	30.1	20.1	525
2014									
Supply Expenditures	9.8	13.6	7.2	5.1	110	16.6	8.9	6.6	135
Trade	<u>18.5</u>	<u>23.1</u>	<u>15.6</u>	<u>10.8</u>	<u>325</u>	<u>25.3</u>	<u>18.0</u>	<u>11.5</u>	<u>335</u>
All	28.3	36.7	22.8	15.9	435	41.9	26.9	18.1	470
2015									
Supply Expenditures	9.4	13.1	6.9	5.0	105	16.0	8.6	6.4	135
Trade	<u>13.8</u>	<u>17.2</u>	<u>11.5</u>	<u>8.0</u>	<u>240</u>	<u>18.9</u>	<u>13.4</u>	<u>8.6</u>	<u>245</u>
All	23.2	30.3	18.4	13.0	345	34.9	22.0	15.0	380

* Oregon impacts from salmon harvests within Oregon

** Oregon impacts from salmon harvests outside Oregon

D.2 Recreational Sector

Recreational sector revenue and expenditures are driven by activity in angler-days by type of angling - see Exhibit D.7 (Exhibit D.6 gives estimated recreational catch of salmon but recreational catch does not drive the economic impact estimates).

These activity measures then are translated into angler expenditures for each type of angling.

Indicator	Formula
Freshwater - For-Hire	no. of days x \$ per day
- Private	no. of days x \$ per day
Saltwater - For-Hire	no. of days x \$ per day
- Private	no. of days x \$ per day

Angler-Days. Aggregate salmon ocean angler-days, segmented by charter and private were available from the Pacific Fisheries Management Council (PFMC). ODFW personnel provided activity estimates for some but not all other activity e.g., information for Columbia River Estuary (Buoy 10) and the Lower Columbia River was available but information for tributaries was not.

We have classified the Columbia River fisheries as freshwater in our analysis.

We used professional judgment in estimating total salmon angler effort in freshwater. We estimated that 8% of freshwater effort was guided/charter effort (based on some survey results provided by ODFW for the Columbia River). We used PFMC data for saltwater charter days for salmon.

Salmon Angler Expenditures. NOAA periodically conducts economic impact studies of recreational fishing on coastal states (Lovell et al. 2013, NOAA “FEUS” Annual). Some analysis specific to Oregon has been conducted (The Research Group 2015).

Based on this information and professional judgment, we developed per angler-day expenditure levels - \$480 per day freshwater for-hire, \$240 per day freshwater private, \$600 per day saltwater for-hire, and \$300 per day saltwater private. The daily expenditures levels for what we call freshwater are higher than for Washington State because in actual fact our freshwater component contains Columbia River angling activity which is technically saltwater angling (per day expenditure levels are higher in saltwater than in freshwater).

Expenditures include both trip expenditures plus durable expenditures.

Angler-day and angler expenditure estimates are given in Exhibit D.7.

Impact Estimates. Impact coefficients from the IMPLAN I-O model for Oregon, as reported in the NOAA FEUS reports, were used to develop the impact estimates in Exhibit D.8. Appendix E gives details on the use of the IMPLAN model.

Exhibit D.6: Recreational Sector Catch - Oregon Salmon Fishery

	2012						2013					
	Sockeye	Coho	Pink	Chum	Chinook	All	Sockeye	Coho	Pink	Chum	Chinook	All
No. of Fish Kept '000												
Freshwater	-	36	-	-	149	185	-	41	-	-	173	214
Saltwater	-	16	-	-	19	35	-	15	-	-	30	45
Total	0	52	0	0	168	220	0	56	0	0	203	259

	2014						2015					
	Sockeye	Coho	Pink	Chum	Chinook	All	Sockeye	Coho	Pink	Chum	Chinook	All
No. of Fish Kept '000												
Freshwater	-	228	-	-	180	408	-	115	-	-	333	448
Saltwater	-	100	-	-	18	118	-	28	-	-	9	37
Total	0	328	0	0	198	526	0	143	0	0	342	485

Source: freshwater - ODFW
 saltwater - PFMC

Exhibit D.7: Recreational Sector Activity & Expenditures - Oregon Salmon Fishery

	2012	2013	2014	2015
Salmon Angler-Days '000				
Freshwater - For-Hire	52.0	70.0	72.0	68.0
- Private	<u>598.0</u>	<u>805.0</u>	<u>828.0</u>	<u>782.0</u>
- All	650.0	875.0	900.0	850.0
Saltwater - For-Hire	6.6	7.4	14.5	7.8
- Private	<u>60.7</u>	<u>78.1</u>	<u>107.0</u>	<u>58.3</u>
- All	67.3	85.5	121.5	66.1
Total State - For-Hire	58.6	77.4	86.5	75.8
- Private	<u>658.7</u>	<u>883.1</u>	<u>935.0</u>	<u>840.3</u>
- All	717.3	960.5	1,021.5	916.1
Salmon Angling Expenditures \$ millions US				
Freshwater - For-Hire	25.0	33.6	34.6	32.6
- Private	<u>143.5</u>	<u>193.2</u>	<u>198.7</u>	<u>187.7</u>
- All	168.5	226.8	233.3	220.3
Saltwater - For-Hire	4.0	4.4	8.7	4.7
- Private	<u>18.2</u>	<u>23.4</u>	<u>32.1</u>	<u>17.5</u>
- All	22.2	27.8	40.8	22.2
Total State - For-Hire	29.0	38.0	43.3	37.3
- Private	<u>161.7</u>	<u>216.6</u>	<u>230.8</u>	<u>205.2</u>
- All	190.7	254.4	274.1	242.5

Note: 1. Columbia River Estuary (Buoy 10) and Lower Columbia River included under freshwater
 2. expenditures = days x \$ per day

Exhibit D.8: Recreational Salmon Sector Economic Impacts - Oregon

Impacts from Oregon Fishing	Oregon Expenditures \$ millions US	Oregon - Direct & Indirect				U.S. - Direct & Indirect			
		Output	GDP	Labor Income	Em- ployment	Output	GDP	Labor Income	Em- ployment
		● ● ● \$ millions US	● ● ● \$ millions US	● ● ●	FTEs	● ● ● \$ millions US	● ● ●	● ● ●	FTEs
2012									
For-Hire	29.0	34.4	17.8	13.7	270	41.5	24.2	18.4	350
Private Anglers	<u>161.7</u>	<u>124.2</u>	<u>77.9</u>	<u>56.8</u>	<u>1,385</u>	<u>214.3</u>	<u>115.0</u>	<u>74.1</u>	<u>1,490</u>
All	190.7	158.6	95.7	70.5	1,655	255.8	139.2	92.5	1,840
2013									
For-Hire	38.0	45.1	23.4	18.0	355	54.3	31.8	24.2	455
Private Anglers	<u>216.6</u>	<u>166.3</u>	<u>104.4</u>	<u>76.0</u>	<u>1,850</u>	<u>287.0</u>	<u>154.0</u>	<u>99.2</u>	<u>1,995</u>
All	254.6	211.4	127.8	94.0	2,205	341.3	185.8	123.4	2,450
2014									
For-Hire	43.3	51.4	26.6	20.5	405	61.9	36.2	27.5	520
Private Anglers	<u>230.8</u>	<u>177.3</u>	<u>111.2</u>	<u>81.0</u>	<u>1,975</u>	<u>305.8</u>	<u>164.1</u>	<u>105.7</u>	<u>2,125</u>
All	274.1	228.7	137.8	101.5	2,380	367.7	200.3	133.2	2,645
2015									
For-Hire	37.3	44.3	22.9	17.7	345	53.3	31.2	23.7	450
Private Anglers	<u>205.2</u>	<u>157.6</u>	<u>98.9</u>	<u>72.0</u>	<u>1,755</u>	<u>271.9</u>	<u>145.9</u>	<u>94.0</u>	<u>1,890</u>
All	242.5	201.9	121.8	89.7	2,100	325.2	177.1	117.7	2,340

Source: Exhibit D.7 plus IMPLAN multipliers as embodied in NOAA FEUS reports (see Appendix E)

D.3 Commercial and Recreational Sectors - Summary

The summary Exhibit D.9 provides total - direct, indirect & induced - economic impacts on the Oregon economy from commercial and recreational salmon activity, revenues and expenditures. The Exhibit also presents impacts on the U.S. economy associated with this Oregon activity, revenues and expenditures.

The induced impact coefficients in Appendix E were used to convert the information in Exhibit D.5 for the commercial sector and in Exhibit D.8 for the recreational sector into total impact measures. The impact measures for the commercial and recreational sectors are consistent.

The commercial and recreational sector impacts in Exhibit D.9 for Oregon are the same as those presented in sections 3 and 4 respectively of the Main Text. The recreational sector impacts for the United States in the Main Text are the sum of U.S. impacts from recreational fishing activity in Alaska, Washington and Oregon (as presented in the 8th Exhibit in each Appendix).

However, the commercial sector impacts for the United States in the Main Text are larger than the simple sum of U.S. impacts from commercial fishing activity occurring in Alaska, Washington and Oregon. The reason is that commercial sector U.S. impacts in the Main Text include salmon sector activity occurring in the U. S. but outside Alaska, Washington or Oregon e.g., the impacts on the U.S. economy of Oregon salmon retailed in the Eastern U.S. This Appendix focuses solely on economic activity originating in Oregon.

Exhibit D.9: Salmon Sector Economic Impacts Summary - Oregon

	Oregon - Total Impacts*				United States - Total Impacts*			
	Output ● ● ●	GDP \$ millions US	Labor Income ● ● ●	Employment FTEs	Output ● ● ●	GDP \$ millions US	Labor Income ● ● ●	Employment FTEs
Commercial								
2012	68.0	40.0	25.6	730	91.9	53.9	33.6	870
2013	97.4	59.6	36.1	1,000	129.6	78.6	46.7	1,180
2014	114.8	72.7	41.3	1,110	149.1	93.1	53.0	1,310
2015	80.9	48.7	29.7	820	107.9	64.4	38.8	980
Recreational								
2012	225.7	136.8	93.3	2,260	406.8	226.2	141.1	2,910
2013	300.9	182.6	124.5	3,010	542.7	301.8	188.3	3,880
2014	325.3	197.0	134.4	3,250	585.1	325.5	203.3	4,190
2015	287.3	174.1	118.8	2,870	517.3	287.7	179.6	3,710
Total								
2012	293.7	176.8	118.9	2,990	498.7	280.1	174.7	3,780
2013	398.3	242.2	160.6	4,010	672.3	380.4	235.0	5,060
2014	440.1	269.7	175.7	4,360	734.2	418.6	256.3	5,500
2015	368.2	222.8	148.5	3,690	625.2	352.1	218.4	4,690

* Direct, indirect plus induced impacts

Note: United States impacts - impacts on national economy from salmon sector activity/expenditures occurring in Oregon

Appendix E

Economic Impact Methodology

Appendix E: Economic Impact Methodology

The estimation of economic impacts of industries through the use of Input-Output or I-O models is a standard and common methodology. However, application of this methodology to salmon fisheries is a challenge.

Apart from the difficulty in estimating the cost/expenditure structure for each sector, another difficulty is that the industries embedded in the I-O models are not necessarily specific to the circumstances of the salmon sector or even the fishing industry at large. For example, the closest I-O retail industry category for recreational fishing rods and reels may be the category Retail Sporting Goods, but this includes golf clubs, tennis rackets, hockey sticks etc.

This Appendix outlines the process for estimating direct plus indirect impacts and then induced impacts. The 2010 versions of the IMPLAN I-O model for the United States and the Statistics Canada I-O model for Canada were used.

E.1 Direct and Indirect Impacts

For the commercial sector, we treated or allocated all expense items for each of Fishing, Handling, and Processing activities into 3 categories - Fuel & Utilities, Other Variable and Fixed. We then identified an industry code for each aggregate and used the associated multiplier.

- Fuel & Utilities - Retail Gasoline for Fishing and Handling, Electricity Distribution for Processing
- Other Variable Processing - Retail Food & Beverage for Fishing & Handling, 20% Retail Food & Beverage, 80% Plastic Manufacturing for Processing (containers are a substantial part of variable processing costs). For Alaska, we included the category Metal Cans Manufacturing in our calculation (the other U.S. regions do not have canning lines).
- Fixed - 10% Insurance, 40% Maintenance & Repairs, 30% Business Services, 20% Gear/Supplies

For goods components such as Gasoline and Food & Beverage, we estimated wholesale and retail margins as well as Manufacturing margins for the I-O results to come to an overall multiplier. These multipliers then were applied to the expenditure items for Fishing, Handling and Processing. Direct impacts were estimated from the Income Statements. The result was the sum of direct plus indirect impacts.

For Wholesale Trade and Retail Trade margins on salmon sales, the process was much simpler as we used the embedded cost structure in the I-O Model to estimate direct plus indirect impacts.

The direct and indirect impact ratios for the recreational sector for U.S. regions were based on existing work using the IMPLAN I-O model e.g., Lovell et al. 2013, NOAA FEUS reports.

Recreational direct and indirect impact ratios for BC and Canada are estimates based on prior studies (e.g., GSGislason 2003, GSGislason 2009, Bailey and Sumaila 2013), based on the mix of angler expenditures from DFO surveys (e.g., DFO 2012), and based on industry-specific Statistics Canada Input-Output model results. Unlike in the United States, no recent economic impact analysis for the recreational sector at the regional and national levels in Canada has been conducted.

E.2 Induced Multipliers & Impacts

Based on the IMPLAN I-O results for U.S. states and the United States and based on Statistics Canada I-O results for British Columbia and Canada, we developed a suite of induced multipliers per \$ of direct and indirect Labor Income.

United States	Induced Multiplier			
	Output*	GDP*	Labor Income*	Employment**
Alaska	.701	.436	.231	5.5
Washington	.941	.577	.311	7.3
Oregon	.952	.583	.324	8.6
Total U.S.	1.632	.940	.526	11.6
Canada				
British Columbia	.56	.37	.16	3.3
Total Canada	.77	.47	.21	4.3

* \$ induced impact in the region per \$ direct & indirect Labor Income in the region

** FTE employment per \$ million direct & indirect Labor Income

For example, \$1 million of direct and indirect Labor Income in Washington results in \$941 thousand in induced output, \$577 thousand in induced GDP, \$311 thousand in induced Labor Income and 7.3 FTE of induced employment.

Note that the impact multipliers from the two I-O Models are not necessarily consistent. For example, because BC has a larger population base and a more integrated economy than does Alaska, one would expect induced multipliers for BC to be larger than those for Alaska but the reverse holds.