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Economic Value of Wild Atlantic Salmon

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Atlantic Salmon Federation

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September, 2011

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EXECUTIVE SUMMARY

Background

By most indicators, wild Atlantic salmon (*Salmo salar*) currently face daunting challenges to their survival throughout much of their traditional range. Many of the historical rivers with salmon runs have not seen salmon return in recent years, and global remaining populations may only be 20% of their historic levels.

Atlantic Salmon Federation (ASF) is dedicated to the conservation, protection and restoration of wild Atlantic salmon and the ecosystems on which their well-being and survival depend. It is an international non-profit organization headquartered in St. Andrews, NB, with regional offices in Quebec, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador and Maine.

ASF is garnering support for large conservation initiatives and has commissioned this study in which the primary goal is to estimate the economic value of wild Atlantic salmon in Canada's four Atlantic Provinces and Quebec. The findings can then be weighed against the costs of various policy and project options. The study includes coverage of:

- ❑ recreational fishing industry and tourism,
- ❑ First Nations food, social and ceremonial fisheries,
- ❑ conservation and enhancement activity, government roles, research and
- ❑ existence value and other passive use values of the species.

In addition, four case studies are prepared for specific rivers including; the Exploits (Newfoundland and Labrador), Margaree (Nova Scotia), Miramichi (New Brunswick), and Grand Cascapedia (Quebec).

Recreational fishing

“Anglers spent an estimated \$102 million in 2010 (excluding high economic impact camps).”

A survey of ASF members gathered information from 1,324 anglers and, after excluding those who frequent high economic impact camps and lodges, the following spending results were obtained.

Total salmon-related spending by province by origin in 2010 (\$millions)

Residence	NB	NL	NS	PEI	QC	Total
Residents	\$28.0	\$19.0	\$3.3	\$0.2	\$21.1	\$71.6
Other Canadians	\$8.3	\$5.7	\$0.6	\$0.0	\$2.9	\$17.4
Visitors to Canada	\$7.6	\$2.4	\$0.4	\$0.0	\$2.7	\$13.1
Total	\$43.9	\$27.1	\$4.3	\$0.2	\$26.7	\$102.1

“Anglers at high economic impact camps spent an estimated \$26 million in 2010.”

Spending and employment information was collected for 59 high economic impact salmon fishing camps in four of Canada's eastern provinces. These were targeted since the top 10% of

anglers account for about 48% of total spending. There are upwards of 200 high economic impact camps, and the 59 sampled provide improved coverage compared to random sampling through a broad angler survey. The spending at the camps surveyed is presented by province.

Private camp spending on operations and capital by province (2010)

Province	Operations	Capital	Total
QC	\$11,344,423	\$2,359,186	\$13,703,609
NB	\$8,062,895	\$1,997,369	\$10,060,264
NS	\$772,440	\$50,000	\$822,440
NL	\$1,450,000	\$114,000	\$1,564,000
Total	\$21,629,758	\$4,520,555	\$26,150,313

This analysis of high economic impact camps likely underestimates the top 10% of anglers according to spending. This segment of anglers, possibly representing up to half (48%) of all spending, is less influenced by fluctuating circumstances and has spent relatively steadily for decades according to reports from high economic impact camps. This would suggest that total salmon angler spending has probably remained fairly stable and well above the \$100 million level. This finding differs from previous accounts of recreational salmon fishing expenditures that fluctuate from a low of \$62 million to a high of \$191 million.

Aboriginal FSC and Labrador resident food fisheries

“Aboriginal food, social and ceremonial (FSC) fisheries and Labrador resident food fisheries contribute over \$400,000 in spending.”

This does not represent the full value First Nations place on the salmon harvest, only the spending for such things as gear, supplies, and transportation. The total value is also a function of non-use values discussed below.

First Nations fisheries for food social and ceremonial (FSC) purposes have priority over other fishing activities according to the Supreme Court of Canada’s decision in *R. v. Sparrow*. Conservation requirements for salmon are recognized and Aboriginals have piloted live trap gear to replace gill nets. In general a more collaborative approach has been advanced with Aboriginals increasingly involved in wild salmon management, science, and habitat enhancement projects.

A resident food fishery remained open in Labrador after the last commercial salmon fisheries ceased in 1999. This is a directed fishery for trout allowing some by-catch of salmon.

Governments, academic researchers, and conservation organizations

“Federal government spending is about \$12 million and provincial government spending is about \$10 million.”

DFO is the lead federal agency with respect to wild Atlantic salmon and spending by other agencies is negligible. DFO’s \$12 million expenditures have historically been divided according to enhancement and habitat restoration (46%), enforcement (27%), research (24%), and management (4%).

“Provincial governments collectively spend about \$10 million annually.”

Like the federal government the provinces undertake enforcement, monitoring, enhancement and conservation, but take on a greater role with respect to licensing, tourism and marketing.

“Academic researchers spend \$756,000 on wild Atlantic salmon research”

The majority of academic research is funded by the National Science and Engineering Research Council (NSERC) and the Canadian Foundation for Innovation (CFI), but private sector companies also contribute significant amounts.

“Non-profit conservation, restoration, and education spending is about \$16 million.”

There are at least 126 non-profit organizations and facilities in eastern Canada with a mandate to conserve salmon and deliver information and education programs. Environmental conservation and restoration organizations not only spend money but also leverage in-kind contributions and volunteer efforts with an estimated value of \$12 million.

80% Public support and non-use value over \$105 million

A random survey of 995 Canadians in Atlantic Canada and Quebec gathered information about public understanding of salmon issues, willingness to invest in salmon restoration, and preferences for a long-term wild salmon program.

“The public is not familiar with wild Atlantic salmon.”

When asked about several topics related to wild Atlantic salmon about 61-72% were either not at all familiar or not very familiar. The survey was designed to provide basic information about wild salmon to participants so they could still complete the survey.

“Reading one additional screen of information depicting “what’s at stake” in salmon conservation decisions, took participants only 30 seconds and positively influenced the proportion of supporters and their willingness to pay for conservation.”

Half of the survey participants were administered one extra screen of information to determine the value of incremental education. This half was positively influenced to indicate up to an additional \$2.91 per tax-paying household or \$11.5 million in total annual support across eastern Canada.

“There is over 80% public support in Eastern Canada for a sustained 20-year program with new annual investments of \$53M - \$157M that will “likely” or “very likely” restore Atlantic salmon abundance to 40% - 80% of historic highs.”

There is clear support for any options that move wild Atlantic salmon restoration beyond the status quo. The midpoint in the range of \$53 - \$157 million suggests there is over \$105 million in public non-use value associated with wild salmon, equivalent to \$26 per tax-paying household.

“Eastern Canadian households want to be sure of what they are getting for their investment and will pay an average premium of \$0.18 for each percentage increase in salmon abundance that is ‘very likely’ instead of just ‘likely’.”

Probability of success was the most important attribute in survey participant's choices regarding wild salmon conservation options. In total this represents \$700,000 across tax-paying households in eastern Canada, effectively for research that can ensure that proposed enhancement measures will have high rates of success.

“The top two rationales for supporting wild salmon conservation were 1) that salmon should exist, 2) the importance of natural heritage and ecosystem integrity.”

Survey participants were asked to rank their top three rationales from a list that also included commercial fishing potential, research potential, international role in species at risk recovery, recreational fishing potential, First Nations and cultural heritage. Only 7% of survey participants indicated they would never support such conservation programs.

Four case-study rivers

The case study rivers, like nearly all salmon rivers in Canada, demonstrate that generating sustainable economic activity is highly valuable, especially given their rural setting. The prime tourism, recreation, food, and cultural values associated with salmon rivers represent excellent local opportunities for enjoyment, advancement, and employment.

Exploits (NL) - The Exploits is now recognized as a world-class salmon river and one of the most successful salmon enhancement projects in North America. In the late 1970s the returning run of salmon numbered around 1,500 and now the run is self-sustaining at about 40,000 fish. Annual spending of \$3.5 million from angling, tourism, and conservation generates \$3.0 million in GDP, 73 full-time equivalent jobs, and \$2.2 million worth of income.

Margaree (NS) - The Margaree-Lake Ainslie River System is a designated Canadian Heritage River with protection afforded for both cultural and natural heritage values. Compared to the other case study rivers, it has exceptionally high export value since it boasts the highest rate of international angler attraction at two-thirds of all anglers on the Margaree. Annual spending of \$2.9 million generates \$2.5 million in GDP, 70 full-time equivalent jobs, and \$2.1 million worth of income.

Miramichi (NB) - The Miramichi is recognized for having the largest salmon runs in the world. The river is home to many salmon camps and lodges attracting visitors from many countries. Over \$20 million in annual spending generates \$16 million in GDP, about 637 full-time equivalent jobs, and \$19.1 million worth of income.

Grand Cascapedia (QC) - The Grand Cascapedia is known for having some of the largest salmon each year. Eighteen of the world's fifty largest wild Atlantic salmon have come from rivers of the Gaspé Peninsula including the Cascapedia. Annual spending of about \$6.2 million generates \$7.2 million in GDP, 172 full-time equivalent jobs, and \$5.2 million worth of income.

Total economic value

“Total spending in 2010 for wild salmon related activities is estimated at \$166.0 million.”

This represents “output” in economic terms which is the starting point for the economic analysis. Breakdowns of all spending are compiled by activity and by province.

Total salmon-related spending by activity by province, 2010

Activity	NL	NS	NB	PEI	QC	Total
Aboriginal and food	\$226,000	\$10,000	\$42,000	\$0	\$132,000	\$409,000
Recreational fishing	\$28,630,000	\$5,166,000	\$53,951,000	\$173,000	\$40,363,000	\$128,283,000
Federal govt	\$5,103,000	\$2,846,000	\$3,951,000	\$100,000	\$0	\$12,000,000
Provincial govt	\$2,400,000	\$560,000	\$2,000,000	\$300,000	\$3,500,000	\$8,760,000
Academic research	\$139,000	\$190,000	\$122,000	\$121,000	\$193,000	\$765,000
NGOs	\$859,000	\$2,142,000	\$10,729,000	\$309,000	\$1,706,000	\$15,745,000
Total	\$37,357,000	\$10,914,000	\$70,795,000	\$1,003,000	\$45,894,000	\$165,962,000

“Salmon-related spending creates almost 3,873 FTE jobs and \$128 million worth of income.”

The Statistics Canada inter-provincial input-output model is used to generate a set of conventional economic indicators to show the economic impacts of spending. The FTE employment estimate understates the number of people that depend on salmon related jobs, and the total number of dependent jobs could be double since the majority are seasonal or part-time.

Total economic impacts of spending for eastern Canada, 2010 (\$000s)

Activities	Total		
	GDP	Employment*	Income
Aboriginal and food	\$328	4	\$213
Recreational fishing	\$115,263	3,316	\$100,242
Federal government	\$10,305	107	\$7,327
Provincial government	\$7,414	122	\$7,562
Academic research	\$825	12	\$615
NGOs	\$15,376	311	\$12,324
Total	\$149,511	3,873	\$128,283

Source: Statistics Canada input-output analysis model.

*Employment in full-time equivalents (FTE).

“The total annual economic value of wild Atlantic salmon is estimated at \$255 million.”

For reference, farmed Atlantic salmon in eastern Canada yielded \$270 million in GDP value in 2006 (Gardner Pinfold, 2008). This does not include government spending or academic research related to salmon aquaculture, so the findings in this study are not perfectly comparable. Having said this, wild salmon-related GDP of \$150 million is about 56% of the GDP associated with aquaculture salmon in eastern Canada and, unlike farmed Atlantic salmon, there is substantial public value associated with the wild salmon run. The total wild Atlantic salmon value of \$255 million is nearly on par with the economic significance of farmed salmon in eastern Canada.

Investing in wild Atlantic salmon

“The basis for investing in wild salmon begins with policy set by DFO as the lead federal agency.”

The general direction for conservation and enhancement of salmon populations has been set in motion by Canada’s Policy for the Conservation of Wild Atlantic Salmon. The policy sets overarching goals and objectives for activities addressing the health of all Atlantic salmon populations. Specifically it states that the goal is:

“to maintain and restore healthy and diverse salmon populations and their habitat, for the benefit and enjoyment of the people of Canada in perpetuity” (DFO, 2009)

Following assessments by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), wild salmon populations may be listed under the Species At Risk Act (SARA) thereby triggering the development of recovery strategies and action plans.

Finally the Conservation Status Report for Atlantic Salmon in Atlantic Canada and Québec involves two parts: 1) species information, and 2) anthropogenic considerations (DFO, 2009b and 2009c). “New and proposed species rebuilding and habitat restoration strategies” are put forward that build on conservation efforts. This provides some insights into the nature and scale of a comprehensive program for all wild Atlantic salmon in Canada.

“Making the case for investment in wild Atlantic salmon draws on the potential use benefits (recreational fisheries growth) and non-use benefits (public interest).”

A return to the former peak of angler numbers is viewed as the key driver for growth in spending for recreational fishing, rather than any increases in the average spending rates per angler. The return to peak levels is assumed to require gradual building over 20 years, and yet the return on a \$15 million per year investment (ROI) is estimated to be about 18%, the net present value (NPV) is \$51 million, and the breakeven point would be 6 years.

The public survey demonstrated over 80% support for investments in salmon restoration in the range of \$4.50 to \$12.50 per tax-paying household. This translates into public support for annual incremental budget allocations upwards of \$57 million. This far exceeds the \$15 million that appears justified on the basis of recreational fishing growth potential. This signals that eastern Canadians would clearly support such investments and more to reflect their high regard for the existence of wild Atlantic salmon and the importance of passing the resource on to future generations.

“Insights from the study are offered to help develop criteria for building a comprehensive wild Atlantic salmon program.”

Trade-offs will be inevitable in building such a program since not all options can be pursued or at least not at the same time in all locations. The following may be helpful for decision-makers:

- ❑ **Communicating about wild Atlantic salmon challenges to the public** is important for gaining support even if this concedes past management shortcomings.
- ❑ **Be clear and specific about the goals** of wild salmon restoration programs including where activities will take place, who will benefit and in what ways.
- ❑ **Communicating the likelihood of success** for program investments clearly matters to the public. There is much greater public support for investments that have higher expectations of success.
- ❑ **A phased approach** may be helpful for achieving and demonstrating early success and this will build support for steps that restore wild salmon stocks toward their historic highs.

I THE STUDY

1. Background

By most indicators, wild Atlantic salmon (*Salmo salar*) currently face daunting challenges to their survival throughout much of their traditional range. Many of the historical rivers with salmon runs have not seen salmon return in recent years, and global remaining populations may only be 20% of their historic levels. The threats to wild Atlantic salmon must be addressed in a much more vigorous manner to stem declines and re-establish salmon populations to desirable levels.

Atlantic Salmon Federation (ASF) is dedicated to the conservation, protection and restoration of wild Atlantic salmon and the ecosystems on which their well-being and survival depend. It is an international non-profit organization headquartered in St. Andrews, NB, with regional offices in Quebec, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador and Maine.

ASF and partners have been involved in recent efforts to decommission dams, lime acidified waterways, restore salmon habitat, and research to determine the causes of the salmon's decline. These efforts suggest there is substantial willingness to stabilize and restore wild Atlantic salmon populations. These conservation initiatives represent significant investments ranging from several thousand dollars to over \$50 million in the case of a dam decommissioning and habitat restoration effort on the Penobscot River.

Garnering support for large conservation initiatives often requires economic analysis that indicates the expected benefits so these can be weighed against the costs of various policy and project options. A detailed economic study respecting the value of wild Atlantic salmon and restoring their populations will provide the necessary economic basis for selecting the most promising conservation measures going forward.

2. Objectives and scope

The goal of the study is to estimate the economic value of wild Atlantic salmon in Canada's four Atlantic Provinces and Quebec. The estimated values for recent years will be developed, along with projections according to potential conservation initiatives. Economic values will be expressed in conventional economic terms such as economic output, gross domestic product (GDP), salaries, and jobs associated with direct, indirect, and induced economic activity.

In support of the overall goal, the more specific valuation objectives are broken down according to the types of wild salmon values and related activities that must be included in the analysis:

- ❑ recreational fishing industry and tourism,
- ❑ First Nations food, social and ceremonial fisheries,
- ❑ conservation and enhancement activity, and
- ❑ existence value and other passive use values of the species.

In addition, four case studies are to be prepared for specific rivers including; the Exploits (Newfoundland and Labrador), Margaree (Nova Scotia), Miramichi (New Brunswick), and Grand Cascapedia (Quebec).

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II APPROACH

1. Total economic value

It is important to recognize that values associated with Atlantic salmon are also partially related to: broader activities associated with angling, salmon habitat including watershed ecosystems, and other species associated with salmon that share the same ecosystems. Anglers value more than just the salmon, they also value the water resource and foodweb that supports salmon, the scenery, and other aspects of fishing experiences. Local residents, including non-anglers, may value the ecosystems for clean water, waste assimilation, and nature enjoyment. All of these values associated with salmon and their habitat may be improved by efforts to stabilize and restore salmon populations. Decommissioning dams, liming acidified waterways, and riparian habitat restoration will have multiple benefits. These are meant to be included when “values associated with salmon” are discussed in this proposal.

Economists commonly employ a total economic value framework (TEV) to account for the range of values associated with any resource. The TEV framework provides a checklist of values to consider for any economic study with an environmental component and includes:

- ❑ Direct Use Values
 - Extractive (e.g., recreational and subsistence fishing)
 - Non-Extractive (e.g., catch-and-release sport fishing, wildlife viewing)
- ❑ Indirect Use Values (e.g., fishing for a species that depends on salmon for food)
- ❑ Option Values (i.e., the value of deferring use of a resource until later)
- ❑ Quasi-Option Values (i.e., the value of information in the future)
- ❑ Non-Use Values (also known as Passive Use Values)
 - Existence Values (e.g., the value individuals derive from knowing salmon exist even if they will never personally see them)
 - Bequest Values (e.g., the value individuals derive from knowing that salmon will not be extirpated/extinct and remain available for future generations)

2. Study tasks

Several tasks are required to determine the full range of values associated with Atlantic salmon. The tasks include:

- ❑ analysis of secondary sources,
- ❑ key informant interviews,
- ❑ case studies, and
- ❑ primary data collection from survey instruments.

The ASF has asked for a proposal in two parts, so that the option of pursuing only the first part could be selected at this time, or the two parts could be pursued in a phased approach. The first part forms the core of the project including a survey of anglers (to estimate direct and indirect use values), and the second part adds a choice experiment (to estimate non-use value). These are described in detail below along with the implications that should be considered.

Secondary sources

Secondary sources including annual reports, published literature, and public datasets provide insights regarding the range of values associated with wild Atlantic salmon. However existing sources tend to be disjointed in terms of their focus and timing. Not all are focused specifically on wild Atlantic salmon in Canada, nor are they published at the same time. We will review available sources and extract the most useful portions for this study. A few key sources are described here to illustrate how they will be used.

Key informant interviews

Much the same as published secondary sources, key informant interviews provide insights for the range of values associated with salmon. This is most important for two aspects of the study: 1) ensuring the range of values are assessed and the relationships between values are clear, and 2) developing the case studies to provide more tangible examples of the values associated with salmon.

Case studies

The purpose of the case studies is to help make the value of wild Atlantic salmon tangible and relevant at the local level. Sometimes aggregate values expressed at the provincial or regional scale are necessary but difficult to grasp and interpret. Local examples demonstrate more clearly how livelihoods and close relationships to salmon rivers have developed, and it is easier to illustrate certain values on a human scale. Four case studies are requested covering the following salmon rivers:

- ❑ Exploits (Newfoundland and Labrador),
- ❑ Margaree (Nova Scotia),
- ❑ Miramichi (New Brunswick), and
- ❑ Grand Cascadepedia (Quebec).

Primary data collection

Two surveys are used to capture salmon use and non-use values. First, a salmon angler survey aims to quantify use value, including direct and indirect uses such as angler expenditures for gear, licences and registration, transportation, and accommodation. Second, a choice experiment is a survey for the general population that aims to quantify non-use values including: option values, quasi-option values, existence and bequest values.

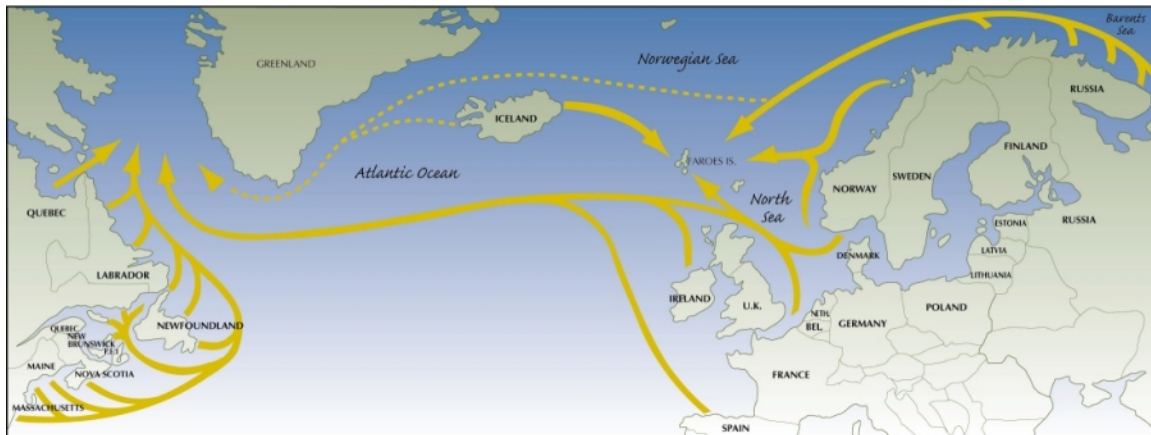
III SALMON OVERVIEW

1. Salmon life cycle and range

Wild Atlantic salmon hatch in freshwater and generally travel by river to the ocean and spend much of their life at sea (some wait multiple years before making the journey). Salmon typically return from the sea to the river where they hatched, and often to the same site on the river in order to spawn (reproduce).

There are nearly 1,100 rivers in Canada that have currently or historically been home to salmon runs. Wild Atlantic salmon migrate from these rivers to gather in large concentrations typically off the western and eastern coasts of Greenland, and in waters around the Faroe Islands. Salmon will spend one or more years at sea before returning to their river of origin to spawn. Some will travel up to 4,000 kms on this journey (see map of migration routes). Wild Atlantic salmon, unlike Pacific salmon that die after spawning, can repeat this extraordinary life cycle many times.

Figure 3.1.1: Wild Atlantic salmon global migration routes



Source: ASF

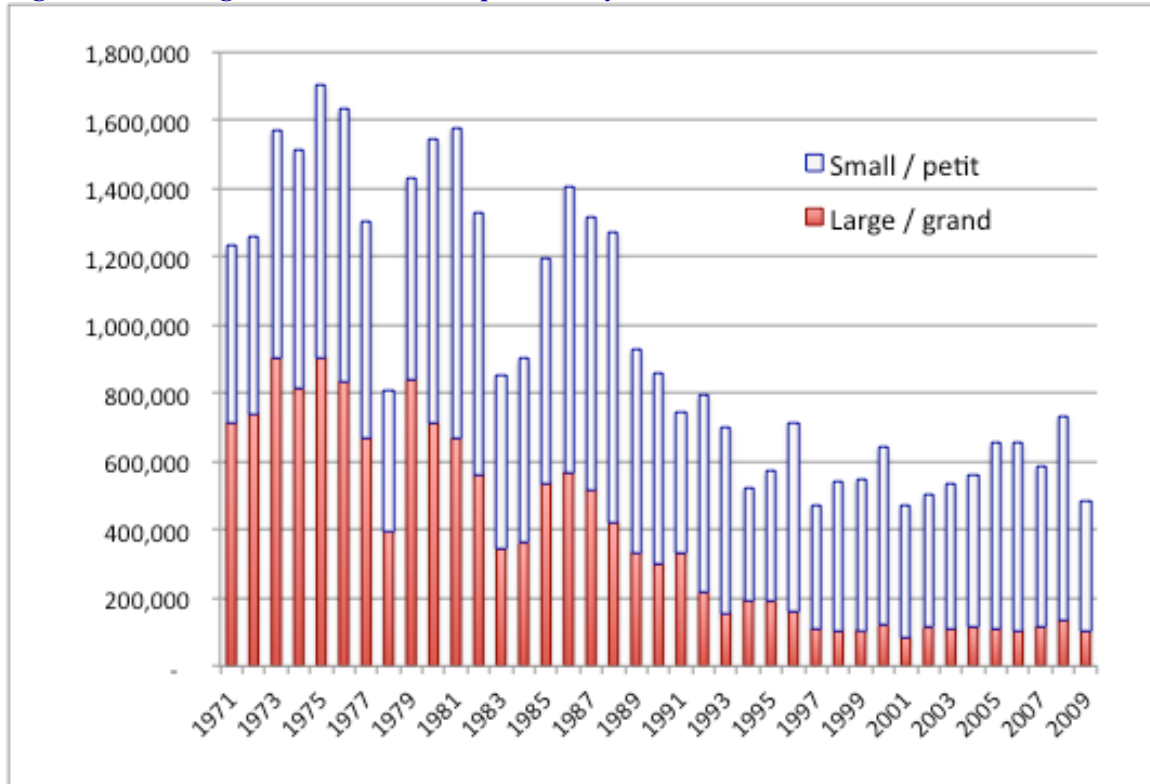
2. Population status and stressors

Status

The number of adult Atlantic salmon that would spend two years at sea, and if not caught would return to North American rivers to spawn, was estimated to be about 900,000 fish around 1975 (see Figure 3.1.2), although it is believed the numbers were much higher when European settlers first arrived in North America. In just over two decades their numbers dropped by almost 90% to about 100,000 and this number has remained relatively stable since then. For those salmon that return after only 1 year at sea, commonly known as grilse, the decline has not been as steep, going from about 800,00 to about 400-500,000 in the same time period. (source ICES North Atlantic Salmon Working Group Report). Almost all of this production has originated in Canada, with only a few % being produced in the USA.

The decline in salmon destined to be large spawners has been particularly troubling as these fish are predominately female, and due to their large size at spawning, they carry a disproportionate number of eggs, relative to the smaller grilse. It is also only these fish destined to be large salmon that migrate to distant waters such as Greenland and even the Faroe Islands, and were historically commercially fished in those areas.

Figure 3.1.2: Large and small salmon pre-fishery abundance since 1971

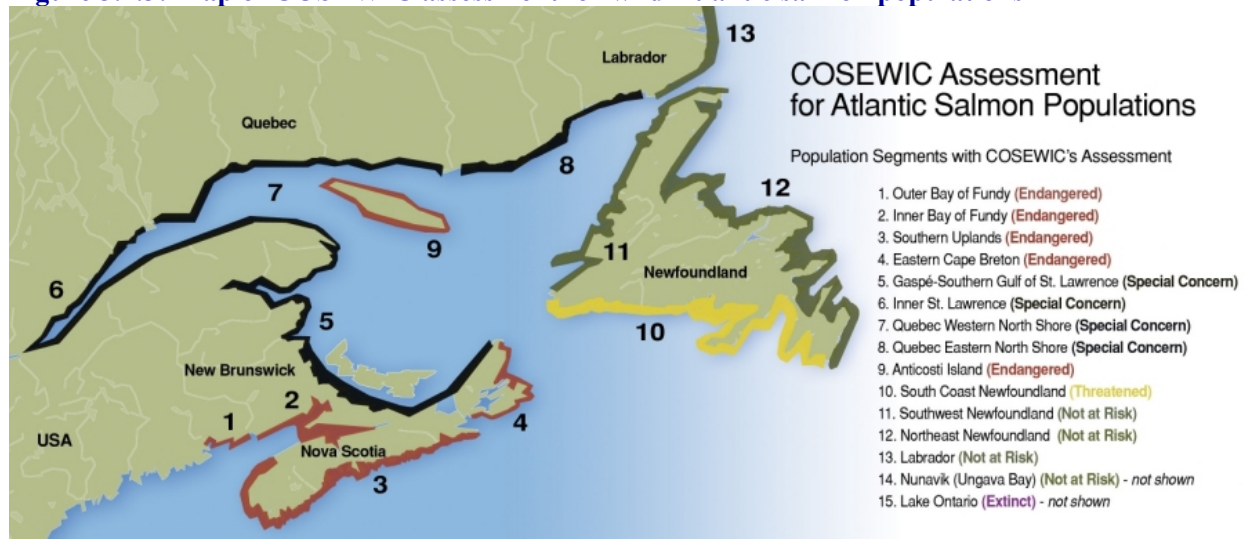


Source: ICES, 2011.

Note: Large salmon numbers do not include repeat spawners.

The drop in salmon numbers has not occurred evenly across eastern Canada. Many rivers no longer have any salmon return. The rivers that have suffered the greatest losses tend to be in southern areas, while more northern rivers in less populated areas maintain healthier salmon runs.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is responsible for assessing the status of species. The following map (Figure 3.1.3) shows the COSEWIC's recommended status for wild Atlantic salmon in different parts of Canada. COSEWIC makes recommendations on the status of species to the Government of Canada. It is up to the Federal Government to accept or reject the committee's recommendations. Presently COSEWIC's proposed status ranking is under review by the federal government therefore the present status of the species holds. The greatest concern is for Bay of Fundy populations (endangered), coastal Nova Scotia (endangered and special concern), Anticosti Island (endangered), and the southern coast of Newfoundland (threatened).

Figure 3.1.3: Map of COSEWIC assessment for wild Atlantic salmon populations

Source: ASF

Stressors

A number of factors are known to threaten wild Atlantic salmon even though it is not clear which factors are causing the most harm. Some factors only affect salmon from certain rivers, while other factors can affect salmon broadly. The following is by no means an exhaustive account of salmon stressors but provides some insights.

All legal and illegal forms of fishing of commercial, recreational, or First Nations reduce salmon numbers. Some restrictions on fisheries protect large spawners or prevent certain harmful gear from being used. Recreational fisheries are increasingly required to release live salmon back into the water instead of harvesting them.

Hydroelectric power dams and other barriers to control water flow on rivers can prevent salmon from reaching the upper waters of these rivers where they used to spawn (reproduce). Hydroelectric dams can also harm or kill fish that pass through the turbines in the dam even if there are ladders or other mechanisms in place to help fish overcome the barriers.

Waste water from communities, pesticides from agriculture or forestry, sediment and other pollutants that runoff into rivers can harm and kill salmon. Acid precipitation from air pollution generated by manufacturing plants and combustion processes can also make rivers too acidic for salmon to survive.

Decreases in the amount of food available to salmon or increases in the number of animals that eat Atlantic salmon can reduce salmon populations. Changes in water temperatures and other marine ecosystem characteristics can affect their survival and reproduction success.

Over 90% of all commercial aquaculture by value in Canada involves raising domesticated Atlantic salmon in net cages at the mouth of rivers where wild salmon pass by. Wild Salmon populations in the vicinity of aquaculture operations in Canada have been designated either threatened (southern Newfoundland) or endangered (Bay of Fundy). The Committee on the Status

of Endangered Wildlife in Canada (COSEWIC) have identified salmon farming as a key threat. Farmed salmon can spread diseases and parasites to wild salmon, while escaped domesticated salmon compete for food and habitat in freshwater, and interbreed with wild salmon thereby weakening the wild gene pool

3. Government roles

The Government of Canada passed a Species at Risk Act (SARA) that set out certain responsibilities and actions that must be taken when species are in danger of becoming locally or globally extinct. The Department of Fisheries and Oceans (DFO) takes the lead role regarding fish and other marine species and has annually spent about \$20 million in recent years on all species at risk programs (not just for Atlantic salmon).

DFO undertakes a wide range of activities to support wild salmon including monitoring, assessment, research, regulation and licensing, enforcement, and grants and contributions to other organizations and agencies. The Department published The Wild Atlantic Salmon Conservation Policy (2009) in response to the salmon population declines and rising concern about long-term sustainability. Although the policy contains promising measures for conserving and restoring stocks, insufficient funds are available for implementation. The Department has been handed budget cuts in recent years including announced cutbacks in the 2011 Budget that are expected to be phased in over the next three years.

Provincial governments play varying roles in salmon management across eastern Canada. Enforcement of recreational fisheries is often a joint effort between the federal government and the provinces. Licensing of recreational fishing is typically administered by the provinces, with some exceptions for Aboriginal and food fisheries. Provinces undertake a small amount of research and monitoring, and may manage access and infrastructure for certain waters that are public or crown reserves.

IV USE VALUES - SALMON ANGLERS

1. Angler survey

Survey design and purpose

The salmon angler survey aims to quantify use value, including direct and indirect uses. The survey design was similar to the DFO 2010 recreational fishing survey. The survey for each province differed somewhat given the distinct licensing schemes and fishing management context. The survey questions are included in Appendix B and additional tables of results are in Appendix C. French versions were also made available for New Brunswick and Québec.

The first part of the survey gathered information regarding licences held, species fished, locations of fishing effort, catch, and harvest. Anglers were asked to indicate their level of satisfaction with the amount of fishing and what were the reasons for any shortfalls. The second part of the survey addressed all forms of angling expenditures including major purchases and investments, packages, and other expenditures. The third part of the survey sought information about the household including other resident anglers and trip information. The fourth and final part solicited opinions about salmon management measures, and about priority assigned to ASF strategies.

The information collected has several purposes:

- The survey provides information from ASF members including their opinions on priorities that can help guide the organization,
- The survey data provides a basis for estimating 2010 spending by all Canadians and international visitors,
- The survey data provides insight into spending patterns that suggests alternative approaches for estimating and interpreting salmon angler spending totals in Canada.

Sampling to represent anglers in Canada

The angler survey was administered to a stratified random sample of the ASF membership list. Since ASF membership does not match the distribution of anglers by province it was necessary to draw more or less from the membership list in each province and abroad to represent the distribution of anglers. The following illustrates the sample relative to the number of anglers in each province.

Table 4.1.1: Angler survey sample size versus number of salmon anglers by province

Province	Anglers*		Sample	
	Number	%	Number	%
NB	15,833	38%	569	43%
NL	13,832	33%	115	9%
QC	9,000	22%	485	37%
NS	2,598	6%	132	10%
PEI	474	1%	21	2%
Total	41,737	100%	1,324	100%

*The number of anglers is not the equivalent to the number of salmon licences, since multiple licences can be held by anglers in some provinces. The number of licences sold is higher than the number of anglers.

The number of anglers in each province is based on 2005 DFO audited licensing data from the provinces. For the DFO recreational fishing survey, about 2.7% of all anglers were sampled resulting in about 1,113 salmon anglers surveyed.

Since the survey of ASF members captured 1,324 anglers this appears adequate (more than 1,113 collected by DFO in 2005) however there are some small discrepancies from the distribution of anglers by province. The one concern is where the province of NL was under-sampled (9% sample versus 33% actual). The question here is whether NL data is sufficiently representative, and the 117 respondents from that province is well above typical thresholds for small sample sizes (over about 30).

Weights are assigned to all data to arrive at aggregate findings by province. Weights not only account for the distribution of anglers by province, but also the origin of the anglers including residents of the province, Canadian visitors from other provinces, and international visitors (see Appendix C for details). This is especially important given the differences in their spending patterns, trip characteristics, and fishing activity levels.

Just over half of average 24 days spent fishing are for salmon

Survey participants were asked how many days were spent fishing in freshwater and saltwater by targeted species. The following table highlights salmon fishing days versus days fishing for other species.

Table 4.1.2: Average number of salmon fishing days by province in fresh and salt water

Province	Freshwater		Saltwater		Salmon		(F+S)
	#	%	#	%	#	%	Total
NB	19.8	90%	2.2	10%	14.1	64%	22.0
NL	17.0	80%	4.1	20%	13.6	65%	21.1
QC	20.9	80%	5.4	20%	9.9	38%	26.3
NS	24.2	88%	3.4	12%	13.0	47%	27.7
PEI	37.8	92%	3.4	8%	3.8	9%	41.2
Average	20.5	85%	3.5	15%	12.5	52%	24.1

The average number of fishing days was 24 with 85% spent in freshwater and the balance spent in saltwater. Salmon fishing days were 52% of the total, with the highest salmon fishing percentages in NL (65%) and NB (64%), and the lowest percentages in PEI (9%).

Two-thirds of anglers want more salmon fishing

When asked if they fished for salmon as much as they would have liked in 2010, two-thirds (66%) of respondents said “no”. The following table shows the results by province and overall average.

Table 4.1.3: Angler survey responses for whether anglers fished enough for salmon in 2010

Province	No	Yes
NB	73%	27%
NL	65%	35%
QC	63%	37%
NS	50%	50%
PEI	59%	41%
Average	66%	34%

The relatively high average is not surprising but the reasons given for not fishing more help to shed some light on the issues. When survey participants were asked why they did not fish more, the top three reasons given were:

- #1 reason** – not enough fish
- #2 reason** – not enough time
- #3 reason** – not enough access to sites

The results highlight two resource constraints namely fish (#1) and access to sites (#3). The second reason is related to angler priorities.

Survey participants were also asked why they think others may not be fishing as much as they could, and the following top three answers were given:

- #1 reason** – not enough fish
- #2 reason** – youth are not as interested in fishing
- #3 reason** – other sports and leisure activities are taking precedent

The top reason of not having enough fish is re-confirmed as a resource constraint, however two external factors are raised as #2 and #3. There is a perception of increasing competition from other leisure activities and interests that are garnering the attention of youth and other anglers generally. These reasons can be intertwined if, for example, salmon fishing is not competing well with other leisure activities and interests because of the number one reason that there is not enough fish and access. It is more difficult to create an enjoyable and memorable fishing experience if few or no fish are caught.

Excluding high economic impact camps, salmon anglers spent \$2,418 on average in 2010

Average salmon-related spending profiles were developed based on weighted responses for each province, and according to those who were residents in the province, visitors from other provinces, and visitors to Canada (Table 4.1.3).

Since almost 100% of salmon anglers indicated that their preferred species is salmon and their expenditures relate to the pursuit of salmon, it could be argued that all reported spending should be included in the profiles. However, not all fishing days were for salmon and it could also be argued that some of the expenditures are not linked to salmon. To reconcile these issues, the midpoint between 100% and the percentage of days fished for salmon in each province was used

to adjust the profiles to better reflect salmon-related spending. Overall this means about 75% of total reported spending is included in the profiles.

Later in this report we discuss the highest spenders among all anglers that frequent private fishing camps and lodges, and these individuals are removed from the following spending profiles. Removing these “high spenders” is done to avoid double-counting when combining the results from the angler survey and the survey of high economic impact camps. The survey respondent weights by province and angler origin also account for the removal of identified high spenders.

Table 4.1.4: Average salmon-related spending per angler by province by origin in 2010

Residence	NB	NL	NS	PEI	QC	Average
Residents	\$2,174	\$1,322	\$2,028	\$436	\$2,038	\$2,164
Other Canadians	\$4,383	\$4,698	\$2,676		\$7,082	\$4,606
Visitors to Canada	\$2,455	\$3,878	\$879	\$954	\$3,221	\$2,672
Total	\$2,340	\$2,617	\$1,868	\$473	\$2,671	\$2,418

The overall average of \$2,418 is bolstered by the highest spenders in QC (\$2,671) and NL (\$2,617). The lowest average spenders are in PEI (\$473). Spending is highest for visitors from other provinces, followed by visitors to Canada, and lowest for residents within each respective province. This trend is consistent across the provinces except in NS where resident spending outpaces that of visitors to Canada.

To put the overall \$2,418 average (angler weighted) value in historical context, the DFO recreational fishing survey spending averages were adjusted for inflation with province-specific CPI indices to obtain 2010 values. The average (angler weighted) spending rates by year were: \$1,833 in 1988, \$1,623 in 1990, \$3,226 in 1995, \$2,257 in 2000, and \$1,492 in 2005. The average of \$2,418 falls within this range and is just above the straight average of the historical values (\$2,086).

Excluding high economic impact camps, salmon anglers spent a total of \$102 million in 2010

The average spending profiles above are grossed up to provincial estimates by applying weights that represent the number of actual salmon anglers divided by the sample size from the survey. Results are shown in the following table and further details on weights and calculations for spending totals are described in Appendix C.

Table 4.1.5: Total salmon-related spending by province by origin in 2010 (\$millions)

Residence	NB	NL	NS	PEI	QC	Total
Residents	\$28.0	\$19.0	\$3.3	\$0.2	\$21.1	\$71.6
Other Canadians	\$8.3	\$5.7	\$0.6	\$0.0	\$2.9	\$17.4
Visitors to Canada	\$7.6	\$2.4	\$0.4	\$0.0	\$2.7	\$13.1
Total	\$43.9	\$27.1	\$4.3	\$0.2	\$26.7	\$102.1

The largest shares of total spending come from NB (43%), NL (27%), QC (26%), which together account for 95% of the total. The total is also comprised mainly from province residents (70%), followed by other Canadians (17%), and the balance from visitors to Canada (13%).

The breakdown of totals according to spending categories is 29% for major purchases and investments, 23% for packages, and 48% for other expenditures (accommodation, food, travel, and supplies).

- ❑ **Major purchases and investments include:** fishing, camping, and boating equipment, special vehicles and trailers, land and buildings.
- ❑ **Packages include:** fees paid to lodges, guides, or outfitters that include a complete range of services such as lodging, food, transportation etc.
- ❑ **Other expenditures include:** accommodations and campsite fees, food, travel costs within the province, boating and equipment rental costs, fishing supplies, guide services, fishing licences and access fees.

Keep in mind the anglers at high economic impact camps and lodges have been excluded from the above profiles and, once this segment of anglers is discussed below, their values can be added to obtain total spending for all anglers.

2. Survey of high economic impact camps

Spending and employment information was collected for 59 high economic impact salmon fishing camps in four of Canada's eastern provinces. This sampling of camps included 29 camps from New Brunswick, 21 from Québec, 6 from Newfoundland and Labrador, and 3 from Nova Scotia. There are likely over 200 camps, lodges, outfitters, and commercial fishing guide operations throughout the five eastern provinces. This survey was meant to sample the high economic impact camps to better understand patterns in their spending and activities.

Individuals frequenting these camps may pay according to daily or weekly rates, but are often invited as guests, charged an annual fee for membership, or provided a share of ownership. Not all of these camps are profit-driven, and many would not be viable as a business. The owners and operators expenses are frequently for the enjoyment of the salmon run rather than for generating revenues.

These camps deserve specific attention for two main reasons 1) their indirect influence on recreational fishing activity, and 2) their direct spending influence on local economies. The historical and cultural significance of camps and their residents has influenced generations of anglers to become more involved in the pursuit of salmon. This has shaped the magnitude of the salmon economy immeasurably. The direct spending by camps is much more measureable and will be presented in quantitative terms.

Influence on recreational fishing and the value of salmon

There are many instances where leisure activities pursued by royalty, heads of state, and society's elite have been adopted widely. Recreational salmon fishing and the establishment of fishing camps is a prime example. Historians point to the 1700s when British administrators established "camps" once they confirmed the tales of enormous salmon. The "camps" were much more than the name suggests since they included a full suite of staff serving a guest's every need, and facilities that demonstrated very careful attention to fine details. Indeed some of today's high economic impact camps date back well over a hundred years and continue to boast world-class accommodations, food, scenery, and fishing opportunities.

Seeking a retreat in the wilderness for the enjoyment of leisurely fishing has now become a coveted seasonal tradition for many individuals, as evidenced by the widespread participation and spending on recreational fishing in Canada. Tens of thousands of recreational fishers annually escape to Canadian waters in part to follow in the footsteps of royalty, world political leaders, industry giants, professional athletes, and entertainment icons that have visited these waters for the pleasure of salmon fishing. Everyone that carves out a few days or weeks each summer for salmon fishing or creates a camp of their own is also partaking in a piece of history, tradition, and luxury in their own way.

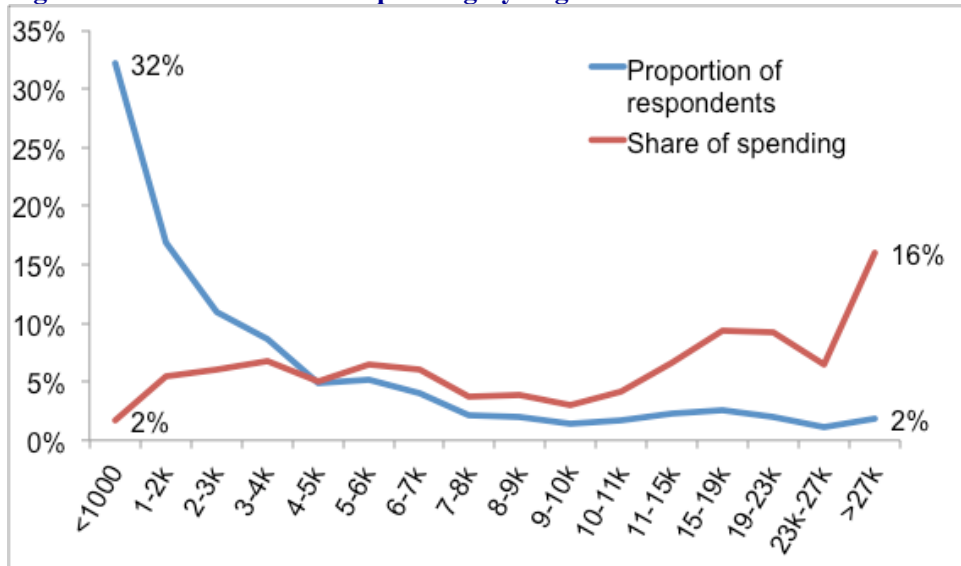
To the extent that private fishing camps and today's privileged continue to set trends for recreational fishing, their continued success shapes the economics of fishing and value of wild Atlantic salmon. There is a willingness to pay for the salmon fishing experience, which is decoupled from just catching and keeping the fish. If only the price of salmon as food was at play then we would not be so interested in the economics of recreational fishing. Spending is instead tens and hundreds of times greater than the price of salmon at the store. Dissolving the initial perception of salmon as food and making it a prized experience is the major influence that has created the industry that now exists.

Direct spending and the need for a targeted approach

In addition to the influence high economic impact camps and their members have on recreational fishing, the direct spending has a significant tangible effect on local economies. As we will see, there is a very high spending rate by a very few individuals, and this is the primary basis for paying specific attention to this group. More importantly, with such high spending rates there is a high potential for error in deriving estimates of total spending so a targeted approach for this group is warranted.

When a survey is conducted by sampling from a population, and a sufficient sample size is used, the results are representative as long as certain assumptions are satisfied. In particular, the data such as spending rates should follow a "normal" pattern. In this situation, most individuals would spend around the average amount while fewer and fewer individuals spend amounts that deviate from the average. In graphical form this takes on the "bell-shaped" curve that is familiar.

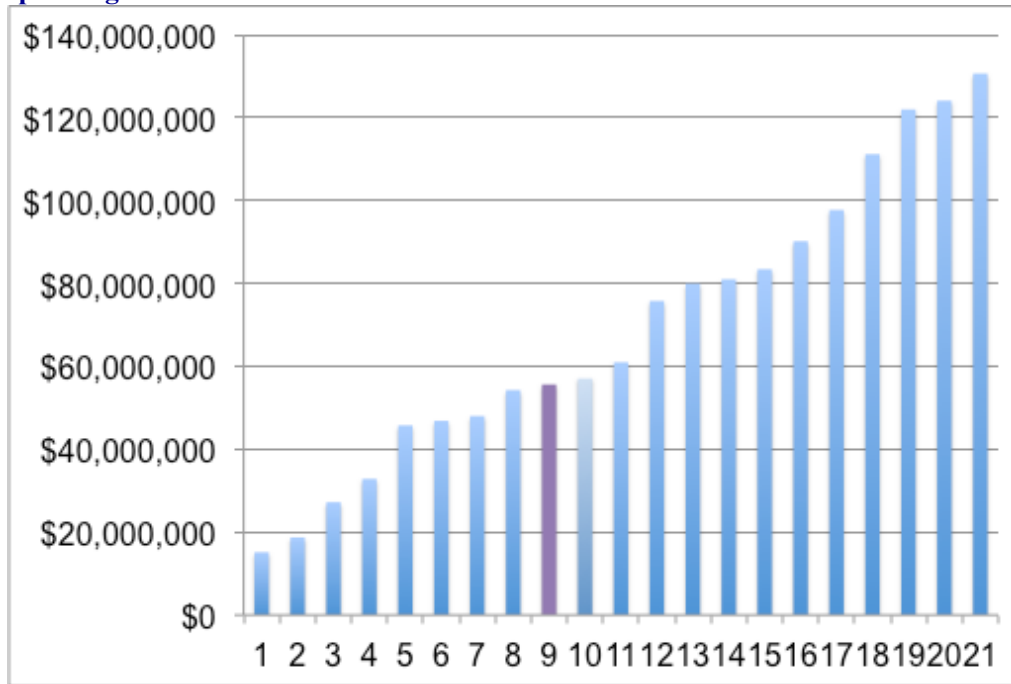
Angler spending does not follow this pattern and thus causes a problem. In our survey of anglers, the distribution of their spending is represented by a downward slope to the right (see figure below). The lowest spending group (less than \$1,000) includes 32% of all anglers, and the highest spending group (over \$27,000) includes just 2% of all anglers. However, the 32% of anglers at the low end account for only 2% of the total spending, while the top 10% of anglers (above \$11,000) account for 48% of total spending.

Figure 4.2.1: Distribution of spending by anglers in 2010 Gardner Pinfold survey

When sampling randomly across the spectrum, a lot of information is captured about those that account for just 2-5% of spending. This is acceptable especially in the context of multiple survey objectives including the need to learn about opinions and activities pertaining to days fished, species caught, and opinions on resource management issues. But enquiries related to spending are not entirely well-served by this approach to sampling.

To ascertain what effect simple random sampling might be having on total estimates of spending, a simulation of sampling from the top 10% of spenders was conducted. Their individual spending figures were replicated to create a dataset that models the total population for this spending group. This amounted to about 2,500 individuals from which a randomly selected 3% sample was taken to compute estimates of total spending. The real spending total of \$55 million was known since this was just a simulation, then the following figure shows the twenty results for random “surveys” of this group.

Figure 4.2.2: Simulated results for random 3% sample of top 10% of anglers according to spending in 2010



The range of total spending estimates spans from a low of \$15 million to a high of \$130 million. If this group represents nearly 50% of all angler spending as discussed above, and this is a year with \$110 million in total spending, then sampling the group in this way could yield estimates ranging from \$70 million to \$185 million. That would be a conservative range since it assumes the lower 50% of spending is estimated with excellent accuracy. The historical inflation-adjusted DFO estimates for total salmon angler spending have actually ranged between \$62 million and \$191 million (2005 and 1995 respectively).

“Variability in historical estimates of total spending on recreational fishing for wild Atlantic salmon can partly be explained by the effect of sparse sampling coverage for the highest 10% of spenders who account for almost half of total spending.”

Some variability is unavoidable as fishing activity changes over time, but it is important to minimize the potential variability due to the sampling method. The degree of variability in the historical data is also difficult to explain considering the tendencies of the top 10% of spenders. This group has steady participation rates and is virtually immune to potential influences on their spending habits. According to the accounts of high economic impact camps, these individuals have rarely missed their annual fishing trip in years, and they have spent about the same amount every year with the exception of rising costs for goods and services. One could imagine that in the top half of total spending there is a sub-group whose spending remains relatively unchanged from year to year.

Information was gathered for 59 camps so the following represents slight underestimates of total spending. High economic impact camps provided information regarding anglers and days fished, operational and capital spending, and employment including part-time, full-time, and person-year breakdowns.

Table 4.2.1: Private camp anglers and fishing days by province (2010)

Province	Anglers	Fishing days
QC	1,635	6,200
NB	1,378	5,161
NS	126	505
NL	218	669
Total	3,358	12,535

The total spending for high economic impact camps is separated according to operations and capital investments (Table 4.2.4). The primary operational expenditure is labour (40% or more), then water leases (up to 27%), food and supplies (up to 20%), utilities, insurance, and transportation are the other main spending categories.

Table 4.2.2: Private camp spending on operations and capital by province (2010)

Province	Operations	Capital	Total
QC	\$11,344,423	\$2,359,186	\$13,703,609
NB	\$8,062,895	\$1,997,369	\$10,060,264
NS	\$772,440	\$50,000	\$822,440
NL	\$1,450,000	\$114,000	\$1,564,000
Total	\$21,629,758	\$4,520,555	\$26,150,313

Dividing the total spending of \$26 million by the total number of anglers reported by the camps, yields an average angler expenditure of \$7,789. This may overstate anglers contribution since not all camp revenues come from the anglers themselves and owners sometimes make investments where revenues do not cover costs. However this understates angler's total expenditures since gear and transportation to/from camps are not typically included in the camp profiles.

High economic impact camps employ a large number of staff and in some places there is actually a requirement to create a certain amount of employment per rod that is granted on private waters. Some camps may only employ a guide, others have cooks and maintenance staff, and the largest camps have specialized staff for accommodations, grounds keeping, and many other services. Most positions are seasonal extending 4-6 months, however a few remain year-round to take care of facilities and for security.

Table 4.2.3: Private camp part-time, full-time, and person-years of employment by province (2010)

Province	Part-time	Full-time	Person-years
QC	305	35	185
NB	193	48	135
NS	11	10	16
NL	47	5	29
Total	556	98	364

This analysis of high economic impact camps likely underestimates the impacts of the top 10% of anglers according to spending. This segment of anglers, possibly representing up to half (48%) of all spending, is less influenced by fluctuating circumstances and has spent relatively steadily for decades according to reports from high economic impact camps. This would suggest that total salmon angler spending has probably remained fairly stable and well above the \$100 million level. This finding differs from previous accounts of recreational salmon fishing expenditures that fluctuate from a low of \$62 million to a high of \$191 million.

3. *Aboriginal fisheries*

Priority is given to aboriginal fisheries in Canada

First Nations fisheries for food, social and ceremonial (FSC) purposes have priority over other fishing activities according to the Supreme Court of Canada's decision in *R. v. Sparrow*. The Government of Canada through DFO have developed agreements and licensing for Aboriginal FSC fisheries. None of the FSC harvest is to be sold, and certain restrictions are applied to fishing activities. The agreements established with First Nations and Councils each have distinct terms regarding allowable gear, season openings and closings, designated fishing areas, minimum sizes of targeted species, allowable bycatch, and the catch limits (allocations).

Aboriginals are expanding conservation efforts

Aboriginal salmon allocations exist in all Atlantic provinces, however many allocations have been forgone in favour of wild salmon conservation. In 2010 there was no FSC fishery in Nova Scotia, virtually none in PEI, none on the Conne River in Newfoundland, and seven agreements suspend FSC fisheries on certain rivers in Quebec.

Where FSC fisheries continue there are some efforts to improve fishing practices. Aboriginals have piloted live trap gear to replace gill nets that are less selective, prone to over-catching, and produce lower quality fish because they sometimes remain dead in the water for extended periods after being caught in the net.

In general a more collaborative approach has been advanced with Aboriginals increasingly involved in wild salmon management, science, and habitat enhancement projects. In some cases investments are being made for infrastructure such as fishing lodges, and to support tourism and community economic development initiative.

The aboriginal harvest is about 60 metric tonnes

Allocation and catch information for Aboriginal fisheries are not readily available to the public. The limited information available comes from Atlantic Salmon Stock Status meeting presentations, and from those involved in working groups related to wild salmon conservation. Since there are many agreements for all of the First Nations and Band Councils and limited staff resources at DFO, comprehensive data are not regularly compiled for statistical purposes.

Aggregate data were presented at an Atlantic Salmon Stock Status meeting in 2011. The data are for all of eastern Canada covering the period from 2005 to 2009 (DFO, 2011). The total harvest is estimated to have varied from 48 to 62 metric tonnes, with 59.3 metric tonnes reported in 2010. Just over half is caught in Labrador, about one-third in Quebec, and the balance (15%) is in New Brunswick (Meerburg Pers. Comm., 2011). The percentage of total harvest represented by large salmon has ranged from 57 to 65% by weight and 34 to 45% by salmon numbers. Over this period the percentage of large salmon has been increasing by a small amount each year.

Aboriginal spending on salmon fishing could be up to \$391,000

This does not represent the full value First Nations place on the salmon harvest, only the spending for such things as gear, supplies, and transportation. The total value is also a function of non-use values discussed later.

Keeping in mind that FSC harvests are not to be sold, the following relies on sales information to estimate spending related to aboriginal salmon fishing. The spending that takes place for transportation, gear, and supplies represents economic activity, and the indirect methods below are a basis for deriving estimates. The question of what value Aboriginals place on the FSC harvest will be dealt with separately.

The underlying assumption for the approach here is that costs associated with the FSC fishing activities are not likely to be greater than the costs of other conventional means of bringing salmon to markets. For instance aquaculture-raised salmon is a more intensive process than net or trap methods typically used in aboriginal fisheries. Hook and line and other more costly methods are used in some Aboriginal fisheries, but these are not dominant. Since aquaculture is financially viable in current market conditions, then market prices will indicate the upper bound for costs.

A wholesale price for head-off and gutted (HOG) salmon is a suitable starting point, as opposed to retail prices since it more closely represents the form of salmon acquired from the harvest. There is not just one wholesale price so a suitable one must be selected to reflect the average catch. Wholesale prices in North America depend on the size class of the fish from 6 lbs to 18 lbs (2.72 kg to 8.18 kg), with a class for every two-pound interval (e.g. 6-8 lbs, 9-10 lbs etc.). The price per pound increases by about 10 cents for each class until the upper three classes where the price then increases by about 20 cents for each class (Urner Barry, 2010). It will be assumed that Aboriginal fishery salmon would on average fit the 8-12 lb class.

Prices have varied greatly over the past few years and although costs have not fluctuated to the same degree they have always been rising. The monthly prices in the 8-12 lb class have ranged over the last ten years from \$1.50 per lb to over \$3.00 per lb (\$3.30/kg - \$6.60/kg). Prices have increased to record highs in recent years due to global supply shortfalls and prices are therefore somewhat high compared to historical norms. Applying 6.60/kg price to the 59.3 MT reported for the last year of available data suggests up to \$391,000 could be spent for FSC fishing activities.

Table 4.3.1: Aboriginal FSC fishery spending by province in 2010

Province	Spending
QC	\$130,000
NB	\$65,000
PEI	\$0
NS	\$0
NL	\$196,000
Total	\$391,000

Note: Distribution of spending is according to harvest in each province (Meerburg Pers. Comm., 2011)

4. Labrador resident food fisheries

Labrador resident food fishery spending is about \$16,000

A resident food fishery remained open in Labrador after the last commercial salmon fisheries ceased in 1999. This is a directed fishery for trout allowing some by-catch of salmon. Most of the harvest occurs in the coastal waters of Southern Labrador, and small amounts are caught in Northern Labrador and Lake Melville.

In the last decade food fisheries have generally declined with a high of 6.8 MT in 2003, a low of 1.7 MT in 2007, and just 2.4 MT in 2010 (Meerburg Pers. Comm., 2011). The percentage of total harvest represented by large salmon has ranged from 13% to 28% (by numbers of fish), and there has been no increasing or decreasing trend over this period.

Using the same methodology as for Aboriginal fisheries, the aim is to estimate salmon-related spending for this fishery. Applying 6.60/kg to the 2.4 MT reported harvest in 2009 yields a total estimated expenditure of \$16,000. It could be argued that expenses are higher for this fishery than for most Aboriginal fisheries in eastern Canada. The nature of coastal fisheries demands more inputs and the costs of those inputs are greater in Labrador than elsewhere. This could therefore be a conservative spending estimate.

V OTHER USE AND NON-USE VALUES

Several other use and non-use activities are linked to wild Atlantic salmon. First, all levels of government are invested in management of salmon and fishing activities, however a conservative approach is taken here focusing on provincial and federal rather than municipal government activities. The federal government is also a contributor to salmon-related research, but academic research is presented separately to recognize the primary role of universities and private sector collaboration. There are numerous non-profit organizations and establishments in eastern Canada that are involved in conservation, education, tourism, and advocacy. Finally, aboriginal values apart from the basic spending for fishing are discussed.

1. Federal and provincial government

Federal government spending is about \$12 million

Fisheries and Oceans (DFO) is the lead federal department with responsibilities and activities related to wild Atlantic salmon. Other departments have very little spending compared with DFO, but Environment Canada has some responsibilities for monitoring and assessment of water quality, especially in relation to contaminant releases and fish kills. Parks Canada Agency plays a small role within park boundaries where important historical salmon rivers exist and a combination of protection, education, and research is delivered by the parks.

The focus here is only on DFO so results may understate federal activities. Wild Atlantic salmon activities cut across several DFO program and sub-program areas. The main ones are the Aboriginal Fisheries Strategy, fisheries and aquaculture management, conservation and protection of fish habitat, species at risk management, and science for health and productive aquatic ecosystems.

Spending on these activities is challenging to determine with any precision since accounting is not carried out according to species. The latest public figure of \$12 million was published in Canada's Policy for Conservation of Wild Atlantic Salmon (2009). A more recent estimate could not be obtained, and a breakdown by province was not available from DFO. A report in 1987 provided breakdowns by province and, although two decades have passed, this is the best basis for estimating expenditures by province (Table 5.1.1). DFO staff indicated that spending patterns have not changed greatly over this period.

Table 5.1.1: Fisheries and Oceans spending on salmon-related activities by province, 2010

Province	Spending
NL	\$5,103,000
NS	\$2,846,000
NB	\$3,951,000
PEI	\$100,000
QC	\$0
Total	\$12,000,000

Sources: DFO, 2009a; DFO, 1987.

If spending patterns from the 1980s still hold, the largest DFO expenditures are for wild salmon enhancement and habitat restoration (46%), enforcement (27%), research (24%), and management (4%). The inflation-adjusted total for expenditures in 1987 is about \$16 million compared to \$12 million recently (down 25% in real terms).

It must be recognized that DFO also established the Atlantic Salmon Endowment Fund of \$30 million. Credit is certainly due to DFO for this initiative but it does not represent an annual activity of the Department. The annual activities resulting from the administration of the Fund appear in the non-profit conservation and education section of this report, to reflect where the activities take place.

Provincial government spending is about \$8.8 million

Provincial governments are involved in water allocation, licensing and enforcement, tourism promotion and marketing, monitoring and assessment, and provision of some infrastructure such as water access ramps and signage. The spending by provinces was estimated according to the value of the recreational salmon fishery since this is the primary driver for provincial government investments. The breakdown of spending estimates by province is provided in the following table and amount to a total of about \$8.8 million.

Table 5.1.2: Provincial spending on salmon-related activities by province, 2010

Province	Spending
NL	\$2,400,000
NS	\$560,000
NB	\$2,000,000
PEI	\$300,000
QC	\$3,500,000
Total	\$8,760,000

The main areas of activity spending for each province are outlined as follows:

- NL – Enforcement, monitoring, conservation, tourism and marketing, and licensing.
- NS – Hatchery operations and salmon enhancement, the Adopt-A-Stream program, licensing and administration, promotion and development (Learn to Fish program).
- NB – Crown Reserve and Crown Angling leases, licensing, other fisheries management activities, enforcement and covert monitoring equipment, salmon interest committee work, regulation requests, and species at risk responsibilities.
- PEI – Funding for watershed groups, Wildlife Conservation Program, monitoring and research.
- QC – Monitoring and research, management and enforcement, salmon production and conservation, and subsidies for the Zones d'Exploitation Contrôlées (ZECs).

2. Academic research

The Natural Sciences and Engineering Research Council (NSERC) has been the largest sponsor of academic research pertaining to wild Atlantic salmon. The Canadian Foundation for Innovation has also made a very significant contribution in recent years through support of the

Ocean Tracking Network. Private companies have also supported and collaborated with university researchers on some projects.

It is again difficult to capture the precise amounts and locations of spending by academic researchers. In some cases wild Atlantic salmon research may be intertwined with farmed Atlantic salmon research or broader ecosystem research. For some projects collaboration between universities makes it difficult to know where spending occurred. The approach taken here may understate the attention paid to wild Atlantic salmon, but a multi-year average of spending is used to obtain a more stable estimate.

National Science and Engineering Research Council (NSERC) grants for academic research are a good indication of salmon-related research spending in universities. NSERC staff provided information on funding grants in the last decade. The results of their query were reviewed to filter out such things as Pacific salmon research and aquaculture-related salmon research (unless it involved relationships between farmed and wild salmon). Only research in the five eastern provinces is included although relevant research also takes place elsewhere in Canada and abroad.

Documented NSERC, CFI, and private sector wild Atlantic salmon research since 2001 resulted in spending across all five eastern provinces (Table 5.2.1). The estimated average of annual spending for wild Atlantic salmon research is \$765,000.

Table 5.2.1: Average annual spending on academic wild salmon research since 2001

Province	Average
NB	\$122,000
NL	\$139,000
NS	\$190,000
PE	\$121,000
QC	\$193,000
Total	\$765,000

Sources: NSERC, CFI, private sector

3. Non-profit conservation, restoration, and education spending is about \$16 million

There are at least 126 non-profit organizations and facilities in eastern Canada with a mandate to conserve salmon and deliver information and education programs. These include organizations such as the Atlantic Salmon Federation and its provincial and local partners, fishing associations and clubs, local watershed management councils, salmon interpretive centres and museums. These are primarily located in New Brunswick (37), followed by Québec (35), Nova Scotia (30), Newfoundland and Labrador (16), and Prince Edward Island (8).

By raising funds from members, private foundations or enterprises, and government grants these organizations invest in facilities, staff, and operations. Their activities include education, conservation, research, and advocacy. The estimated spending by province is shown in the following table.

Table 5.3.1: Non-profit conservation and education spending by province, 2010

Province	Spending
NB	\$10,729,000
NL	\$859,000
NS	\$2,142,000
PE	\$309,000
QC	\$1,706,000
Total	\$15,745,000

The total estimated spending in eastern Canada is about \$16 million with most of this occurring in New Brunswick. This is one indication that the scale of conservation and education organization activities are on par with federal and provincial. Spending by the federal government has diminished greatly in the last two decades while non-profit activity has increased.

Environmental conservation and restoration organizations not only spend money but also leverage in-kind contributions and volunteer efforts. Statistics Canada last reported in 2000 that the value of volunteers in the environmental non-profit sector was about 1.5 times the paid labour in the sector. This was based on surveys conducted across Canada that elicited the number of volunteers, their hours of volunteer contribution, and a modest wage per hour to value their time. If 50% of all spending is allocated to salaries (half of \$15.7 million) then the volunteer effort could be estimated at about \$12 million.

4. *Aboriginal FSC and food fisheries*

In the earlier account of spending by Aboriginals and Labrador residents on salmon fisheries, it was acknowledged that the question of how they value salmon must be addressed separately. These values are discussed here for consideration, and they serve as a bridge to the next section on option, existence, and bequest values.

Many Aboriginals and Labrador residents share a strong desire to be self-sufficient and therefore do not want to be dependent on commercial food systems. Some have health concerns related to store-bought foods and aquaculture-raised salmon in particular. The FSC and food fisheries allow them to gather their own food from trusted sources in a way that connects them with long-standing traditions including pre-European life for Aboriginals.

Continuity of these fisheries provides a sense of fulfillment and enjoyment of the harvest, and helps to build community skills and capacity. Stewardship of the resource and growing involvement in management and enhancement of salmon is adding new experience and insights for these communities. All of this is valued over and above the food acquired from the harvest.

The full extent of these values is difficult to measure, but an estimate lies somewhere between the subsistence food values and the very high values attributed to salmon by recreational anglers. Aboriginals and Labrador residents might never be “willing to pay” on the same scale as recreational anglers, but there is also the concept of “willingness to accept” compensation for not fishing.

This by no means suggests that a compensation scheme should be established, but it serves to illustrate the point. Conservation measures, at times, must simply be adopted for everyone's benefit. Having said this, if a process were used to establish compensation levels for additional reductions in harvests by aboriginals or Labrador residents, the result would help indicate the value they place on the salmon fisheries.

The next section on option, existence, and bequest values captures some of the values discussed here. The desire to stop fishing may have a lot to do with saving the option to fish again in the future or passing on that opportunity to children and grand children. The desire to stop fishing may also arise from the recognition that salmon should not be lost and we must do everything possible to make sure they continue to exist. The next section will show that these values are substantial and may account for the largest part of the value Aboriginals and Labrador residents assign to wild Atlantic salmon.

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VI OPTION, EXISTENCE, AND BEQUEST VALUES

1. Background and purpose

The choice experiment aims to quantify non-use values including: option values, existence and bequest values. Choice experiments are designed to elicit many of the non-use values associated with a product (e.g. salmon abundance) or program (e.g. conservation measure). Instead of surveying anglers, this survey is delivered to a random selection of individuals among the general public.

There are several important reasons for pursuing a choice experiment:

- ❑ The types of values elicited by a choice experiment are not generally available from other sources (e.g. DFO recreational fishing survey) and the values that are revealed tend to be quite large and should not be overlooked in salmon management decisions (e.g., same order of magnitude as all direct and indirect angler expenditures).
- ❑ Choice experiments are widely recognized as the “gold standard” for ascertaining non-use values of resources, and the credibility of results is important.
- ❑ Choice experiments can provide guidance on the types of conservation measures that are most supported when, for example, decision-makers are faced with a choice between conservation measures that have different expected outcomes and different probabilities of success.

The last reason given for pursuing choice experiments is particularly relevant. Although a great deal of attention may be paid to what level of conservation investment could be justified given the value of the salmon resource, justifying investment of any levels also rests on the expected outcomes of different conservation measures. A species may represent tremendous value but the highest cost conservation measure is not necessarily the most preferable if it has a low probability of success. Risk tolerance becomes a significant factor in such decisions and an understanding of public perceptions and support is often helpful to make good judgments.

Targeting non-anglers

The survey design and methodology is discussed further in Appendix D. Previous work by Rudd, 2007 was the primary basis for developing the survey questions, with up to date information added, exclusive focus on salmon conservation, and new elements to help determine the value of public education. A few design and approach elements are discussed here to set the context for the results.

Although anglers spend the most on an individual basis for salmon related goods and services, they are only a small proportion of the total population in Atlantic Canada. The importance of surveying the general public is that even the relatively small financial contributions most individuals find worthwhile for conservation efforts will add up quickly across the total population. The contributions could come in the form of a tax vehicle or as private donations.

The public, generally non-anglers, values knowing that a species exists and will persist (existence value) even if individuals have no intent to use the resource. Whether individuals have fished for

salmon or not, they may also value passing on the resource to future generations so they may have the chance to enjoy it in the future (bequest value). Many also recognize the reality that we don't know enough about species and ecosystems and important discoveries may yet provide us with medicines or insights for adapting to climate change, and we should keep our options open (option and quasi-option values). It turns out that many of these values are relatively well understood by Canadians, they appreciate species and nature generally, and they assign significant value to efforts that address environmental concerns.

2. *Salmon conservation choices*

All levels of government, private organizations, and individual citizens are involved in salmon conservation efforts. Together they invest significant amounts of time and money to secure and improve salmon stocks locally and globally. They are faced with a number of choices regarding how best to conserve salmon populations, and each choice can be quite different. Understanding the differences is important for designing a choice experiment survey that is relevant and realistic. Three types of conservation measures are briefly described below to provide some tangible examples that will be systematically assessed for use in the choice survey.

Before proceeding, it is important to recognize that key measures of salmon population success involve both the estimate of wild salmon being produced (pre-fishery) and then how many of those are allowed to spawn (post-fishery). The estimated historical high was about 900,000 large fish being produced, and this has dropped 88% over three decades to a low of about 100,000 in 2001, and this number has remained stable with perhaps some increase in recent years. At the peak, only about 130,000 (15-20%) of these fish made it to the spawning grounds whereas recent numbers have been about 56,000-78,000 (50-75%). This highlights the dramatic shift that has taken place in fisheries from targeting large fish to instead allowing them to pass for spawning, and recognizing their valuable contribution to stock sustainability.

Salmon assessment and research

There are still many unresolved questions regarding the cause(s) of the rapid decline of salmon populations. A multitude of factors such as harvesting, disease, loss and degradation of habitat, commercial aquaculture, changes in predators, climate change and other factors are all believed to contribute. It is not clear which factors have the most effect, and therefore what is the best area of focus for conservation investments.

Many would argue that we cannot effectively manage what we don't know. It is important to expand accurate assessments of salmon populations so that significant changes are acted upon quickly and more can be done to relate changes to the key factors involved. Only about 7% (about 70 of 1082) salmon rivers in Canada are monitored regularly to determine salmon population status and it is not clear whether the other 93% of rivers are bearing the same trends as the ones that are monitored.

Targeted research on specific topics could also include the potential effect of commercial salmon aquaculture and closed – containment solutions, or research into the issue of salmon mortality at sea. The locations of salmon aquaculture sites at the mouth of rivers in Canada and abroad generally coincide with rivers that have experienced significant drops in wild salmon runs. When wild salmon leave the river and spend part of their life cycle at sea, there are reduced numbers returning to the rivers but the reasons for this are unknown. Climate change, commercial

fisheries, salmon aquaculture, predators, and other factors are contributors but their relative importance is poorly understood.

Reducing harvest and increasing enforcement

The U.S. closed commercial salmon fisheries in 1947, Canada began a buy back program for its remaining commercial fishery in 1992 and completed it 2000. The Greenland commercial fishery has been suspended since 2002 as the result of a private conservation agreement among ASF, the North Atlantic Salmon Fund (NASF) and Greenland fishermen. However some subsistence harvesting still occurs in Greenland and Canada (e.g. food, social, and ceremonial fisheries for First Nations), some harvest by recreational fishing is still permitted in some places and some times, and illegal poaching exists. The commercial and subsistence salmon fisheries which are regulated through an inter-governmental body, the North Atlantic Salmon Conservation Organization (NASCO), impact Canadian salmon stocks greatly as most years upwards of 75% of the salmon harvested come from Canadian rivers.

Salmon populations dropped precipitously over the 1970's, 80s, and 90s. The suspension of Greenland commercial fisheries in 2002 marked a stabilization point and the beginning of a modest recovery over the last decade. Although other factors may also be at play, many believe that both the "*Greenland Agreement*" and NASCO have had a significant effect. The avoided salmon catch in Greenland is estimated at 30,000 fish.

There continues to be subsistence fishing in Greenland and Canada, recreational fishing that includes some harvest, and illegal salmon poaching. Considering the estimated number of salmon that are still caught each year, this would be about double the amount that has been saved through the *Greenland Agreement*. The costs associated with suspending all harvesting are more difficult to quantify than the Greenland programs but are expected to be much greater. Although the benefits of doing so are quite clear, the loss of First Nations allocations, recreational fishing value, and enforcement costs are considerable.

Improving habitat

Habitat restoration and enhancement typically targets salmon river habitat rather than ocean habitat, and there have been many highly successful efforts. Habitat improvements include removal of hydro dams, construction of fish ladders and other devices to overcome fish barriers, restoring vegetation along riverbanks and changing land-use practices in agriculture and forestry, liming waterways affected by acid precipitation, and other measures. Three examples of recent habitat enhancement efforts are outlined here.

The Atlantic Conservation Foundation administers an endowment fund that included a one time \$30 million contribution from the Government of Canada (Fisheries and Oceans). This supports habitat restoration projects in the five eastern Canadian provinces by spending the interest earned each year from the endowment. At this scale of endowment fund, the projects are small and dispersed and the direct benefits to salmon returns are somewhat difficult to quantify.

The Atlantic Salmon Federation (ASF) was the founding partner of the Penobscot River Restoration Trust (PRRT) which now includes several conservation organizations and the Penobscot Indian Nation. PRRT has raised \$25 million in private and public funding to purchase three dams on the lower Penobscot and a further \$18 million towards the decommissioning of the dams and restoration of the river. The Penobscot Project is one of the largest river restoration

projects undertaken in North America and will open up more than 800 kilometres of habitat for Atlantic salmon and 10 other species of anadromous fish.

The benefits of liming acidified waterways have been well-documented in Scandinavian countries, and there has been a pilot project success in Canada that increased salmon returns for West River, Nova Scotia. The southwest region of Nova Scotia has been most affected by acid precipitation and the West River serves as a case study. Liming on the river involved a combination of up-front capital costs and annual operating costs totaling about \$750,000 for the ten-year life of the project. The case suggests that for annual equivalent investments of \$75,000 this can increase salmon returns by about 1,000 large spawners over a 10 year-period. Expanding this to a multi-million dollar program could address the acidified waters in southwest Nova Scotia. Once self-sustaining populations are established, more modest maintenance investments could be sufficient.

3. Choice survey results

Overview

A synopsis of the key survey elements and findings is presented in this section to help understand and substantiate the overall conclusions. There were 1,000 survey participants and 953 valid complete responses were collected and used for all of the analysis and results in this section. More detailed methodology and some additional findings are contained in Appendix E.

The results begin with a breakdown of answers to basic questions concerning salmon. The results for salmon conservation choices are then explained, and finally the survey data are used to answer prime policy-relevant questions.

The public is not familiar with wild Atlantic salmon

Before proceeding with the choice tasks, survey participants were asked to rate their familiarity with several wild Atlantic salmon topics using a five-point scale from “not at all familiar” to “extremely familiar” (Table 5.3.1).

Table 6.3.1: Choice survey participant self-reported familiarity with Atlantic salmon topics

Topic	1. Not at all	2.	3.	4.	5. Extremely familiar	Total
State of salmon stocks	35%	29%	23%	12%	2%	100%
Threats to salmon	33%	28%	23%	13%	3%	100%
Government roles	38%	29%	23%	8%	2%	100%
Species at Risk Act (SARA)	44%	28%	19%	8%	2%	100%
Conservation measures	40%	29%	22%	9%	2%	100%

Combining the percentages for those “not at all familiar” and “not very familiar” captures a clear majority of respondents across all five topics (61% - 72%). Respondents appeared slightly more familiar with the state of salmon stocks and threats to wild salmon than they were familiar with the other three topics.

Most federal responsibilities are rated as “very important”

In order to detect any strong biases in priority given to government spending, respondents were asked to rate the importance of federal government spending across nine areas of responsibility. The rating with the highest number of responses is bolded in each row of the table below. Federal government areas of responsibility are arranged from top to bottom in the table following highest to lowest number of responses for the “very important” rating.

Table 6.3.2: Choice survey participant rating of federal government spending priorities

Topic	1. Not important	2.	3.	4.	5. Very important	Total
Safety and police	0%	2%	11%	22%	65%	100%
Health	1%	6%	15%	18%	61%	100%
Infrastructure	1%	3%	15%	31%	51%	100%
Food and drug safety	1%	4%	17%	36%	42%	100%
Post-secondary education	2%	5%	19%	36%	38%	100%
Environment	2%	6%	22%	32%	38%	100%
National defence	3%	8%	20%	33%	36%	100%
Aid and disaster relief	4%	10%	26%	29%	32%	100%
Innovation and development	5%	16%	30%	30%	19%	100%

The ratings are generally toward the high end of the scale across all areas of federal responsibility. The combined percentages for the highest levels (4 and 5) capture a range of 49% - 87% of respondents. Safety and police appear to be most important followed by health, while aid and disaster relief, and innovation and development are afforded the lowest importance. The environment category placed near the middle of the group of federal responsibilities, and salmon conservation would fall within this category.

The public is highly involved in outdoor activities but few are members of related organizations

Participants were asked to select from a list of outdoor activities the ones they have participated in. Only 16% did not select any outdoor activities, 33% selected one activity, 39% selected two or more activities, and 2% refused to answer.

Table 6.3.3: Choice survey participant involvement in outdoor activities.

Outdoor Activity	% of participants
Wilderness / park visit	28%
Fishing	28%
Birding	26%
Hiking	25%
Paddling	15%
ATV	11%
Hunting	9%
Snowmobiling	9%
Mountain biking	8%
Refuse to answer	2%

In total 82% of respondents selected at least one activity, suggesting a strong majority of eastern Canadians partake in at least some outdoor activities. Fishing was identified by 28% of participants and tied for top spot with wilderness and park visits. The fishing activity was not specific to wild Atlantic salmon and could have been any time in the past.

Despite relatively high involvement in outdoor activities this does not appear to translate into membership with related organizations. Participants were asked to indicate the types of outdoor recreation and environment organizations where they are members (Table 5.3.4).

Table 6.3.4: Choice survey participant membership in outdoor recreation and environmental organizations.

Organization	% of participants
Outdoor rec & fitness	10%
Conservation or environment	8%
Hunting or fishing	4%
Natural history	2%
Refuse	0%

Only 20% of participants indicated they were members of one organization listed, and 2% were members of more than one organization.

The value of public education for salmon conservation

“Reading one additional screen of information depicting “what’s at stake” in salmon conservation decisions, took participants only 30 seconds and positively influenced the proportion of supporters and their willingness to pay for conservation.”

Two information screens were used to prepare all survey participants for the choice tasks (details in Appendix E). The low familiarity with salmon topics was anticipated so these basic information screens aimed to provide a minimum understanding for participants to make informed decisions when selecting among potential conservation measures.

One additional information screen was randomly assigned to just half of the survey participants. This screen attempted to show “what is at stake” in economic, cultural, and ecological terms when making decisions about salmon conservation. The goal of randomly assigning this extra information to just half the group was to determine what effect it would have on participant choices. In particular would those participants, knowing a little more about what is at stake, have a higher regard for conservation and be willing to pay more for restoration of wild Atlantic salmon populations?

The “stakes” screen took about 30 seconds on average to read and represented less than one standard 8.5 by 11” of text. The results show that this small piece had a positive influence on the number of supporters and the amount they were willing to pay for a salmon conservation program.

The specific influence of public education depends on the conservation program being considered

To show how the influence of additional education depends on the conservation program, we present results for two conservation program paths differing in their probability of success (“likely” vs. “very likely”), and each path has three levels of salmon abundance outcomes. The “likely” success path offers 50% - 80% chance of success, and the “very likely” path offers 80-99% chance of success. The three levels of increases in salmon abundance are from the current 20% of historic highs to 40%, 60%, and 80% of historic highs respectively.

For the 509 participants that did not see the “stakes” screen there is about 81% support to move along either conservation path, while 19% of respondents would prefer not to invest in conservation. For the 487 participants that saw the “stakes” screen, the level of support increased by just under 1%. Although 1% is a small amount, they were only influenced by a small amount of information.

The effect on willingness to pay (WTP) for salmon conservation programs is set out in the table below for each probability path and each level of salmon abundance. The difference in annual household contribution for salmon conservation that the one “stakes” screen made is positive along each path and ranges from \$0.11 to \$2.91.

Table 6.3.5: Influence of knowing “stakes” on annual willingness to pay (WTP) for different 20-year salmon conservation programs

	Move to 40% abundance	Move to 60% abundance	Move to 80% abundance
“Likely” probability path			
WTP with “stakes”	\$13.98	\$19.21	\$23.64
WTP without “stakes”	\$12.84	\$17.95	\$23.53
Difference per household	\$1.14	\$1.26	\$0.11
Eastern Canada difference:	\$4,523,857	\$5,006,303	\$431,417
“Very likely” probability path			
WTP with “stakes”	\$26.41	\$33.97	\$40.05
WTP without “stakes”	\$24.32	\$31.06	\$38.97
Difference per household	\$2.09	\$2.91	\$1.08
Eastern Canada difference:	\$8,279,008	\$11,512,061	\$4,254,437

Note: Totals for eastern Canada are based on the number of tax-paying households according to Statistics Canada’s 2006 Census.

“Applying the household survey results to the 3.97 million tax-paying households in eastern Canada, the differences in aggregate WTP between those who learned what is at stake versus those who didn’t range from \$430,000 to \$11.5 million per year.”

More specifically, the results show that WTP is greater for the “very likely” path than the “likely” path. This is anticipated given the more tangible benefits it is expected to deliver. WTP also predictably increases as programs offer greater increases in salmon abundance.

Interestingly, there are greater differences in willingness to pay on the “very likely” path, between those who did and didn’t see the “stakes” screen. This suggests that knowing what is at stake raises support even higher perhaps because those individuals more strongly seek tangible results.

There is a consistent trend along each probability path where differences rise at the 60% abundance level then fall at the 80% abundance level. Knowing what is at stake appears to exert the most influence when considering mid-range abundance targets, and we will see in the general results that this is typically where there is deceleration in financial support. Put another way, knowing the stakes can motivate otherwise waning supporters to increase their funding for mid-range abundance targets. The diminishing difference at the highest abundance target suggests that additional public information has less effect at that level. Perhaps as support is nearing maximums at 80% targets, there is little room to push individuals for more support.

Public education may also influence eastern Canadians to take other positive actions

Near the end of the survey, participants were asked whether they would be likely to take any new actions related to the survey topic. Unless they were planning to take one of these actions prior to the survey, it is assumed that some aspect of the survey peaked their interest in the topic of salmon.

Table 6.3.6: Choice survey participant indicate other new actions they will consider taking after the survey

Actions	% of participants
Don't know	45%
Learn about species at risk	34%
Learn about wild salmon	24%
Learn government role	22%
Approach someone to discuss	11%
Seek fishing opportunities	10%
Contact a local organization	3%
Refuse to answer	2%

Note: percentages do not add up to 100% since multiple answers were allowed.

When participants selected “don’t know” or “refuse to answer”, these were nearly always the only selection they made meaning these together represent about 46% of the respondents. The remaining 54% of respondents selected on average two new actions they would take following the survey.

The top three actions all relate to learning about the topics in the survey such as species at risk generally, wild salmon in particular, and the role government plays in managing and restoring species health. The other three less popular actions are more involved such as approaching an acquaintance to discuss the issues, look into fishing opportunities, or contacting a local outdoor organization or environmental group.

The intent of the survey is not necessarily to stimulate action by participants, but this demonstrates how introducing and informing people on the subject through some form of public education will likely have benefits in addition to the support shown in the choice tasks for conservation investments.

What is the status quo option?

Canadians already support a combination of measures that help manage the wild salmon resource including administration of fisheries restrictions, enforcement, research, species at risk programs, grants and contributions to habitat restoration and other conservation activities. Most of these are managed through DFO. Budgets were about \$16 million in 1987 and possibly higher before that, but they have dropped to about \$12 million in recent years. This is now equivalent to about \$1.00 per tax-paying household in eastern Canada.

Over the twenty-year period from the late 1970s to late 1990s the salmon stocks plummeted by 80% and appear to have stabilized in the last decade at about 20% of their former levels. Recovery strategies and recovery action plans are being developed under the Species at Risk Act (SARA) to address the situation. If only current budgets are maintained then results will be mixed at best and further declines are possible over the long-term. This is framed as the “status quo” option where a minimum of activities will continue but at no extra cost to tax-payers and with no expected improvements in salmon abundance. Much more significant investments in many types of conservation measures will be required to address the variety of different threats to wild salmon across Canada’s river systems.

Assessing the status quo versus other conservation options

“Survey results indicating levels of support and willingness to pay are always framed in terms of the difference between the most minimal program option (status quo) and all others.”

In the choice survey there is always the ability to opt out (choose “none”) for salmon conservation options that are presented. In theory participants that select “none” are indicating they are satisfied with the status quo and with (DFO) programs as they exist. However, participants do not typically have much information on existing programs other than the assumption that programs were not sufficient to avoid the 80% decline in adult salmon abundance. No other information is given in the survey about existing program costs or future prospects for those programs to improve salmon population health.

Because it is not possible to clearly determine if survey participants opting out are satisfied with the status quo, all choice data analysis avoids this assumption and takes a conservative approach. Rather than using the “none” option to represent the status quo, the lowest choice combination of salmon abundance, cost, and probability of success is instead used. This option is clearly defined within the survey in the same terms as all the other choices, and it signifies a program that is at least as good as current conservation programs today. All other conservation program options are then compared with this most basic program. Since there is actually a small willingness to pay for that basic program that is disregarded, the estimates of public support and willingness to pay for all other program options are a bit higher than they are presented here.

How much support exists in eastern Canada for a new sustained 20-year salmon conservation program?

“There is over 80% public support in Eastern Canada for a sustained 20-year program with new annual investments of \$53M - \$157M that will “likely” or “very likely” restore Atlantic salmon abundance to 40% - 80% of historic highs.”

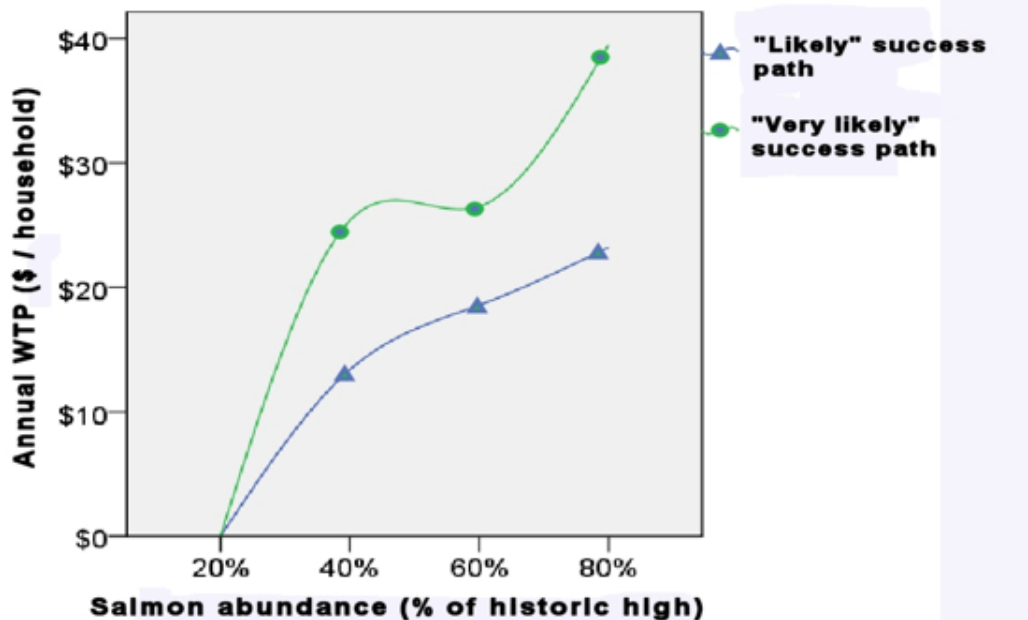
The collection of 955 valid complete surveys provides data for 33,371 choices made by participants. This tells us what selections they made when different sets of choices were presented, and therefore what trade-offs they were willing to make. The data shows what attributes of conservation programs appear to drive their decisions and measures how important those attributes are relative to one another.

In order to answer policy-relevant questions we now use the data as if it is a panel of representative eastern Canadians always available to cast their opinion on any proposed salmon conservation program. A new question can be devised now or in the future for a given conservation program with attributes specified according to the survey, and the “panel” can be probed for their level of support. Asking the “panel a question involves a simulation run of the model (“a run”) and we can compare the level of support between different runs.

We devised a series of conservation options representing a wide range of possibilities to show how public support and willingness to pay changes across the spectrum. To test each one, the “panel” of eastern Canadians was asked a referendum style question about a single conservation program option with certain levels for each attribute (salmon abundance, cost, and probability of success). The attribute for the location of conservation investment (in or out of province) was always set to in-province assuming that a comprehensive salmon conservation program will see many investments and activities taking place across the provinces. This attribute also turns out to be the least important of the four.

We present results (Figure 5.3.1) for two conservation program paths differing in their probability of success (“likely” vs. “very likely”), and each path has three levels of salmon abundance targets. The “likely” success path offers 50% - 80% chance of success, and the “very likely” path offers 80-99% chance of success. The three levels of increases in salmon abundance are from the current 20% of historic highs to 40%, 60%, and 80% of historic highs respectively.

Figure 6.3.1: Annual household willingness to pay (WTP) for 20-year salmon conservation programs according to salmon abundance targets and “likely” or “very likely” success



Over 80% public support is maintained along both paths therefore the first important finding is:

“Eastern Canadians clearly reject the status quo of continuing salmon conservation efforts to date, by showing over 80% support for any new program investments that are proposed.”

The level of support would deviate from 80% on each path if the costs are different. For instance, 80% support is maintained for the “likely” successful program targeting 40% salmon abundance at \$13.36 (first triangle). If this program can be delivered at a lower cost then public support would increase and vice versa for a higher program cost. Support also changes if the program maintains the same cost but cannot not deliver the stated benefits in terms of salmon abundance. If the program can deliver better salmon abundance then public support would increase and the reverse for a lower salmon abundance target.

The willingness to pay (WTP) generally increases along each path as progressively higher abundance targets are set. This was intuitive but not a guarantee if, for instance, the public had no desire to support any programs over a certain cost threshold. A maximum does not appear to have been reached within the array of choices and costs as they were presented in the survey.

The public is less interested in “halfway” measures, and may support a phased approach

Along both probability paths there is a surge in WTP from 20% to 40% abundance (steep upward paths), a slackening in support from 40% to 60% abundance (paths become more horizontal), then another surge to the 80% target that is more pronounced on the “very likely” path.

This suggests there is strong WTP for the initial program that moves abundance forward from the current 20%, but managers should then strive for 80% abundance or higher. The public is less interested in “halfway” measures that target around 60% abundance, so once programs move to 40% any effort to progress from there might as well go for high targets in the 80% or more range. This could also suggest there is support for a phased approach, with one phase targeting 40% abundance and the second phase targeting upwards of 80%.

Certainty of success matters – the value of research

“Eastern Canadian households want to be sure of what they are getting for their investment and will pay an average premium of about \$0.18 for each percentage increase in salmon abundance that is ‘very likely’ instead of just ‘likely’.”

The WTP is greater along the “very likely” path than it is along the “likely” path. This is not surprising, however even when the probability of success is accounted for there is still a higher WTP for each abundance target along the “very likely” success path. If the average probability of success is assumed to be the midpoint of 65% (midpoint of 50% - 80%) on the “likely” path, and 90% (midpoint of 80%-99%) on the “very likely” path, then we can calculate WTP based on “probable % abundance increases” (Table 5.3.7).

Table 6.3.7: Willingness to pay (WTP) per probable % increase in salmon abundance along the “likely” and “very likely” success paths

Abundance target	“Likely” WTP/%	“Very likely” WTP/%
40%	\$1.03	\$1.41
60%	\$0.71	\$0.74
80%	\$0.60	\$0.73
Average:	\$0.78	\$0.96

The average WTP per percentage increase in salmon abundance is greater for the “very likely” and for every abundance target along the paths. This means that even if the expected percentage increase in salmon abundance is the same in each case, respondents will pay a little more to be on the “very likely” path. On average, the premium they are willing to pay is \$0.18 for each percentage increase in salmon abundance that is “very likely”.

There will be a whole range of conservation measures considered that include some that are very well documented (liming acidified waterways and riparian zones, and installation of fishways and ladders to overcome barriers), and some that are less predictable (developing closed-containment aquaculture systems for farming Atlantic salmon).

The acceptable premiums shown for programs with higher probability of success could mean two things for building a salmon conservation program. First, all other things being equal, the higher probability of success options should be selected first even if there is additional cost in the range reflected by the premium. Second, all other things being equal, any research that can be undertaken to increase the chances of success will be justified as long as the research costs are again within the range of the premium.

“Eastern Canadian households are collectively willing to pay a 20-year annual premium of \$700,000 for research and assurances that each % increase in salmon abundance targeted by conservation programs will be ‘very likely’ instead of only ‘likely’.”

For example, if a comprehensive salmon conservation program targeting a 10% increase in abundance is accompanied by research that increases the chances of success from “likely” to “very likely”, the research investment would be justified up to about \$700,000 per year.

Why do some individuals opt-out of supporting conservation programs?

As the 955 valid and complete survey participants worked through the fourteen choice tasks we presented, 365 participants selected the “none” option in at least one of their choice tasks. After they completed all of their choice tasks, we asked them why they selected “none” and gathered the following results.

Table 6.3.8: Why survey participants selected “none” in at least one of their choice tasks.

Reason	%
Waiting for a task with better options	38%
Didn’t support options shown	32%
Couldn’t make a clear choice	30%
Don’t know	8%
Never support conservation	7%
Refuse to answer	1%

Note: Multiple selections were allowed so percentages do not add up to 100%.

The four meaningful reasons from highest to lowest number of times they were identified are: waiting for a task with better options (38%), didn't support options that were shown (32%), couldn't make a clear choice (32%), and never support conservation (7%). Except for not being able to make a clear choice, the other three main reasons are all indicating a rejection of the options shown on the screen.

In choice surveys it is desirable to have participants push themselves as much as possible to make difficult choices. It is reassuring that the reason "couldn't make a clear choice" was only identified by 30% of those who used the "none" option. This means that in a very few cases they effectively gave up on the task because they couldn't distinguish a preferred option. Most of the time "none" was selected as a conscious rejection of all three program options and this is the intended use for the "none" option.

What conservation program attributes are most important?

There are two ways of learning from the survey what conservation program attributes are most important. Statistical analysis of the choice data measures the importance given to each attribute, but we also asked participants explicitly what attributes they felt were most important in their decisions. These two sources of information provide good insights and allow cross-referencing of findings to verify consistency.

The choice data analysis software produces a measure of importance for each attribute in percentage terms. These measures signify the influence each attribute has in the overall choices made by participants. In order of importance the attribute measures were: probability of success (32.6%), salmon abundance (29.5%), household cost per year (27.7%), and location of conservation investments inside or outside your province (10.2%).

The top three are relatively close in importance and the location of investments is a distant fourth place. The scaling of importance in percentages does make the measures comparable. For instance, the 29.5% importance of salmon abundance means this attribute has about 3 times the weight that location of investments has (10.2%) in making choices about conservation programs.

The relative balance of the top three attributes also signals that participants did a good job of weighing these aspects of the choices. It demonstrates their ability to handle the complexity of choice tasks since they were only "ignoring" the one attribute for location of investments. Sometimes choice experiments involve more choices or more attribute and participants can't manage the complexity so they focus in on just one or two aspects and use those to drive their choices. This appears not to be a problem in the survey here.

Survey participants were asked to rank the top three attributes that most influenced their choice selections. The rankings were assigned 3 points for 1st place, 2 points for second, and 1 point for third. Rankings were tallied and a percentage score was calculated out of the maximum possible if all respondents had ranked an attribute in 1st place. The percentage scores are presented in Table 6.3.9.

Table 6.3.9: Scores for self-reported rankings of choice attribute importance

Attribute	% Score
Salmon abundance	62%
Probability of success	60%
Annual household cost	43%
Location in or out of province	35%

Note: Scores are calculated independently for each attribute so percentages do not total to 100%.

Although these percentages are not directly comparable, it does suggest that the top two are of relatively equal importance, followed closely by annual household cost, and location of conservation investments is last. The order is consistent with the statistical analysis, but perhaps respondents tend to discount the importance of costs in their decisions when in fact it is just as important as the top two attributes.

What are the main rationales for those who support salmon conservation programs?

The importance of attributes was the first indication of what is important to participants, but this doesn't reveal the underlying rationale. Survey participants were asked to rank their top three reasons from a list of possible rationales for supporting salmon conservation programs.

Table 6.3.10: Scores for self-reported rankings of rationale for wild salmon conservation and restoration

Attribute	% Score
Salmon should exist	52%
Natural heritage and ecosystem integrity	39%
Commercial fishing potential	22%
Research potential	22%
International role in species at risk recovery	22%
Recreational release fishing potential	18%
Recreational capture fishing potential	15%
First Nations and cultural heritage	10%

Note: Scores are calculated independently for each attribute so percentages do not total to 100%.

The top two reasons involve existence and bequest values, and this is reassuring because those are two key things the survey is attempting to capture. The combined recreational fishing items would total 33% and place third, but it was important to distinguish capture from release fishing and the latter appears to play a greater role in supporting salmon recovery.

The remaining rationales demonstrate that option values are important such as the possibility (option) of future salmon use in commercial fisheries or research. Moral obligation to uphold international responsibilities is important to some. Finally, the combination of First Nations and cultural heritage importance shows moral, option, and bequest values are important in that respect.

“The results showing stated rationale for support indicate that efforts to gain support for investments in conservation should utilize the most significant arguments - that salmon should exist and Canadians must ensure that ecosystems are able to sustain and pass on salmon to future generations as part of our natural heritage.

VII CASE STUDIES

1. Overview

The purpose of case studies is to help make the value of wild Atlantic salmon tangible and relevant at the local level. Sometimes aggregate values expressed at the provincial or regional scale are necessary but difficult to grasp and interpret. Local examples demonstrate more clearly how livelihoods and close relationships to salmon rivers have developed, and it is easier to illustrate certain values on a human scale. Four case studies are developed for the following salmon rivers:

- ❑ Exploits (Newfoundland and Labrador),
- ❑ Margaree (Nova Scotia),
- ❑ Miramichi (New Brunswick), and
- ❑ Grand Cascapedia (Quebec).

Case studies would be developed to provide profiles of key information on each river including but not limited to the following:

- ❑ A brief physical description of the river,
- ❑ A list of key fish species and other points of interest (species at risk, protected areas, heritage sites)
- ❑ Socio-economic indicators for communities along the river,
- ❑ The salmon history (trend data, activity),
- ❑ A description of salmon-related activities (angling, science, tourism, conservation),
- ❑ Economic value of salmon on that river (historic, present, potential),
- ❑ Current issues (threats, opportunities).

2. Exploits - NL

Features

The Exploits is now recognized as a world-class salmon river and one of the most successful salmon enhancement projects in North America. Major investments in fishways, fish ladders, and stocking programs have successfully overcome the natural falls and hydroelectric dams that were initially constructed to support mining operations, forestry and pulp and paper production. These industries have long ceased, leaving the Exploits to be developed for salmon fishing, paddling, and other eco-tourism opportunities.

From 1974 to 1992 salmon broodstock from the lower section of the river was used to produce over 50 million salmon fry that were transported by helicopter and established all over the mid-Exploits up to Red Indian Lake. In the late 1970s the returning run of salmon numbered around 1500 and now the run is self-sustaining at about 40,000 fish. These salmon runs are now second only to the Miramichi as the largest runs in North America. The Salmonid Interpretation Center draws about 26,000 visitors each year that want to learn about salmon and the Exploits.

Description

The Exploits is the largest river on the island of Newfoundland with a drainage area of about 12,000 square kilometres originating in the Long Range Mountains of Western Newfoundland and extending to the sea through the Bay of Exploits and Notre Dame Bay.

Over 100 kilometres of stunning scenery begins with the mid-Exploits at Red Indian Lake, named after the Beothuks that once inhabited the island. The Red Indian Rapids and Red Indian Falls are just below the lake, and the next community of Badger marks the beginning of a 10 kilometre stretch of cascading ledges leading to Badger Chute where the river is forced through a 15 metre wide section. Grand Falls and Bishop Falls are the largest waterfalls, and they are located in the lower sections of the river where they historically restricted sea-run salmon to just 10% of the watershed area.

Community profile

The community along the Exploits River is most closely defined by Census Division 6 in central Newfoundland and Labrador including the four main communities of Grand Falls-Windsor, Gander, Bishop's Falls, and Badger. The combined total population is 36,208.

The economic circumstances were weakened with the closure of the AbitibiBowater pulp and paper mill and corresponding drop in forestry activity. Unemployment now stands at 18.6%, while there are 18,435 persons aged 15 or over with average earnings¹ of \$28,204. The total community earnings are therefore \$520 million. The top three industry sectors according to employment are: services (22%), retail (16%), and business (15%). Tourism and recreation falls within the services sector and is therefore one of the most significant local employment generators.



Recreational fishing management

All waters are public access and there is no requirement for guides, except non-residents that must have a guide or be accompanied by a direct relative living in the province. A licence to fish is required for those 18 years and older, and those under 18 may fish under a family licence. The fishing season is open from June 1st to October 8th. The only section of the river where angling for salmon is not permitted is in the upper watershed above Red Indian Lake. Daily retention and release limits are dependent on the section of the river, with daily maximums of two retained and four released. The season retention limit is six salmon. Small salmon under 30 centimetres are always to be returned to the water, while larger salmon may only be retained according to applicable restrictions.

¹ Includes wages and salaries before deductions, not government transfers/benefits or interest from savings or investments.

State of salmon

The following is based on the most recent Conservation Status Report (DFO, 2008a). Over the past 25 years, salmon returns have increased nearly six-fold from about 6,000 to over 32,000 salmon in total. This is the result of combined strategies to overcome fish barriers, and intensive stocking from 1986 to 1992. Over this period salmon population health indicators have been increasing in the ranges as follows:

- number of returning salmon – 6,000 – 32,200
- number of large spawners – 300 – 2,000
- number of eggs deposited - about 12 million

There is a low percentage of large salmon and egg deposition and just 41% of conservation requirements have been met in recent years. However the strong increases in returning salmon underscore a positive outlook for self-sustaining salmon populations on the Exploits.

Salmon angling activity

The following is based on the 2005 DFO recreational fishing survey results for Fishing Region 7 in Newfoundland and Labrador where the Exploits River is located. Of the 2,239,000 angler days enjoyed across the whole province, about 333,000 (15%) were reported for the Exploits. This province accounts for the largest share of angler days in Atlantic Canada, and this central region of the province is certainly one of the main destinations.

Table 7.2.1: Number of days fished for salmon and all fish in Exploits fishing region (2005)

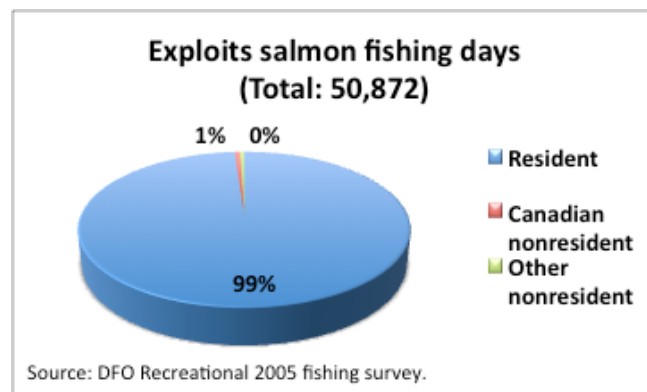
Angler origin	Salmon	All fish	% Salmon
Resident	50,296	331,323	15%
Cdn nonresident	332	1,131	29%
Other country	244	599	41%
Total	50,872	333,053	15%

Source: DFO Recreational 2005 fishing survey.

About 15% of the 333,000 fishing days were spent fishing for salmon, however visitors to the province were somewhat more focused on salmon than local residents. Canadians from other provinces were spending 29% of their time targeting salmon and visitors from abroad were spending 41% in contrast with just 15% of the days spent by local residents fishing salmon.

Less than 2% of all angling days in the region were enjoyed by visitors to the province. The Exploits only grew to prominence in recent years and there is a prime export opportunity yet to be fully developed as in other provinces. Locals may on the other hand be guarding one of the best-kept secrets for good reasons.

Perhaps contrary to popular belief, anglers are not harvesting fish from the water by the hour. Fishing involves a great deal of



patience and persistence and many aspects other than the catch itself are important to a successful expedition. Beautiful scenery, tranquility, camaraderie, and relaxation are equally important. Just over 21,000 salmon were caught yielding a daily catch success rate of 36% (1 in three days). Of the total catch, 9,018 were kept (58% release rate) which may reflect the optimism for salmon stocks to continue on their growth trend.

Table 7.2.2: Catch statistics for Exploits fishing region salmon fishing days (2005)

Caught	21,340
Kept	9,018
Daily success rate	36%
Release rate	58%

Source: DFO Recreational 2005 fishing survey.

Angler spending

DFO reported spending by salmon anglers in 2005 according to conservation unit 4 (CU 4) in Newfoundland and Labrador where the Exploits River is located. We have the following estimates after conversion to 2010 dollars and adjusting the spending based on the proportion of salmon fishing days on the Exploits relative to the whole CU.

Table 7.2.3: Angler expenditures for the Exploits in 2005 (2010 dollars)

Angler origin	Major purchases	Packages	Direct Spend	Total
NL Resident	\$1,803,956	\$327,901	\$964,245	\$3,096,102
Other Canadian	\$33,143	\$6,024	\$17,716	\$56,883
Other Country	\$49,383	\$8,976	\$26,396	\$84,756
Total	\$1,886,483	\$342,901	\$1,008,357	\$3,237,741

The total spending wholly attributable to salmon fishing was about \$3.2 million. Residents of the province are responsible for 96% of all expenditures. Major purchases, packages, and direct spending represent 58%, 11%, and 31% of the total respectively. The top three major purchase items are vehicles (41%), camping equipment (18%), and boat equipment (17%). Of all other expenditures the top three items are travel costs (32%), food (27%), and packages (12%). Based on the total number of salmon fishing days, anglers spend an average of \$64 per day.

Historical context in NL

Although 2005 is the only year for which we have readily available economic data at a fine resolution for the case studies, it was not a representative year. Examining the historical context is therefore critical for current and future outlooks.

Simply focusing on the DFO data from 1988 to 2005, the number of anglers, salmon fishing days, and total spending all declined by about one-third. However, the spending per day of salmon fishing increased by about one-third. If 2005 was a weak year on the Exploits as experienced elsewhere in the province, then growth of salmon runs and angling interest should yield higher spending in the future.

Table 7.2.4: Historical salmon fishing statistics for NL from 1998-2010 (2010 dollars)

Province	1988	1990	1995	2000	2005	2010
Anglers	21,661	15,587	21,619	15,890	13,832	18,003
Fishing days	336,959	218,993	282,840	180,749	162,730	244,841
\$/angler	\$1,419	\$1,251	\$1,907	\$1,334	\$1,447	\$1,670
\$/day	\$91.21	\$89.06	\$145.77	\$117.27	\$122.96	\$122.83
Days/angler	16	14	13	11	12	14
Total	\$30,735,398	\$19,504,599	\$41,230,369	\$21,196,351	\$20,009,352	\$30,073,257

Sources: 1998-2005 data by BriLev Consulting Inc.; 2010 data by Gardner Pinfold Consultants Inc.

Economic impacts

Based on the angler spending estimate (output) of \$3.2 million for salmon fishing on the Exploits River in 2005, and about \$300,000 in government and non-profit activities associated with the Exploits, the economic impacts are calculated for three common indicators: gross domestic product (GDP), employment (jobs), and income (salaries and wages). Each of these is calculated using a composite of multipliers from Statistics Canada's latest interprovincial input-output model of the Newfoundland and Labrador economy.

The initial spending by anglers has direct impacts on the economy for those supplying food, travel, accommodation, fishing gear and equipment directly to anglers. The front line suppliers rely on many other businesses that indirectly supply goods and services including for example farmers that grow food for retail and restaurants, or vehicle and gear manufacturers that supply local outfitters and distributors with boats, trailers, nets and other products. Finally, the employees in both direct and indirect supply chains spend their earned income at the household level having a further induced effect on the economy. Each wave of spending affects GDP (economic value-added), employment, and total income to produce the totals shown here.

Table 7.2.5: Economic impacts of angler spending on the Exploits in 2005

Impacts	GDP	Employment	Income
Direct	\$1,414,000	39	\$990,000
Indirect	\$1,061,000	21	\$778,000
Induced	\$544,000	13	\$442,000
Total	\$3,019,000	73	\$2,210,000

Source: Statistics Canada input-output model.

The total GDP (value-added) of \$3.0 million is 85% of the \$3.5 million in combined direct spending (output), suggesting that some angling products and services needed in NL are brought in from other provinces or countries. The total employment of 73 is about 0.5% of all persons with earned income in Census Division 6 where the Exploits River is located. This means about 1 in 200 jobs are dependent on salmon angling and related tourism. The same can be said for the total income of \$2.2 million as a share of all income in the census division. More specifically this represents about 5% or 1 in 20 jobs for the food services and accommodation sector in the census division. Keeping in mind that the Exploits has only been recently developed as a world class salmon fishing destination, these numbers are presently expected to be larger than in 2005 and have excellent potential to grow.

3. Margaree - NS

Features

The Margaree river offers public access along its length with the exception of a sanctuary where angling is not permitted in one section. The Margaree-Lake Ainslie River System is a designated Canadian Heritage River with protection afforded for both cultural and natural heritage values. The designation is based in part on the great variety of resident wildlife including bald eagles, osprey, and ring-necked ducks that spend their summers around Lake Ainslie, as well as pine marten, lynx, and moose that inhabit the area year-round. The Margaree has long been recognized by non-residents of Nova Scotia as the best salmon fishing river in the province. The river boasts 54 named salmon angling pools, adding to the charm of the river and the people who live there. The Margaree Salmon Museum draws over 4,000 visitors each year including many non-anglers.

Description

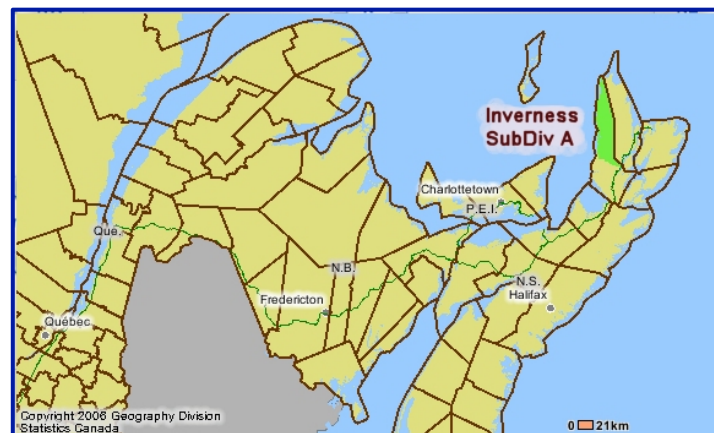
Extending 120 kilometres in length, the Margaree captures water from a 1,100 square kilometer drainage area. There are two main branches, one originating from the plateaus of the world famous Cape Breton Highlands National Park (Cabot Trail), and another flowing from Lake Ainslie, the largest natural lake in Nova Scotia. The two tributaries join at Margaree Forks and meander through Acadian and Scottish farmland and fishing communities that border the Gulf of St Lawrence. The river shows its full splendor in Fall when uncommon maple-elm climax hardwood stands express their brilliant colours among spruce-fir stands winding down along the river valley.

Community profile

The community around the Margaree river is most closely defined by Census Subdivision A of Inverness county including the three main communities of Inverness, Margaree, and Chéticamp. The combined total population is 5,859.

The unemployment rate stands at 17.1 % while there are 3,145 persons aged 15 or over with average earnings² of \$21,144.

The total community earnings are therefore just over \$66 million. The top three industry sectors according to employment are: services (27%), agriculture (17%), and health care (12%). Tourism and recreation falls within the services sector and is therefore one of the most significant local employment generators.



² Includes wages and salaries before deductions, not government transfers/benefits or interest from savings or investments.

Recreational fishing management

Salmon licences are required separately for those over and under 16 years of age. Non-resident licences are available on a seven-day or full-season basis. Guides are not required even for non-residents. All salmon over 63 centimetres must be returned to the water in a way that causes the least harm possible. All fish caught must be for personal consumption. Only two grilse salmon may be caught per day and a maximum of four per season.

State of salmon

The following is based on the most recent Conservation Status Report (DFO, 2008a). Over the past 25 years, the total number of returning large salmon declined by 31% from about 4,100 down to 2,800. Over this period salmon population health indicators declined accordingly within the ranges as follows:

- number of returning salmon - 6,000 - 4,050
- number of large spawners – 4,100 - 2,800
- number of eggs deposited - about 17 million

Despite declines in health indicators, the total number of returning salmon and the number of adults have more than doubled the conservation requirements every year since 1985. There are no present concerns regarding the stability of salmon on the Margaree.

Salmon angling activity

The following is based on the 2005 DFO recreational fishing survey results for Inverness county where the Margaree river is located. Of the 976,000 angler days enjoyed across the whole province, 54,551 (6%) were reported for Inverness County.

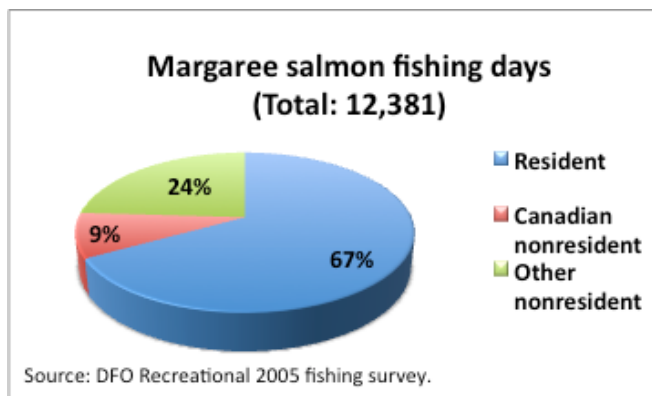
Table 7.3.1: Number of days fished for salmon and all fish in Inverness County (2005)

Angler origin	Salmon	All fish	% Salmon
Resident	8,278	48,654	17%
Cdn nonresident	1,123	1,838	61%
Other country	2,980	4,059	73%
Total	12,381	54,551	23%

Source: DFO Recreational 2005 fishing survey.

About 23% of the 12,381 fishing days in the county are spent fishing for salmon, however visitors to the province are much more focused on salmon than local residents. Canadians from other provinces were spending 61% of their time targeting salmon and visitors from abroad were spending 73% in contrast with just 17% of the days spent by local residents fishing salmon.

One-third of all angling days in the county were enjoyed by visitors to the province and about a quarter were from other countries. This demonstrates the international recognition earned by the area for salmon fishing and this indicates the prime export opportunity that benefits the community and the province as a whole.



Perhaps contrary to popular belief, anglers are not harvesting fish from the water by the hour. Fishing involves a great deal of patience and persistence and many aspects other than the catch itself are important to a successful expedition. Beautiful scenery, tranquility, camaraderie, and relaxation are equally important. Only 2,352 salmon were caught yielding a daily catch success rate of 19% (1 in five days). Of the total catch, only 217 were kept (91% release rate) which is a tribute to the respect for conservation objectives and the secondary significance of actually taking the prize home.

Table 7.3.2: Catch statistics for Inverness salmon fishing days (2005)

Caught	2,352
Kept	217
Daily success rate	19%
Release rate	91%

Source: DFO Recreational 2005 fishing survey.

Angler spending

DFO reported spending by salmon anglers in 2005 according to conservation unit 12 (CU 12) in Nova Scotia. The following estimates are based on 2010 dollars and adjustments according to the proportion of salmon fishing days in Inverness County where the Margaree River is located relative to the total for CU 12.

Table 7.3.3: Angler expenditures for the Margaree in 2005 (2010 dollars)

Angler origin	Major purchases	Packages	Direct Spend	Total
NS Resident	\$329,589	\$15,042	\$238,967	\$583,597
Other Canadian	\$149,482	\$6,822	\$108,381	\$264,685
Other Country	\$957,852	\$43,715	\$694,486	\$1,696,053
Total	\$1,436,923	\$65,578	\$1,041,834	\$2,544,335

The total expenditures wholly attributable to salmon fishing was just over \$2.5 million. Residents of the province are responsible for just 23% of all expenditures, while visitors from other countries account for two-thirds (67%). Major purchases, packages, and direct spending represent 56%, 3%, and 41% of the total respectively. The top three major purchase items are vehicles (30%), boating equipment (27%), and land and buildings (17%). Of all other expenditures the top three items are travel costs (34%), food (27%), and supplies (13%). Based on the total number of salmon fishing days, anglers spend an average of \$206 per day.

Historical context in NS

Although 2005 is the only year for which we have readily available economic data at a fine resolution for the case studies, it was not a representative year. Examining the historical context is therefore critical for current and future outlooks.

Simply focusing on the DFO data from 1988 to 2005, the number of anglers was down 65%, salmon fishing days dropped 81%, and total spending declined by 71%. Many of the rivers have closed, particularly on in Southwest Nova Scotia. However, the spending per day of salmon fishing increased by 58%. The Margaree has been more stable than the rest of the province but 2005 still likely represents a weak year. The historical economic significance and future potential is understated by the 2005 data.

Table 7.3.4: Historical salmon fishing statistics for NS from 1998-2010 (2010 dollars)

Province	1988	1990	1995	2000	2005	2010
Anglers	7,497	8,650	3,936	2,428	2,598	2,088
Fishing days	109,511	147,908	47,730	25,591	20,819	27,144
\$/angler	\$1,464	\$1,463	\$1,020	\$1,085	\$1,271	\$2,311
\$/day	\$100.19	\$85.56	\$84.10	\$102.89	\$158.58	\$177.78
Days/angler	15	17	12	11	8	13
Total	\$10,972,197	\$12,655,471	\$4,013,954	\$2,633,168	\$3,301,403	\$4,825,790

Sources: 1998-2005 data by BriLev Consulting Inc.; 2010 data by Gardner Pinfold Consultants Inc.

Economic impacts

Based on the total angler spending estimate (output) of \$2.5 million and \$400,000 spent locally by governments and non-profit groups, the economic impacts are calculated for three common indicators: gross domestic product (GDP), employment (jobs), and income (salaries and wages). Each of these is calculated using a composite of multipliers from Statistics Canada's latest interprovincial input-output model of the Newfoundland and Labrador economy.

The initial spending by anglers has direct impacts on the economy for those supplying food, travel, accommodation, fishing gear and equipment directly to anglers. The front line suppliers rely on many other businesses that indirectly supply goods and services including for example farmers that grow food for retail and restaurants, or vehicle and gear manufacturers that supply local outfitters and distributors with boats, trailers, nets and other products. Finally, the employees in both direct and indirect supply chains spend their earned income at the household level having a further induced effect on the economy. Each wave of spending affects GDP (economic value-added), employment, and total income to produce the totals shown here.

Table 7.3.5: Economic impacts of angler spending on the Margaree in 2005

Impacts	GDP	Employment	Income
Direct	\$1,237,000	35	\$883,000
Indirect	\$736,000	21	\$736,000
Induced	\$513,000	14	\$453,000
Total	\$2,486,000	70	\$2,073,000

Source: Statistics Canada input-output model.

The total GDP (value-added) of \$2.5 million is 84% of the \$2.9 million in direct spending (output), suggesting that some angling products and services needed in NS are brought in from other provinces or countries. The total employment of 70 is about 2% of all persons with earned income in Inverness Subdivision A where the Margaree River is located. This means about 1 in 50 jobs are dependent on salmon angling and related tourism. The same can be said for the total income of \$2.1 million as a share of all income in the area. More specifically this represents about 15% or 1 in 8 jobs for the food services and accommodation sector in the area. Keeping in mind that these numbers are presently expected to be larger than in 2005 and have potential to grow.

4. *Miramichi - NB*

Features

The Miramichi is recognized for having the largest salmon runs in the world. Salmon runs were estimated to have reached 600,000 fish in the past and, although the numbers have declined since then, it still retains the title of being the largest producer of salmon in the world. With 37 major tributaries and over 7,700 individual streams there is a tremendous variety of landscapes and wildlife to explore. Prime farm and forestry land accompanies the lower reaches of the river, and long stretches of wilderness in the upper sections provide sanctuary for anglers and wildlife alike. The Atlantic Salmon Museum (Miramichi Salmon Museum) welcomes over 4,000 visitors to enjoy current and historical fishing displays and a rich collection of artwork.

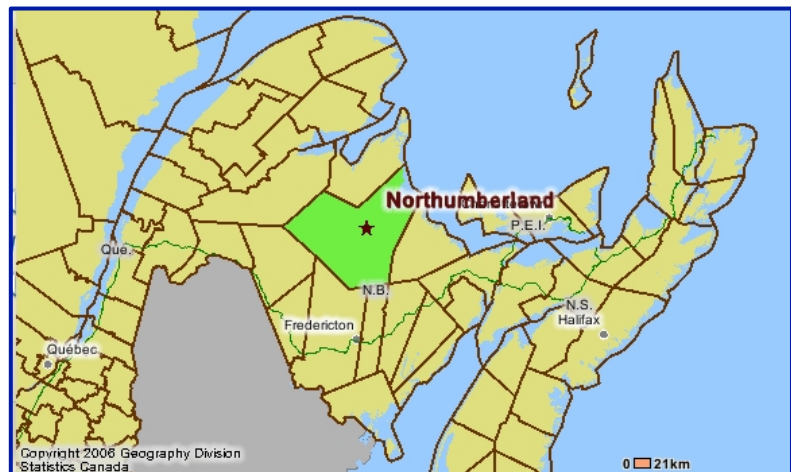
Description

The Miramichi measures about 250 kilometres in length and drains from an area of about 14,000 square kilometres. There are two main branches, the Southwest Branch represents just over 70% of the area, with the balance in the Northwest Branch. The two branches join in a common estuary that drains into the Gulf of St Lawrence.

Sections of the river vary by how fast the water flows and the origin of the water, either spring fed or land based, so these and other factors combine to determine when salmon travel on different parts of the river. Unlike many smaller rivers with only a Spring run and Fall run of salmon, the diversity and expanse of the Miramichi system contributes to salmon runs throughout the fishing season. Much of the main Southwest Branch is dotted by private or leased waters where permission is required to fish, but many renowned public sections are available throughout the Miramichi.

Community profile

The community along the Miramichi River is most closely defined by the Northumberland Census Division including the four main communities of Miramichi, Blackville, Doaktown, and Burnt Church (reserve). The combined total population is 48,868.



The economic circumstances were weakened with the closure of the UPM pulp and paper mill and corresponding drop in forestry activity. Unemployment now stands at 18.1%, while there are 25,495 persons aged 15 or over with average earnings³ of \$22,809. The total community earnings are therefore about \$582 million. The top three industry sectors according to employment are: services (21%), business (14%), and manufacturing (13%). Tourism and recreation falls within the services sector and is therefore one of the most significant local employment generators.

Recreational fisheries management

The Miramichi is a complex river system with respect to access and riparian rights. There is a mixture of Crown Reserve, Crown Lease, private and public waters. In particular the Crown Reserve draws resident anglers from all over the province since it provides treasured access to salmon.

The full season runs from April 15th to October 15th with certain restrictions for sections of the river. Guides are generally required for non-residents except in private waters and where exemptions are granted to adjacent property owners. Resident full-season retention and live-release licences are offered separately for those over and under 15 years of age. Non-resident retention and live-release licences are provided for 3 day, 7-day, and full-season periods. Only year-round residents may fish in crown reserve waters where access is determined by a draw. Only grilse salmon up to 63 centimetres may be retained up to a limit of 1 per day (4 live release per day) and 8 retained per season.

The Miramichi River is home to the longest standing salmon hatchery in Canada and the Miramichi Salmon Conservation Centre. These are run by the Miramichi Watershed Management Committee which involves, by MOU, the Department of Fisheries and Oceans, the New Brunswick Department of Natural Resources, First Nations, camps, and others.

State of salmon

The following is based on the most recent Conservation Status Report (DFO, 2008a). Over the past 25 years, the number of large spawners (adults) declined by 60% from about 89,000 to just 35,000 in 2006, and then remained stable since. Over this period salmon population health indicators have been relatively stable in the ranges as follows:

- ❑ number of returning salmon – 96,000 - 200,000
- ❑ number of large spawners – 35,400 – 89,000
- ❑ number of eggs deposited - about 150 million

Over the last decade, the Miramichi overall has not met the conservation requirements for the number of salmon at different life stages or egg production. However, the trends on the southwest and northwest branches should be distinguished. The southwest has met or exceeded conservation requirements, while the northwest has been at or below 50% of conservation requirements. The northwest branch is where most of the Crown Reserve waters are located and these are of high importance to resident anglers of the province. Given the closure of commercial fisheries, and the introduction of catch and release fisheries, there are rising numbers of young salmon and the overall outlook for the Miramichi is promising.

³ Includes wages and salaries before deductions, not government transfers/benefits or interest from savings or investments.

Salmon angling activity

The following is based on the 2005 DFO recreational fishing survey results for the Miramichi fishing area in New Brunswick. Of the 603,000 angler days enjoyed across the whole province, 149,337 (25%) were reported for the Miramichi.

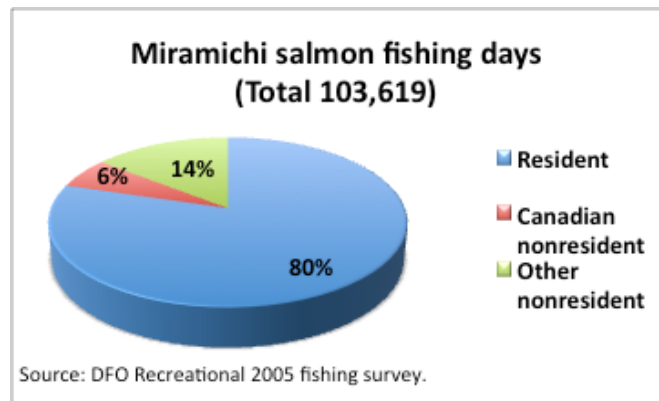
Table 7.4.1: Number of days fished for salmon and all fish in Miramichi (2005)

Angler origin	Salmon	All fish	% Salmon
Resident	82,518	127,274	65%
Cdn nonresident	6,151	6,630	93%
Other country	14,951	15,433	97%
Total	103,619	149,337	69%

Source: DFO Recreational 2005 fishing survey.

About 69% of the 103,619 fishing days in the county were spent fishing for salmon, however visitors to the province are almost exclusively dedicated to salmon. Canadians from other provinces were spending 93% of their time targeting salmon and visitors from abroad were spending 97%, in contrast with 65% of the days spent by local residents fishing salmon.

One-fifth of all angling days in the Miramichi watershed were enjoyed by visitors to the province and 14% were from other countries. This demonstrates the international recognition earned by the area for salmon fishing and this indicates the prime export opportunity that benefits the community and the province as a whole.



Perhaps contrary to popular belief, anglers are not harvesting fish from the water by the hour. Fishing involves a great deal of patience and persistence and many aspects other than the catch itself are important to a successful expedition. Beautiful scenery, tranquility, camaraderie, and relaxation are equally important. About 49,000 salmon were caught yielding a daily catch success rate of 48% (1 in two days). This is the highest rate among the case studies, giving it the distinction of being the easiest place to catch salmon. Of the total catch, only 10,527 were kept (79% release rate) and this is relatively high reflecting the increased caution in recent years to help conserve the stocks.

Table 7.4.2: Catch statistics for Miramichi salmon fishing days (2005)

Caught	49,368
Kept	10,527
Daily success rate	48%
Release rate	79%

Source: DFO Recreational 2005 fishing survey.

Angler spending

DFO reported spending by salmon anglers in 2005 specifically for the Miramichi River in New Brunswick. The following estimates are in 2010 dollars after adjusting for inflation.

Table 7.4.3: Angler expenditures for the Miramichi in 2005 (2010 dollars)

Angler origin	Major purchases	Packages	Direct Spend	Total
NB Resident	\$3,611,455	\$2,436,903	\$4,082,410	\$10,130,768
Other Canadian	\$707,500	\$477,400	\$799,762	\$1,984,661
Other Country	\$1,356,619	\$915,406	\$1,533,530	\$3,805,556
Total	\$5,675,574	\$3,829,708	\$6,415,702	\$15,920,985

The total expenditures wholly attributable to salmon fishing were \$15.9 million. Residents of the province are responsible for 64% of all expenditures. Major purchases, packages, and direct spending represent 36%, 24%, and 40% of the total respectively. The top three major purchase items are vehicles (31%), boating equipment (27%), and land and buildings (19%). Of all other expenditures the top three items are travel costs (23%), food (19%), and packages (19%). Based on the total number of salmon fishing days, anglers spend an average of \$154 per day.

Based on the 2010 survey of high economic impact camps by Gardner Pinfold it is estimated that just over \$4.5 million is spent on the Miramichi River. The extent to which these expenditures are reflected in the DFO recreational fishing survey is not entirely clear. It is likely that the combined total spending is closer to \$20.5 million, especially considering the historical context that follows.

Historical context in NB

Although 2005 is the only year for which we have readily available economic data at a fine resolution for the case studies, it was not a representative year. Examining the historical context is therefore critical for current and future outlooks.

Simply focusing on the DFO data from 1988 to 2005, the number of anglers declined 17%, salmon fishing days dropped 42%, and total spending declined by 40%. The spending per day of salmon fishing did however remain stable. Overall, the 2005 total spending was the lowest on record and 2005 data for the Miramichi may not be indicative of the historical economic significance of that salmon run or its future potential.

Table 7.4.4: Historical salmon fishing statistics for NB from 1998-2010 (2010 dollars)

Province	1988	1990	1995	2000	2005	2010
Anglers	19,113	27,002	16,395	17,698	15,833	20,255
Fishing days	214,366	263,545	133,496	124,488	125,210	285,592
\$/angler	\$1,702	\$1,236	\$1,581	\$1,340	\$1,236	\$2,408
\$/day	\$151.76	\$126.62	\$194.14	\$190.47	\$156.26	\$170.76
Days/angler	11	10	8	7	8	14
Total	\$32,532,918	\$33,369,596	\$25,917,469	\$23,711,138	\$19,565,152	\$48,767,432

Sources: 1998-2005 data by BriLev Consulting Inc.; 2010 data by Gardner Pinfold Consultants Inc.

The 2005 \$16-20 million in estimated angling expenditures for the Miramichi is therefore an underestimate of historical and future potential economic activity. Full expenditures are more

likely in the \$20-25 million range, and that is before considering the economic impacts of this spending.

Economic impacts

Based on the total angler spending estimate (output) of \$20.5 million (including high economic impact camps), and \$2.5 million by governments, non-profits, and Aboriginals; the economic impacts are calculated for three common indicators: gross domestic product (GDP), employment (jobs), and income (salaries and wages). Each of these is calculated using a composite of multipliers from Statistics Canada's latest interprovincial input-output model of the Newfoundland and Labrador economy.

The initial spending by anglers has direct impacts on the economy for those supplying food, travel, accommodation, fishing gear and equipment directly to anglers. The front line suppliers rely on many other businesses that indirectly supply goods and services including for example farmers that grow food for retail and restaurants, or vehicle and gear manufacturers that supply local outfitters and distributors with boats, trailers, nets and other products. Finally, the employees in both direct and indirect supply chains spend their earned income at the household level having a further induced effect on the economy. Each wave of spending affects GDP (economic value-added), employment, and total income to produce the totals shown here.

Table 7.4.5: Economic impacts of angler spending on the Miramichi in 2005

Impacts	GDP	Employment	Income
Direct	\$9,188,000	299	\$7,580,000
Indirect	\$4,594,000	207	\$7,351,000
Induced	\$3,170,000	131	\$4,181,000
Total	\$16,952,000	637	\$19,112,000

Source: Statistics Canada input-output model.

The total GDP (value-added) of about \$16.9 million is 74% of the \$23.0 million in direct spending (output), suggesting that some angling products and services needed in NB are brought in from other provinces or countries. The total employment of 519 is about 2.5% of all persons with earned income in the Northumberland Census Division where the Miramichi River is located. This means about 1 in 40 jobs are dependent on salmon angling and related tourism. The total income of \$19.1 million is 3.3% of all income in the area. More significantly this represents about 35% or 1 in every 3 jobs for the food services and accommodation sector in the area.

5. Grand Cascapedia - QC

Features

The Grand Cascapedia is known for its postcard perfect scenery and is recognized for having some of the largest wild Atlantic salmon caught each year. Eighteen of the world's fifty largest wild Atlantic salmon have come from rivers of the Gaspé Peninsula including the Cascapedia. Salmon over 40 pounds are not uncommon during the annual catch.

The Gesgapegiag Micmac Band has an equal share in the governance of the river, and this serves as an example for co-management of wild Atlantic salmon with First Nations. There is very high regard for the management measures and conservation ethic supporting the Cascapedia, and the successful maximization of economic opportunities. Fishing access is determined by pre-season

and in-season draws to maintain balanced access and protection of the prized salmon runs. The Museum of Cascapedia – St. Jules attracts over 6,000 visitors to learn of the rich and famous who came to enjoy this river and the sport of fishing. From Queen Victoria's daughter Louise to modern icons, it is a story of quality, class, history and tradition.

Description

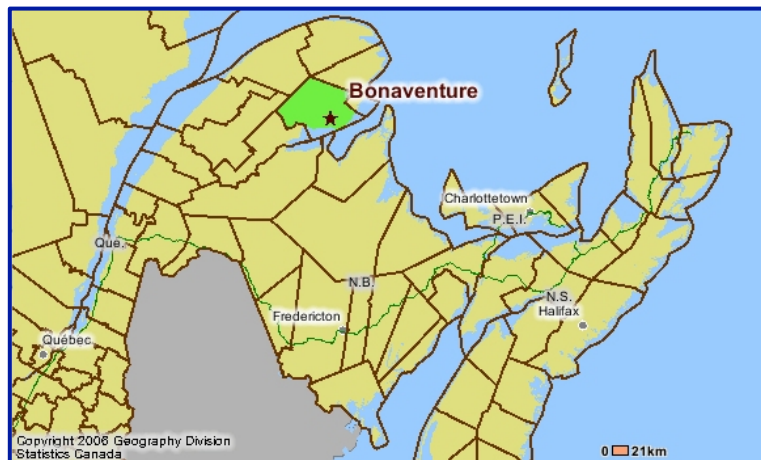
The Cascapedia begins with tributaries in the Chic Choc Mountains of the Gaspé Peninsula and flows over 139 kilometres to the Bay de Chaleur and the Gulf of St. Lawrence. The river drains from an area of 3,170 square kilometres. The first 18 kilometres are in private hands and the rest is public access. Fishing is managed by a non-profit society for over 100 fishing pools organized into six zones.

The mountain water source provides cold, clear water throughout the season allowing for excellent season-long fishing unlike many other rivers that warm up and water levels drop off in mid-summer. Water clarity is considered exceptional and this facilitates a great fishing experience with the salmon in full view.

Community profile

The community along the Grand Cascapedia River is most closely defined by the Bonaventure Census Division in Québec including the three main communities of New Richmond, Paspébiac, and Bonaventure. The combined total population is 17,948.

The economic circumstances have been weak but stable with unemployment at 19.6%, and 9,030 persons aged 15 or over with average earnings⁴ of \$24,315. The total community earnings are therefore \$220 million. The top three industry sectors according to employment are: services (21%), retail (15%), and business (13%). Tourism and recreation falls within the services sector and is therefore one of the most significant local employment generators.



Recreational fisheries management

Resident and non-resident, seasonal and daily licences are available to those over 18 years of age, and those under age or full-time registered students may fish with a licence-holder. The season extends from April 15th to September 30th although certain restrictions apply at different times through the year and are subject to closures or additional restrictions applied in mid-season for

⁴ Includes wages and salaries before deductions, not government transfers/benefits or interest from savings or investments.

conservation purposes. Generally one large salmon may be retained in August, and two other small salmon may be retained during the remainder of the season.

State of salmon

The following is based on the most recent Conservation Status Report (DFO, 2008a). Over the past 25 years, the salmon harvest declined from a high of around 1,100 in the late 1980s and early 1990s to lows of about 150 in the last five years. During this time anglers transitioned to live release fishing starting in 1997 at 62 fish and rising to 1,359 fish in 2010. Over this period salmon population health indicators have been relatively stable in ranges as follows:

- ❑ number of returning salmon - 1,400 to 3,300
- ❑ number of large spawners – 922 to 2,500
- ❑ number of eggs deposited - 6.08 to 16.7 million

In recent years the number of eggs deposited has been almost double the conservation requirement and salmon numbers at different life stages have remained relatively stable. There are no present conservation and recovery concerns and the outlook for Cascapedia is positive.

Salmon angling activity

The following is based on a combination of data collected by DFO, the provincial department Ressources Naturelles et Faune, Quebec, and Gardner Pinfold. Of just over 9 million angler days enjoyed across the whole province, 59,354 (only 1%) were for salmon, and of these 4,944 (8.3%) were reported for the Cascapedia.

Table 7.5.1: Number of days fished for salmon and all fish in G. Cascapedia (2005)

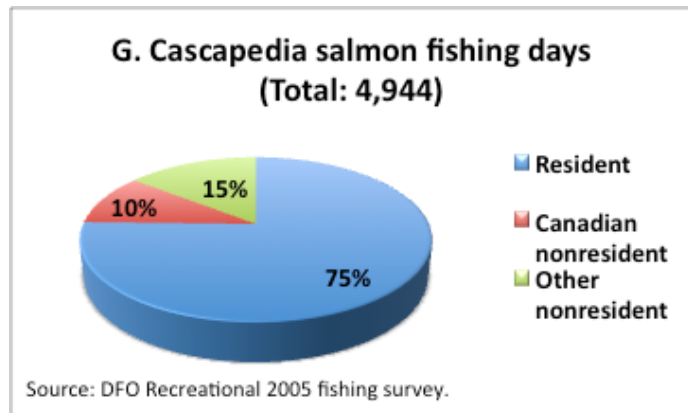
Angler origin	Salmon	All fish	% Salmon
Resident	3,726	NA	NA
Cdn nonresident*	503	NA	NA
Other country*	715	NA	NA
Total	4,944	NA	NA

Source: DFO Recreational 2005 fishing survey.

*Non-resident days are estimated based on proportions obtained from 2010 Gardner Pinfold survey of anglers.

One-quarter of all angling days in the Cascapedia were enjoyed by visitors to the province and 15% were from other countries. This demonstrates the international recognition earned by the river for salmon fishing and this indicates the prime export opportunity that benefits the community and the province as a whole.

Perhaps contrary to popular belief, anglers are not harvesting fish from the water by the hour. Fishing involves a great deal of patience and persistence and many aspects



other than the catch itself are important to a successful expedition. Beautiful scenery, tranquility, camaraderie, and relaxation are equally important. Only 1,442 salmon were caught yielding a daily catch success rate of 29% (1 in three days). Of the total catch, only 203 were kept (86% release rate) which is one of the highest among the case study rivers and is a tribute to the respect for conservation objectives.

Table 7.5.2: Catch statistics for Cascapedia salmon fishing days (2005)

Caught	1,442
Kept	203
Daily success rate	29%
Release rate	86%

Source: DFO Recreational 2005 fishing survey.

Angler spending

DFO reported spending by salmon anglers in 2005 according to conservation unit 18 (CU 18) in Québec where the G. Cascapedia is located. The following estimates are in 2010 dollars and are based on adjustments according to the proportion of salmon fishing days on the G. Cascapedia relative to the total for CU 18.

Table 7.5.3: Angler expenditures for the Cascapedia in 2005 (2010 dollars)

Angler origin	Major purchases	Packages	Direct Spend	Total
QC Resident	\$364,600.63	\$686,790	\$446,388	\$1,497,778
Other Canadian	\$49,255	\$92,781	\$60,304	\$202,340
Other Country	\$69,941	\$131,747	\$85,631	\$287,319
Total	\$483,797	\$911,317	\$592,323	\$1,987,437

The total expenditures wholly attributable to salmon fishing were almost \$2.0 million. Residents of the province are responsible for 75% of all expenditures, while visitors from other countries account for just 14%. Major purchases, packages, and direct spending represent 24%, 46%, and 30% of the total respectively. The top three major purchase items are land and buildings (37%), vehicles (36%), and boating equipment (14%). Of all other expenditures the top three items are travel costs (38%), accommodation (31%), and packages (13%). Based on the total number of salmon fishing days, anglers spend an average of \$402 per day. The 2010 Gardner Pinfold survey of high economic impact camps indicates that about \$4 million in additional spending occurs in these establishments for a total of \$6.0 million.

Historical context in QC

Although 2005 is the only year for which we have readily available economic data at a fine resolution for the case studies, it was not a representative year. Examining the historical context is therefore critical for current and future outlooks.

Simply focusing on the DFO data from 1988 to 2005, the number of anglers was down 39%, salmon fishing days dropped 46%, and total spending declined by 54%. Spending per angler and per day were also down by 25% and 15% respectively. The 2005 total spending was the lowest on record and therefore 2005 data for the Cascapedia may not be indicative of the historical economic significance of that salmon run or its future potential.

Table 7.5.4: Historical salmon fishing statistics for QC from 1998-2010 (2010 dollars)

Province	1988	1990	1995	2000	2005	2010
Anglers	14,852	28,777	16,645	11,761	9,000	13,536
Fishing days	116,208	118,819	98,135	98,328	62,265	134,006
\$/angler	\$2,838	\$2,264	\$7,213	\$5,203	\$2,137	\$2,188
\$/day	\$362.75	\$548.30	\$1,223.35	\$622.31	\$308.85	\$221.05
Days/angler	8	4	6	8	7	10
Total	\$42,154,300	\$65,147,953	\$120,053,888	\$61,190,334	\$19,230,828	\$29,621,802

Sources: 1998-2005 data by BriLev Consulting Inc.; 2010 data by Gardner Pinfold Consultants Inc.

The 2005 \$2-3 million in estimated angling expenditures for the G. Cascapedia is therefore an underestimate of historical and future potential economic activity. Full expenditures are more likely in the \$4-6 million range (double 2005 values), and that is before considering the economic impacts of this spending.

Economic impacts

Based on the total angler spending estimate (output) of \$6.0 million (including high economic impact camps), and combined spending of \$250,000 for government, Aboriginals, and non-profits; the economic impacts are calculated for three common indicators: gross domestic product (GDP), employment (jobs), and income (salaries and wages). Each of these is calculated using a composite of multipliers from Statistics Canada's latest interprovincial input-output model of the Newfoundland and Labrador economy.

The initial spending by anglers has direct impacts on the economy for those supplying food, travel, accommodation, fishing gear and equipment directly to anglers. The front line suppliers rely on many other businesses that indirectly supply goods and services including for example farmers that grow food for retail and restaurants, or vehicle and gear manufacturers that supply local outfitters and distributors with boats, trailers, nets and other products. Finally, the employees in both direct and indirect supply chains spend their earned income at the household level having a further induced effect on the economy. Each wave of spending affects GDP (economic value-added), employment, and total income to produce the totals shown here.

Table 7.5.5: Economic impacts of angler spending on the Cascapedia in 2005

Impacts	GDP	Employment	Income
Direct	\$3,199,000	75	\$2,007,000
Indirect	\$2,195,000	50	\$1,819,000
Induced	\$1,834,000	46	\$1,416,000
Total	\$7,228,000	172	\$5,242,000

Source: Statistics Canada input-output model.

The total GDP (value-added) of about \$7.2 million exceeds the \$6.25 million in direct spending (output), suggesting that compared to the other eastern provinces a greater share of inputs to recreational fishing are provided from within the province. The total employment of 172 is about 3% of all persons with earned income in the Bonaventure Census Division where the G. Cascapedia River is located. This means about 1 in 30 jobs are dependent on salmon angling and related tourism. The same can be said for the total income of \$5.2 million as a share of all income in the area. More significantly this represents about 32% or 1 in every 3 jobs for the food services and accommodation sector in the area.

VIII TOTAL ECONOMIC VALUE

Determining the total economic value of wild Atlantic salmon will begin by combining the actual spending estimates with economic input-output analysis to obtain the full impact on each of the provincial economies and eastern Canada as a whole. Added to this will be the option, existence, and bequest values from the public choice survey to show the full value Canadians place on wild Atlantic salmon.

1. Economic impacts from salmon-related spending

The total gross domestic product is a key measure of the total economic value generated. The following builds up to total economic impacts starting with the compilation of total spending numbers which are used to shock Statistics Canada's input-output model of the provincial economies yielding a suite of economic impact indicators.

Total spending on wild salmon-related activities in eastern Canada is \$166.0 million.

The following table combines all spending for aboriginal and food fisheries, recreational fishing, federal and provincial governments, academic research, and non-government organizations. The spending is shown by province for 2010. This represents "output" in economic terms and is the starting point for economic analysis that shows how this spending has additional impacts as it flows through the economy.

Table 8.1.1: Total salmon-related spending by activity by province, 2010

Activity	NL	NS	NB	PEI	QC	Total
Aboriginal and food	\$226,000	\$10,000	\$42,000	\$0	\$132,000	\$409,000
Recreational fishing	\$28,630,000	\$5,166,000	\$53,951,000	\$173,000	\$40,363,000	\$128,283,000
Federal govt	\$5,103,000	\$2,846,000	\$3,951,000	\$100,000	\$0	\$12,000,000
Provincial govt	\$2,400,000	\$560,000	\$2,000,000	\$300,000	\$3,500,000	\$8,760,000
Academic research	\$139,000	\$190,000	\$122,000	\$121,000	\$193,000	\$765,000
NGOs	\$859,000	\$2,142,000	\$10,729,000	\$309,000	\$1,706,000	\$15,745,000
Total	\$37,357,000	\$10,914,000	\$70,795,000	\$1,003,000	\$45,894,000	\$165,962,000

The dominant spending activity is recreational fishing (77%), followed by non-profit organizations (9%), federal government (7%), and provincial governments (5%). The greatest amount of spending occurs in New Brunswick (43%), followed by Quebec (28%), Newfoundland and Labrador (23%) and the others.

Economic impacts are based on Statistics Canada's input-output model

Statistics Canada maintains interprovincial economic input-output models that may be run for custom analysis. This is required since recreational fishing is not a defined sector of the economy according to the North American Industry Classification System (NAICS) adopted by Statistics Canada. Recreational fishing is a mix of accommodation, food and beverage, retail, transportation, and other industries and commodities. The recreational fishing expenditures must be split into categories that align with NAICS codes in order to run the input-output analysis. The

other activities align more closely with existing NAICS codes and are more straight-forward. Additional detail on the methodology is provided in Appendix C.

Economic impacts are reported according to conventional indicators

The economic input-output analysis calculates how the initial spending (output) flows through the economy triggering demand for a myriad of goods and services. Following conventional practice, the economic impact is measured with three indicators:

- ❑ **GDP:** an industry's contribution to Gross Domestic Product represents its broadest measure of economic impact. The domestic product of an industry captures the value it adds to purchased inputs through the application of labour and capital. GDP represents the sum of the value added by each industry. GDP is typically lower than the gross output (spending) since many goods and services are brought in from other parts of the country and abroad. GDP represents the value that stays in within each province or region.
- ❑ **Income:** this captures payments in the form of wages and salaries (and shares of revenue in the case of fishing vessel crews) earned in the affected industries. Returns to labour in the form of wages, salaries and earnings form a key component of GDP. Industries paying relatively high average wages and salaries generate a correspondingly higher economic impact than industries paying lower average incomes.
- ❑ **Employment:** industry employment is important politically because of the significance generally attached to jobs, but from an economic impact perspective, the significance lies in the economic impact generated through the spending of employment income. The greater the employment and higher the average income, the more significant the industry in terms of economic impact. Employment is measured in full-time equivalents (FTE).

Economic impacts are generated through direct, indirect and induced demand in the economy expressed in terms of industry and consumer purchases of goods and services.

- ❑ **Direct impact:** refers to impact arising from the expenditures made by firms in the subject industries on the goods and services needed to produce industry outputs. For example, the fishing industry buys nets and traps from manufacturers; water transportation buys fuel from refineries.
- ❑ **Indirect impact:** refers to the inter-industry purchases triggered by the direct demand. For example, net makers buy monofilament line from manufacturers; refineries buy services from maintenance contractors; catering companies buy basic food products. These industries in turn buy more basic goods and services, and so on.
- ❑ **Induced demand:** refers to the demand created in the broader economy through consumer spending of incomes earned by those employed in direct and indirect activities. It may take a year or more for these rounds of consumer spending to work their way through an economy.

The sum of impacts flowing from each level of demand gives the overall economic impact of Canada's marine sectors. Generally, the greater the domestic supply capability at each level, the greater will be the economic impact. Conversely, the higher the import content, the weaker the domestic industry response (multipliers) and the lower the impact.

Salmon-related spending creates \$150 in GDP, 3,873 FTE jobs and \$128 million worth of income

The model results are presented here for all of eastern Canada, and the specifics for each province are included in Appendix C. First the breakdown of results are shown for direct, indirect, and induced economic activity (Table 8.1.2), then totals are presented (Table 8.1.3).

Table 8.1.2: Economic impacts by salmon activity for eastern Canada, 2010 (\$000s)

Activities	GDP			Employment (FTE)			Income		
	Direct	Indirect	Induced	Direct	Indirect	Induced	Direct	Indirect	Induced
Aboriginal&food	\$210	\$49	\$69	2	1	1	\$138	\$26	\$49
Rec fishing	\$55,853	\$34,832	\$24,577	1,564	1,017	735	\$40,329	\$36,591	\$23,322
Federal govt	\$5,128	\$3,228	\$1,949	77	10	20	\$5,128	\$662	\$1,537
Provincial govt	\$4,732	\$1,170	\$1,512	55	40	28	\$4,621	\$1,232	\$1,709
Research	\$553	\$101	\$171	8	2	3	\$429	\$47	\$139
NGOs	\$11,243	\$1,089	\$3,044	219	26	66	\$8,985	\$580	\$2,759
Total	\$77,719	\$40,469	\$31,323	1,925	1,095	853	\$59,630	\$39,138	\$29,515

Source: Statistics Canada input-output analysis model.

Employment is calculated in full-time equivalents (FTE's) and this does not tell the whole story particularly with respect to the recreational fishery. Many of the jobs associated with the recreational fishery are seasonal, lasting from 3-6 months. The full number of people that depend on and benefit from this employment is actually much greater than the 3,873 shown below. There are well over double this number in terms of those who derive income from all salmon-related spending in eastern Canada.

Table 8.1.3: Total economic impacts of spending for eastern Canada, 2010 (\$000s)

Activities	Total		
	GDP	Employment	Income
Aboriginal and food	\$328	4	\$213
Recreational fishing	\$115,263	3,316	\$100,242
Federal government	\$10,305	107	\$7,327
Provincial government	\$7,414	122	\$7,562
Academic research	\$825	12	\$615
NGOs	\$15,376	311	\$12,324
Total	\$149,511	3,873	\$128,283

Source: Statistics Canada input-output analysis model.

Some additional information can be gained from these results as follows:

- **Average income** – the income divided by the number of full-time employees (\$33,121).
- **Productivity per employee** - the GDP divided by the number of full-time employees (\$38,602)
- **Returns to labour** – income divided by GDP indicates that on average 86% of productivity is tied to labour, and the balance represents returns to capital or other factors.

Not surprisingly this means that most salmon-related activities are labour intensive. This is typical of tourism which the recreational fishing industry is integrated with. By contrast the coastal Labrador resident food fisheries would be more capital intensive with greater expenditures

on vessels and gear, or some of the research involving expensive monitoring devices and vessels for deployment, but these represent very small shares of all salmon activity spending.

2. Total non-use value of wild salmon is \$105 million

Total value basis

Keep in mind that estimates of total value are derived from the choice survey completed by 995 individuals in eastern Canada. The results indicate what the response might be from the population as a whole. However about two-thirds of the survey participants indicated they were initially “not very familiar” or “not at all familiar” with topics associated with wild Atlantic salmon. The survey provided some basic information in 2-3 screens or on average less than 2 minutes, and this must be considered when interpreting results.

Education is a key driver of value

Canadians need to know what has happened to salmon stocks and what can be done in order to garner their support. The public is highly involved in outdoor and environmental activities so it is not surprising that they appreciate and support conservation efforts, but public education is beneficial. In fact the survey revealed that providing 30 seconds of reading material about “what’s at stake” will positively influence public support (by 1%) and willingness to pay for salmon conservation (up to \$2.91 per household, equivalent to \$11.5 million per year across eastern Canada).

Annual public non-use value is at least \$26 per household and collectively \$105 million

In the end, results indicate there is over 80% public support in Eastern Canada for a sustained 20-year program with new annual investments of \$53M - \$157M that will “likely” or “very likely” restore wild Atlantic salmon abundance to 40% - 80% of historic highs. Using the mid-point as a guidepost, the public non-use value of salmon conservation could be \$105 million per year.

This can be considered untapped potential spending for salmon over the next 20 years. The actual spending is currently dominated by recreational fishing, with all-time low investments from the public through federal departments or otherwise. Re-allocation of government budgets or increased tax revenues to direct more resources to salmon conservation could reverse the decline in spending for government programs, aboriginal and non-profit conservation and education initiatives.

Combining the GDP (\$150 million domestic value) from actual salmon-related spending and the estimated public conservation value of salmon (\$105 million) –

“The total estimated annual value of salmon-related activities in eastern Canada is \$255 million”

For reference, farmed Atlantic salmon in eastern Canada yielded \$270 million in GDP value in 2006 (Gardner Pinfold, 2008). This does not include government spending or academic research related to salmon aquaculture, so the findings in this study are not directly comparable. Having said this, wild salmon-related GDP of \$149 million is about 56% of the GDP associated with aquaculture salmon in eastern Canada and, unlike farmed Atlantic salmon, there is substantial public value associated with the wild salmon run. The total wild Atlantic salmon value of \$254 million is nearly on par with the economic significance of farmed salmon in eastern Canada.

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IX INVESTING IN WILD SALMON

Before determining the merits of additional investments in wild Atlantic salmon, it is important to acknowledge the current direction, and then specifically what new activities would flow from investments. This provides a basis for framing the potential benefits and assessing the prospects of achieving value for money. The focus here is primarily on the federal government role as the lead, but it is recognized that the provinces, non-profit organizations, and the private sector will play a cooperative role.

1. Basis for investing in wild salmon

Canada's Policy for the Conservation of Wild Atlantic Salmon

The general direction for conservation and enhancement of salmon populations has been set in motion by Canada's Policy for the Conservation of Wild Atlantic Salmon. The policy sets overarching goals and objectives for activities addressing the health of all Atlantic salmon populations. Specifically it states that the goal is:

“to maintain and restore healthy and diverse salmon populations and their habitat, for the benefit and enjoyment of the people of Canada in perpetuity” (DFO, 2009)

Three objectives are outlined in support of the goal: 1) safeguard the genetic diversity of wild Atlantic salmon; 2) maintain habitat and ecosystem integrity; and 3) manage fisheries for sustainable use and benefits.

Furthermore, six strategies are outlined and accompanied by “action steps” to provide some indication of the activities that are expected to take place. The strategies and action steps tend not to be prescriptive so they are flexible and the descriptions serve to illustrate the kind of activities that will take place.

In a closing discussion on implementation – “making it all work”, the success and progress is said to be dependent on resource capabilities over time, and the ability to share activities with provincial governments, First Nations and other Aboriginal organizations, volunteers, other stakeholders and other federal agencies.

Species at Risk Act (SARA)

Following assessments by COSEWIC, wild salmon populations may be listed under SARA triggering the development of recovery strategies and action plans. The inner Bay of Fundy (iBoF) salmon population is listed as endangered and a recovery strategy has been adopted (DFO, 2010b). Although this only addresses one population rather than all wild Atlantic salmon in Canada, it does offer much more detailed direction regarding goals and measures to recover the population.

A five-year target and a long-term target are set for recovery efforts. The long-term target is subject to improved marine survival but specifies an abundance of 9,900 spawning adults (about 25% of past abundance) distributed across 19 rivers representing 85% of the accessible habitat.

COSEWIC has since determined that other populations of wild Atlantic salmon are endangered or threatened and this may lead to the development of more recovery strategies and action plans. As more specifics become available the picture of a comprehensive approach to salmon conservation and recovery becomes clearer.

Conservation Status Reports

The Conservation Status Report for Atlantic Salmon in Atlantic Canada and Québec involves two parts: 1) species information, and 2) anthropogenic considerations (DFO, 2009b and 2009c). The Policy for Conservation of Wild Atlantic salmon is recognized as a starting point to attain conservation targets, but conservation is considered a minimum and this is different than setting targets to restore populations near or to their historic highs. “New and proposed species rebuilding and habitat restoration strategies” are put forward that build on conservation efforts. This provides some insights into the nature and scale of a comprehensive program for all wild Atlantic salmon in Canada.

The measures underway or about to be implemented at the time of the report were divided according to the main issues facing wild salmon:

- 1) Management of fisheries,
- 2) Protect and restore salmon habitat,
- 3) Manage aquaculture,
- 4) Marine survival, and
- 5) Invasive species.

The appendix lays out management alternatives and mitigation measures that can be implemented according to each of 28 geographically-based conservation units. The level of detail helps to show how the strategies and actions should systematically address the threats to salmon and be tailored to local circumstances. For instance, transportation infrastructure (roads, culverts, and fish passage) are among the greatest threats in South Labrador, as opposed to acid precipitation for southern upland Nova Scotia, or a combination of hydroelectric and water storage dams, aquaculture siting, and air pollutants on the south coast of Newfoundland.

These increasingly detailed assessments of threats and potential measures suggest that within a few years there will be a thorough and comprehensive basis for deciding what investments should be made for wild salmon conservation and restoration.

2. Making the case for investment

Both the use and non-use values highlighted in this study will underpin the case for investment in salmon. First, the economic activity associated with salmon fisheries (use of the resource) and growth potential are discussed. Second, the public expression of support for salmon recovery simply for its existence, bequest, and future option values is linked to salmon investments. Understanding these two keystones for supporting conservation and restoration will be helpful when making critical choices once options are fully developed.

Use benefits – recreational fisheries business case

First, when considering the value proposition for wild salmon investments, the economic results for wild salmon should be isolated to just the fisheries activities. The compilations of spending by

governments, researchers, and non-profits already represent investments in salmon conservation and recovery and they are in place to maintain the current state of wild Atlantic salmon. The fisheries expenditures alone are \$128 million, which translate into \$115 million in GDP. The basic question is how much benefit can be gained by further investing in wild Atlantic salmon? The current total spending by anglers is a combination of the number of anglers and their average spending rates. The average spending rates of \$2,418 found in this study are not the highest on record (\$3,226 in 1995 represented in today's dollars), but it will be assumed that no growth in average spending per angler will occur even if the fishing experience is enhanced through restoration efforts. Instead, only consider the change from today's 55,000 salmon anglers to the former high of 81,000 in 1990 (26,000 anglers, about a 50% change). Applying today's spending rate to the 26,000 anglers yields \$63 million in spending growth potential, or \$56 million in GDP growth potential.

There has been steady decline in salmon anglers since the peak twenty years ago, so it is reasonable to expect that another twenty years may be needed to rebuild the number of enthusiasts. Attracting those anglers will rely on the results of wild salmon investments including the more enjoyable experience of angling with more numerous and healthy salmon runs. Catches may become easier, and more (local) rivers will be open. The often-cited barriers to angling would be addressed such as lack of access and excessive distances required to travel for fishing opportunities.

The following assesses the return on investment (ROI), net present value (NPV), and breakeven point for a \$15 million annual investment representing more than a doubling of DFO's current annual budget:

- **ROI** – 18% returns can be achieved, easily allowing room for debt servicing costs at any foreseeable interest rate.
- **NPV** – \$51 million at an 8% discount rate which is a conservative rate given today's low costs of borrowing and the Canadian Cost-benefit Analysis Guide direction for social and environmental investments (TBC, 2007).
- **Breakeven point** – The annual revenues would exceed the annual costs in the 6th year after which net revenues extend to the twenty-year mark.

The above indicators are based on increased angler spending potential. If these are instead based on increased GDP potential the ROI, NPV, and breakeven point are 15%, \$30 million, and 7 years respectively.

Non-use benefits – public support

Just because there may be a business case based on potential growth for the recreational fisheries this does not mean the public is currently prepared to make the investment. It would not be surprising in today's economic circumstances that the public would be cautious about any new investments for what might be perceived as environmental programs.

However, the public survey of 995 individuals in eastern Canada revealed over 80% support for a sustained 20-year salmon restoration program that will "likely" or "very likely" raise Atlantic salmon abundance to 40-80% of historic highs. The current DFO wild Atlantic salmon budget of \$12 million represents about \$1.00 in annual taxes per tax-paying household in eastern Canada. Canadians showed strong support for all program options that move beyond the status quo and, depending on the nature of the programs, they indicated a willingness to contribute new resources

in the range of \$4.50 to \$12.50 per tax-paying household. This translates into public support for annual incremental budget allocations of \$57 to \$157 million.

This support is contingent on the ability to demonstrate that results will “likely” (50-80% chance of success) or “very likely” be achieved (80-99% chance of success). Given the challenge to guarantee high success rates, the high-end \$12.50 per household (\$157 million) should be tempered. Still, even the low-end (\$4.50 per household and \$57 million annual total) far exceeds the \$15 million annual investment that would be justified based on potential returns to the recreational fisheries.

There are two simple conclusions: 1) public support clearly exists for the levels of investment associated with the recreational fisheries business case, and 2) there is a great deal of additional support owing to Canadians’ high regard for the existence of wild Atlantic salmon and the importance of passing the resource on to future generations. Together these findings make a very strong case for increased investments in wild salmon.

3. Building a comprehensive program

Further research over the next few years will produce more detailed blueprints for conservation and restoration options. But there will always be choices in terms of the order in which actions are taken, and there will be trade-offs since the costs and benefits are never distributed evenly across individuals or biogeographic areas. The following insights from the study, primarily from the public choice experiment, are offered to help develop criteria for making such choices.

- ❑ **Communicating salmon issues to the public** is important for gaining support even if this concedes past management shortcomings. Funding for related education and communications is not only justified, but the annual budget for this purpose alone could be several million dollars.
- ❑ **Be clear and specific about the goals** of wild salmon restoration programs, especially in communications to the public. Is the objective to increase use values such as fishing and/or to ensure non-use existence and bequest values? Is the goal simply to increase the number of salmon regardless of where this can best be achieved, or will it be achieved throughout the traditional range of salmon and people will enjoy the return of local salmon runs?
- ❑ **Communicating the likelihood of success** for program investments clearly matters to the public. There is much greater willingness to invest in certainty than simply “throw money at the problem and hope for the best”. Probability of success was the most important program attribute in the public choice survey. A \$700,000 a year premium was revealed for guaranties of each 1% increase in wild salmon abundance, meaning research that helps confirm the likely success of new investments should be pursued as long as research costs are less than the premium.
- ❑ **A phased approach** may be helpful for achieving and demonstrating early success and this will build support for steps that restore wild salmon stocks toward their historic highs. A segment of the public may be satisfied with just the first phase, but there is still over two-thirds majority support to completely restore historical wild salmon abundance or nearly so.

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