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***Protection, Restoration and Enhancement of Salmon Habitat  
Focus Area Report***

***Canada***



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**HABITAT MANAGEMENT  
FOCUS AREA REPORT  
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## **PREAMBLE**

This Focus Area Report describes Canada's program to manage Atlantic salmon habitat. It is submitted in response to the request from the North Atlantic Salmon Conservation Organization (NASCO) to provide the information required to assess the efficacy of the current management approach and proposed actions in addressing the overall objectives of NASCO to conserve, restore and enhance salmon habitat.

### **1.0 DESCRIPTION OF THE HABITAT**

Fish habitat in Canada is defined under *Section 34* of the federal *Fisheries Act* as “*spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes*” and applies to all freshwater and marine areas under Canadian jurisdiction.

#### **1.1 Extent**

The number of Atlantic salmon rivers in eastern Canada exceeds 700 rivers within 28 provisional Atlantic Salmon Conservation Units distributed from Ungava Bay in the north to Canada's border with the United States between New Brunswick and Maine (Annexes 1 and 2; DFO and MNRF *In prep a*). Conservation Units are defined as “*groups of individuals likely exhibiting unique adaptations that are largely reproductively isolated from other groups, and that may represent an important component of a species' biodiversity*” (DFO 2007a).

The areas of both fluvial (rivers and streams) and lacustrine (ponds and lakes) habitats utilized by salmon have been determined for most of Canada's major producing and more southern Atlantic salmon rivers (O'Connell *et al* 1997). Fewer of the more northern rivers have been surveyed (e.g., in Labrador and Ungava), and for those not surveyed, area-based determinations of salmon conservation requirements are based on various parameters of relevant index rivers.

It is not known how many rivers in Canada produced anadromous Atlantic salmon prior to European colonization but it is widely held that tributaries of the upper St. Lawrence River used to support sea-run populations (DFO and MNRF *In prep a*). Watt (1989) derived estimates of the freshwater productive capacity for Atlantic salmon using estimates of accessible drainage areas and commercial catches of salmon and concluded that since 1870 there has been a net loss of 16%. Actual losses were estimated at 8% due to chronic problems associated with agriculture, 7% to impoundment, water diversion and obstruction, and 3% to acidification. Watt also estimated that these losses were partially offset by a 2% gain in productive capacity as a result of the provision of fish passage around obstructions. These estimates do not account for losses to habitat between European colonization and 1870, nor do the estimates reflect the accelerating pressures put on fish habitat over the last three decades.

#### **1.2 Nature**

Atlantic salmon generally prefer streams that are clean, cool and well oxygenated, characterized by moderately low (2 m/ km) to moderately steep (11.5 m/ km) gradients

(Elson 1975), and with bottom substrates composed of assorted gravel, cobble and boulder. These streams generally possess natural riffles, rapids, pools and flats which are utilized by the salmon during its different life stages. Adult salmon usually occupy the pools except during the act of spawning when they can be found over and proximate to the shallow gravel areas where the eggs are deposited. While the juvenile salmon prefer the riffle areas with irregular bottoms and substrates comprised of cobble and small boulders, they also occupy, to varying degrees, a wide range of other habitat types within the same stream or river (Amiro 2006). On insular Newfoundland, lacustrine habitat contributes to significant salmon production (Pepper 1976; O'Connell and Ash 1989).

The estuaries of rivers are both migration corridors and freshwater/saltwater transition areas for emigrating smolts and returning adults. The length of time spent by smolts in the home estuary is thought to be brief (Reddin 2006) and could be as short as one or two tidal cycles (Tytler *et al* 1978). In contrast, returning adults may spend a more extended period of time in the estuary.

Canadian post-smolts exiting the estuaries of their home rivers generally quickly migrate northward to the Labrador Sea where they feed and overwinter before returning to their river of origin (Ritter 1989; Reddin 2006). The main exception to this northward migration is that of the post-smolts of the rivers of the inner Bay of Fundy. These post-smolts are believed to remain and overwinter in and/or proximate to the Bay of Fundy (Ritter 1989).

### 1.3 Threats

The principal present-day habitat-related threats to Atlantic salmon, in no order of priority, are: municipal waste water discharge; industrial effluents (e.g., pulp and paper, mining, food processing); spills of oils and chemicals; hydroelectric power generation including dams and reservoirs; water extraction for domestic and industrial use; urbanization (altered hydrology); transportation infrastructure (e.g., roads, culverts, bridges, causeways); aquaculture; agriculture, forestry and mining operations; dredging; noise from shipping and transportation vessels; acid rain; erosion and siltation due to land-use activities (e.g. agriculture, urban development); and habitat fragmentation, climate and ecosystem changes (from cumulative impacts) (DFO and MNR *In prep b*).

A semi-quantitative assessment of the impact of these habitat-related threats to salmon is summarized by salmon Conservation Units (CU) (Annex 2). The most wide-ranging threats to Canada's Atlantic salmon originate from 'transportation infrastructure', 'agriculture, forestry and mining operations' (i.e. industrial land-use activities), and 'municipal waste water discharge'. The fish habitat protection provisions of the *Fisheries Act* apply to aspects of all of these activities. The least severely threat-impacted areas are in Québec (CUs 18-28) and Newfoundland and Labrador (CUs 1-8). Conversely, the Maritime Provinces (CUs 9-17) are the most severely threat-impacted with several threats affecting > 30% of salmon or a loss of > 30% of spawners (Annex 2; DFO and MNR *In prep b*). Salmon of CU 15 (the Southern Upland) are severely impacted by acid rain which has caused the loss of populations in several of the 63 rivers within the CU, and has seriously impacts most of the others. In combination with the persisting low marine survival (ecosystem change) common to CUs 13-17, in particular, acid rain is threatening

the loss of the majority of the remaining salmon populations within that area (Amiro 2000; DFO 2000).

## 2.0 FRAMEWORK FOR FISH HABITAT MANAGEMENT

### 2.1 Legal

In Canada, *Section 91* of the *Constitution Act, 1867*<sup>1</sup> assigns exclusive legislative authority over “Sea Coast and Inland Fisheries” to Canada’s Parliament, a federal entity. Under this constitutional head of power, Parliament enacted the *Fisheries Act, 1868* as one of the country’s first laws for the protection of fisheries, and the conservation and protection of the fisheries resources and their habitat. Parliament assigned responsibility for the administration of the *Fisheries Act* to the federal Minister of Fisheries and Oceans (DFO). Under the *Fisheries Act* there are many *regulations*, including separate sets of *Fishery Regulations* for Québec, the collective Maritime Provinces, and Newfoundland and Labrador.

The *Fisheries Act* defines a set of authorities, powers, duties and functions that can be applied to regulate threats or impacts to fish and fish habitat associated with proposed works and undertakings and existing facilities and structures in, around or with Canadian fisheries waters. Specifically, the *Act* can regulate: i) obstructions to fish passage (*Sections 20 and 21*); ii) alterations to stream flows (*Section 22*); iii) killing of fish by means other than fishing (*Section 32*); iv) harm to fish habitat (*Section 35*), and v) the deposit of deleterious substances in waters frequented by fish (*Section 36* –pollution prevention). Collectively, these are commonly referred to as the ‘habitat protection and pollution prevention provisions’ and together with other provisions (e.g. powers to require that information and records be provided by proponents under s. 37, penalties for contraventions of the *Act* under s. 40, powers of Inspectors, Guardians and Fisheries Officers to investigate contraventions and enforce the *Act* under s.49) have established the *Fisheries Act* as the strongest law for conserving and protecting fish and fish habitat throughout Canada.

Despite its robustness, the *Act* has a number of limitations including: i) it is limited to regulating for the conservation and protection of seacoast and inland fisheries and therefore can only regulate impacts to fish species and fish habitat rather than a project type or work activity, *per se*; ii) proponents of works or undertaking are not required to apply for an authorization to harm fish or fish habitat, and can only be found in violation if fish or fish habitat is harmed without authorization, and iii) the conditions specified within an authorization under the *Act* to harm fish habitat are not, in and of themselves, enforceable, only where harm to fish or fish habitat results from failure to follow conditions of the authorization could enforcement action be taken.

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<sup>1</sup> See [http://www.solon.org/Constitutions/Canada/English/ca\\_1867.html](http://www.solon.org/Constitutions/Canada/English/ca_1867.html) for text on the 1867 *Constitution Act*.

The authority of the *Fisheries Act* is complemented by other federal legislation including the *Canadian Environmental Assessment Act (CEAA)*, Canada's *Species at Risk Act (SARA)*, the *Canadian Environmental Protection Act (CEPA)* and the *Oceans Act*.

- *CEAA* and *SARA* are aimed at integrating environmental considerations in federal decisions through the conduct of environmental assessments and at preventing wildlife species from becoming extirpated, respectively. The *Species at Risk Act* also has provisions for protecting 'critical habitat' which is defined as "habitat necessary for the survival or recovery of a listed wildlife species" (Section 2). *Critical habitat* has not been defined for any of Canada's Atlantic salmon populations, although efforts are ongoing within DFO to define *critical habitat* for the inner Bay of Fundy salmon populations which are present only in the rivers within CU 16 (Annex 1) and are currently listed as 'endangered' under *SARA*.
- *CEPA* is aimed at preventing pollution and protecting the environment and human health, while contributing to sustainable development. For example, *CEPA* is the federal government's primary legislation for preventing atmospheric pollutants causing acid rain and contributing to climate change.
- The *Oceans Act* commits the government of Canada to conserve, protect and develop the oceans in a sustainable manner. The Act legally defines Canada's oceans boundaries, promotes integrated, collaborative and inclusive decision making for oceans-related activities, and assigns responsibility for new and emerging oceans-related activities to the Minister of Fisheries and Oceans.

Canada's provinces have their own important constitutional authorities with respect to land, which is considered to include water and the environment (including air pollution and waste disposal). The responsibilities associated with these local authorities are important to protecting fish and fish habitat from the adverse impacts of human activities and complement the provisions of the federal *Fisheries Act*. For example, the provinces have legislation, which specifies regulations and processes for protecting the environment (DFO 2007b). DFO has delegated administrative responsibility to the Province of Québec for managing Atlantic salmon and other diadromous and freshwater fish species within its waters but remains responsible for applying the provisions of the *Fisheries Act* for the conservation and protection of fish and fish habitat in both fresh and marine waters of Québec.

## 2.2 Policy

The principal policy for managing fish habitat in Canada is DFO's 1986 *Policy for the Management of Fish Habitat* (DFO 1986). This *Policy* provides a comprehensive framework for managing fish habitat consistent with the concept of sustainable development, through the administration of the habitat protection and pollution prevention provisions of the *Fisheries Act*. Under this *Policy*, DFO's overall objective in managing fish habitat is a "net gain" of habitat for Canada's fisheries resources. It strives to achieve this objective by working to i) conserve the productive capacity of fish habitats supporting Canada's fisheries resources, ii) restore fish habitat by rehabilitating its productive capacity, and iii) develop fish habitat by improving productive capacity or by creating new habitats. The *Policy* introduces the guiding principle of "no net loss" of fish habitat to achieving the conservation goal for Canada's fish habitat and lays out the

procedures for its application.. The Policy also identifies eight Implementation Strategies for achieving its objectives; the Strategies include: Protection and Compliance, Integrated Resource Planning, Scientific Research, Public Consultation, Public Information and Education, Cooperative Action, Habitat Improvement, and Habitat Monitoring.

A range of operational policies, processes and practices provide further guidance to ensure consistency and efficiency in the administration of the habitat protection provisions of the *Fisheries Act*, and the application of the *Policy*. Examples of these include:

- Standard operating policies to guide staff in making transparent and consistent decisions during the regulatory review of works and undertakings and also of existing facilities and structures that could adversely impact fish and fish habitat<sup>2</sup>;
- Standardized processes and practices for reviewing proposed works and activities, for applying the provisions the *Fisheries Act* to habitat-related matters associated with existing facilities and structures, and for responding to reported incidences potentially affecting fish habitat;
- Management tools to assess and mitigate impacts of low risk activities (e.g., more than twenty (20) ‘*Operational Statements*’ developed by DFO and used to identify those routine work activities that require no further assessment because they generally pose a low risk of adversely impacting fish and fish habitat when the proper mitigation measures are applied (Annex 3), and provincial ‘*Watercourse and Wetland Alteration Guidelines*’ developed jointly by DFO the provincial environment departments of New Brunswick and Prince Edward Island to initially screen proposals and provide guidance to proponents who undertake work activities in or proximate to waters<sup>3</sup>;
- ‘*Pathways of Effect (PoE)*’ diagrams to aid in describing individual land-based and in-water activities and their effects on the aquatic environment (Annex 4);
- Guidelines for reviewing and approving ‘*Best Management Practices (BMPs)*’ applied to common activities which potentially affect fish and fish habitat and are carried-out by industries and governments (e.g., for road construction and maintenance, forest cutting near watercourses and agricultural cultivation and other land use practices), and
- Manuals to support and guide community stewardship of the aquatic resources (e.g., “*Ecological Restoration of Degraded Aquatic Habitats: a Watershed Approach*” (DFO 2006), and “*The Nova Scotia Adopt-A-Stream Program: A Watershed Approach to Community-based Stewardship*”<sup>4</sup>).

Beyond physical impacts to habitat, Canada is taking action to combat acid rain under the *Canada-Wide Acid Rain Strategy for Post-2000*. This *Strategy*, approved by federal, provincial and territorial ministers of the environment and energy, commits the Canadian governments to reducing further sulphur dioxide (SO<sub>2</sub>) emissions from industry, to

<sup>2</sup> See “[http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/policies-politique/operating-operation/index\\_e.asp](http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/policies-politique/operating-operation/index_e.asp)” for details.

<sup>3</sup> For examples of these guidelines see either “<http://www.gnb.ca/0009/0371/0005/index.htm>” or “<http://www.gov.pe.ca/envengfor/index.php3?.number=1015688&lang=E>”.

<sup>4</sup> See “<http://www.novascotiasalmon.ns.ca/projectsandprograms/adopt/Adopt.htm/>” for program details.



seeking commitments from the USA to further reduce emissions, to maintaining adequate science and monitoring programs, and to cooperating in defining policy priorities.

### 2.3 Institutional

The Minister of Fisheries and Oceans Canada is responsible to Parliament for the administration of the *Fisheries Act*. Administrative responsibilities for the management of the pollution prevention provisions (*Section 36*) of the *Fisheries Act*, however, has been delegated to Environment Canada. Section 36 of the *Fisheries Act* provides powers for developing regulations to manage and monitor pollution related threats to Atlantic salmon habitat (e.g., Pulp and paper and metal mining effluent). Environment Canada also has the primary responsibility for administering the *Canadian Environmental Protection Act (CEPA)*. Administrative responsibility for the management of the freshwater fisheries resources has been delegated to most provinces and territories.

The lead role within DFO for administering the habitat protection provisions of the *Fisheries Act* and for liaison with Environment Canada on issues related to section 36 of the *Fisheries Act* is assigned to the Oceans, Habitat and Species at Risk Sector's Habitat Management Program (HMP). In addition, the HMP is responsible for ensuring that the legal obligations and provisions of both *CEAA* and *SARA* are met prior to making regulatory decisions under the habitat protection provisions, and in certain specific cases under the pollution prevention provisions of the *Fisheries Act*. The HMP is supported in delivering on its mandate by DFO's Science Sector (i.e., to provide habitat related research, scientific advice and monitoring) and the Fisheries and Aquaculture Management Sector (i.e., for enforcement action).

All five Atlantic salmon-producing provinces have legislation and administer programs aimed at protecting the environment, including waters, and managing their natural resources (DFO 2007b). Provincial jurisdiction also extends to regulation of industry sectors (e.g. agriculture, forestry, and mining) and setting standards to ensure good environmental performance in these areas. The processes for administering these federal and provincial programs are implemented jointly to varying degrees in each of the five provinces.

An inter-governmental organization of federal, provincial and territorial fisheries and aquaculture ministers, the "Canadian Council of Fisheries and Aquaculture Ministers", serves to foster relations, cooperation and communications among governments in Canada for managing fisheries and conserving and protecting fish and fish habitat. As a result of one of the Council's objectives, namely "*coordination of fish habitat management activities by governments to provide efficient, seamless program delivery to Canadians*", DFO has formal arrangements with the provinces and territories for managing Canada's fish habitat. In addition to the Canadian Council, the Atlantic Council of Fisheries and Aquaculture Ministers, made up of Ministers from the Atlantic Provinces, Quebec, Nunavut and the federal government, meets regularly to discuss and work on fisheries and aquaculture issues of particular interest to Eastern Canada.

## 2.4 Partnering

Both the conduct and success of DFO's HMP in eastern Canada are dependent upon numerous formal partnering arrangements between DFO and other federal government departments (e.g., the *Atlantic Agreement* on delivery of *Section 36* between DFO and Environment Canada), provincial agencies (e.g., *Memoranda of Understanding on Fish Habitat Management* with Nova Scotia and Prince Edward Island, and the economic development plan for salmon put in place by the Quebec government and partner organization such as la Fondation de la faune du Québec), and industry (e.g., the *Agreement on Fish Habitat Management* with Nova Scotia Power Inc.). Informal and formal arrangements have also been established with numerous non-government conservation organizations (e.g., Atlantic Salmon Federation and its provincial councils and various community/watershed groups). Many of these latter partnership arrangements have been formed in response to the need for all parties to work together.

Canada's efforts to reduce acid rain are greatly enhanced through partnering arrangements and agreements between the Canadian federal government and the provinces/territories and also with the United States (USA) federal and State governments (e.g., separate agreements in the late-1980s between Canada and each of the eastern Canadian provinces to reduce atmospheric emissions, and the 1991 Canada-USA *Air Quality Agreement* aimed at reducing trans-boundary air pollution, including acid rain).

## 3.0 PROCESS FOR HABITAT MANAGEMENT

### 3.1 Regulatory Program

The regulatory program for fish habitat management in Canada is led by DFO's HMP. The focus of the HMP is on the application of the habitat protection provisions of the *Fisheries Act* to impacts to fish and fish habitat that are likely to result from proposed works and undertakings associated with new development projects, and with existing facilities and structures. Under the HMP, priority is given to the conservation and protection of fish species and their habitats where there is an economic, social, cultural or ecological importance to Canadians. DFO delivers the HMP in collaboration with Environment Canada and provincial governments.

Proposed works and undertakings (i.e. projects) subject to the regulatory process under the *Fisheries Act* are commonly referred to as '*habitat referrals*' or simply as '*referrals*'. These project proposals can be submitted directly by proponents to DFO for review, but are often *referred* by other federal or provincial agencies. Such *referrals* are generally reviewed by both federal and provincial governments relative to their respective legislative authorities and administrative responsibilities. Federally, DFO's HMP reviews referrals with respect to the habitat protection provisions of the *Fisheries Act*. Within the provincial governments, departments of the environment are generally the lead responsible agencies for the review of project proposals for other environmental impacts. In the Maritime Provinces (New Brunswick, Nova Scotia and Prince Edward Island), the provincial departments of the environment are the initial recipients of the majority of applications from proponents for projects proposed in and around fish habitat. The

*habitat referrals* go first and foremost to these provinces as a result of agreements between DFO and the provinces that there be ‘one window’. In Newfoundland and Labrador Region the majority of *referrals* are received directly from proponents, though some may also be received from provincial agencies.

DFO’s HMP has developed a *Risk Management Framework* (RMF) to manage impacts to fish and fish habitat based on the level of risk they pose to the resource. The RMF has three operational components: *Aquatic Effects Assessment*, *Risk Assessment*, and *Risk Management*. The *Aquatic Effects Assessment* component uses *Pathways of Effects* diagrams (Annex 3) to communicate cause-effect relationships between development activities and impacts on fish and fish habitat, to identify mitigation measures to break the linkages (i.e. the Pathways), and to describe residual effects that cannot be mitigated. The *Risk Assessment Matrix* (Annex 4) has been developed by HMP to visually show the level of risk associated with residual effects to fish and fish habitat, based on the relative scale of the potential negative effect and the sensitivity of the fish and fish habitat affected. Based on the outcomes of the first two components of the RMF, consideration of cumulative effects and the fisheries resource objectives at hand, a decision can then be made as to the regulatory actions required of HMP for appropriate *Risk Management* of the potential effects to fish and fish habitat posed by the particular development project.

In general terms, based on the level of risk to fish and fish habitat likely to result from a *referred* project, DFO HMP staff have several options for their recommended regulatory course of action: i) provide advice to the project proponent on siting (i.e. project relocation) and/or mitigation measures (i.e. project redesign) to avoid a HADD or fish mortality; ii) authorize a HADD or the killing of fish likely to result from the project where HADD or fish mortality is unavoidable and is considered acceptable, or iii) reject the project as proposed where the impacts to fish or fish habitat is considered unacceptable (e.g. the project would adversely affect critical habitats or species at risk).

Where re-location or re-design of a proposed work activity are possible options to reduce or avoid a HADD, extensive negotiations often take place between DFO and the proponent to avoid or minimize the HADD while allowing for development to proceed. DFO issues ‘*Letters of Advice*’ for *referrals* for which the effects of the proposed work activity can be eliminated or managed successfully through the mitigation measures that it specifies in the *Letter of Advice*. In many cases, activities that pose a low risk to fish and fish habitat have been identified by HMP through the publication of *Operational Statements* (Annex 5). These documents describe the conditions and practices that, if followed, would allow an activity to be undertaken without resulting in a HADD of fish habitat, or fish mortality; much like those contained in a *Letter of Advice*. Works that meet the terms set out in an *Operational Statement* need not be reviewed by HMP, as no site specific advice or authorization is required. Operational statements also serve as a tool for project proponents to develop best management practices and procedures to carry out their operations without impacting fish and fish habitat. . In the Maritime provinces, *Operational Statements* have been harmonized with provincial watercourse and wetland alteration guidelines, as part of one-window delivery processes. As part of the *Operational Statements*, proponents are asked to notify DFO when work is being carried

out under the Statements. This allows for tracking of *Operational Statement* work, for auditing and monitoring of the effectiveness of their use, for seeking stakeholder feedback, and for continuous revision and improvement of the *Operation Statements*.

Should an assessment of a *referral* indicate that there is likely to be a HADD of fish habitat, or fish mortality, a *Fisheries Act* 'Authorization' issued by the Minister of DFO is required for the project to proceed in compliance with the law. DFO specifies conditions in *Authorizations* for HADDs or for the killing of fish; these include mitigation measures to minimize impacts, and monitoring requirements to ensure compliance with the terms of the *Authorization* and effectiveness of the mitigation measures imposed. In the case of HADD *Authorizations*, proponents are also required (as another condition of the *Authorization*) to develop and implement a fish habitat compensation plan to off-set the loss in the productive capacity of fish habitat resulting from their project. Financial security instruments (e.g., letters of credit) are often used by DFO to ensure the completion of mitigation measures, monitoring requirements, and habitat compensation works that are specified in the *Authorizations*. All costs associated with meeting these conditions are the responsibility of the proponent.

The issuance of *Authorizations* to harm fish habitat (ss.35(2)), or to kill fish by means other than fishing (s.32) both trigger the need for an environmental assessment under the *Canadian Environmental Assessment Act (CEAA)*. It is HMP's responsibility under *CEAA* to ensure that the environmental assessment is carried out. HMP may only issue an *Authorization* under these sections of *Fisheries Act* if it is determined that no significant adverse environmental effects are likely to result from the project being authorized. The *CEAA* assessment is based on detailed environmental information and impact assessment gathered and provided by the project proponent. In addition to the *CEAA* process, *Fisheries Act Authorizations* for HADD or the killing of fish must not jeopardize the survival or recovery of species at risk, as per the *Species at Risk Act*, and must be issued in consideration of aboriginal and treaty rights.

DFO carries out inspections of projects to determine conformity with the conditions set out in *Operational Statements*, *Letters of Advice*, *Authorizations* and other instruments, and to ensure compliance with the provisions of the *Fisheries Act*. In cases of non-conformity with conditions specified by DFO and/or non-compliance with the *Act*, as a first step, DFO usually reviews these incidences with the proponent to determine potential solutions and negotiates remedial measures for non-conformities and/or non-compliance. When negotiations are not successful in addressing the non-conformity and/or non-compliance, or when there has been significant unauthorized damage to fish habitat the cases are typically referred to DFO Fishery Officers for investigation and where required, enforcement action. DFO Inspectors can also make orders to prevent, or correct, potential, or actual, cases where deleterious substances have been deposited into fish habitat. These orders are enforceable.

The management of acid rain is a shared responsibility among federal, provincial and territorial governments. A main focus of Canada's efforts to combat acid rain is to reduce emissions of sulphur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>) from both Canadian and

American sources. Such efforts encompass a wide range of program activities by Canadian governments. For example, the federal government regulates emission standards for vehicles and is responsible for reducing transboundary air pollution. The provinces and territories regulate emissions from industries through their regulatory (permitting) programs.

### 3.2 Stewardship

Another focus of DFO's HMP is to foster local and community stewardship of fish habitat in recognition of the substantial benefit this can have in protecting, restoring and developing fish habitat. Staffs from both DFO's HMP and provincial departments of natural resources or fisheries often work with local community organizations to implement projects designed to conserve, protect and improve fish habitat. They assist community organizations with the design and implementation of fish habitat surveys to determine potential risks to the resource and to identify opportunities for restoration or development. They also provide technical support those carrying out fish habitat restoration and development work, assist with effectiveness monitoring studies to measure the performance of restored and newly developed habitat, and assist with the preparation of funding proposals to carry out such work.

Canada's *Atlantic Salmon Conservation Foundation*<sup>5</sup> is one source of funding which can be accessed by community groups to carry out habitat-related stewardship work in their respective areas. The *Foundation* is responsible for administering the income from the \$30 million *Atlantic Salmon Endowment Fund* created by the federal government in 2007 to fund projects that contribute to salmon restoration and conservation in Atlantic Canada and Québec. A main aim of the *Foundation* is to foster partnerships among community organizations, First Nations and Aboriginal groups, and federal and provincial governments to strengthen the conservation program for wild Atlantic salmon and their habitat at the watershed level.

The *Fondation de la faune du Québec*<sup>6</sup> is a source of funding for projects aimed at protecting and improving salmon habitat in Quebec. The *Foundation* is a non-profit organisation with the mandate to promote conservation and enhancement of wildlife and its habitat. Created in 1984, by the provincial government, the *Foundation* reports to the Quebec Minister of Natural Resources and Wildlife and is funded through fees collected for fishing, hunting and trapping licences, contributions by partner groups, and various other sources. The *Foundation* encourages partnerships with local organization such as wildlife area managers, conservation organizations, and hunting and fishing associations, among others. Since its creating, the *Foundation* has supported the implementation of over 100 salmon habitat development projects, representing an investment of more than \$16 million. Notably, the *Foundation* leveraged more than \$2 million through a partnership under the economic development plan that resulted in development and restoration projects for salmon habitat valued at more than \$5 million.

Some of the other sources of funding for habitat-related work include the *Environmental Damages Fund*<sup>7</sup>, *New Brunswick Wildlife Trust Fund*<sup>8</sup>, the *Habitat Stewardship Program*

<sup>5</sup> See "<http://www.ascf-fcsa.ca/news.html>" for program details.

<sup>6</sup> See "[http://www.fondationdelafaune.qc.ca/initiatives/programmes\\_aide/](http://www.fondationdelafaune.qc.ca/initiatives/programmes_aide/)" for program details

<sup>7</sup> See "<http://www.ec.gc.ca/edf-fde/default.asp?lang=En&n=C5BAD261-1>" for program details.

for *Species at Risk*<sup>9</sup>, the *Nova Scotia Sportfish Habitat Fund* as a major contributor to the *Adopt-a-Stream Program*, and funds made available by proponents through habitat compensation plans.

### 3.3 Science

Scientific research and advice on relationships between fish habitat and fish production as well as on the impacts and risks of human activities to fish and fish habitat are critical to supporting the decisions of DFO's HMP. Research on Atlantic salmon habitat is carried out and/or supported by DFO (i.e., through its Science Program), various provincial agencies (e.g., Québec Ministries of Natural Resources and Wildlife – Wildlife Québec), local universities (e.g. le Centre interuniversitaire de recherche sur le saumon atlantique<sup>10</sup> in Quebec) and other institutions (e.g., Canadian Rivers Institute<sup>11</sup>), non-government conservation organizations (e.g., Atlantic Salmon Federation and various community groups) and industry (e.g., J.D. Irving Limited and New Brunswick Power Corporation). DFO scientific advice pertaining to broad or complex habitat issues is peer reviewed through DFO's scientific advisory process<sup>12</sup>.

Science for Canada's acid rain program is largely conducted by Environment Canada. Extensive monitoring of precipitation, air pollution, water quality and soils is carried out to assess the success of emission-reduction programs and ecosystem health.

## 4.0 PROGRAM ASSESSMENT

### 4.1 Record of Achievement

Over the period 2004-2007, DFO's HMP assessed over 7,000 *habitat referrals* within the Atlantic Provinces and Québec (Annex 6). Of these *referrals*, approximately 80% fall within ten main work categories judged to be relevant to waters and watersheds potentially frequented by Atlantic salmon. Works pertaining to 'watercourse crossings' (i.e., bridges, causeways, culverts, fords and open cut crossings) have been the most active of the ten categories in each of the provinces (44% of all referrals). The second most active category has been "shoreline works" (i.e., foreshore, streambank and riparian work), accounting for 19% of all *referrals* (Annex 6).

The conservation and protection of fish and fish habitat in the face of many human development activities cannot be achieved simply through the work of one regulatory agency. For this reason, DFO's HMP has entered into many formal and informal partnerships, as well as collaborative projects, in order to protect, restore and develop fish habitat. Examples of special initiatives by DFO's HMP to work with industry and stakeholders to conserve, restore and develop Atlantic salmon habitat include: i) the discussion of options to restore salmon to Rattling Brook, Newfoundland and Labrador;

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<sup>8</sup> See "<http://www.nbwtf.ca/eindex.asp>" for program details.

<sup>9</sup> See "<http://www.cws-scf.ec.gc.ca/hsp-pih/>" for program details.

<sup>10</sup> See "<http://www.bio.ulaval.ca/cirsa/>" for program details.

<sup>11</sup> See "<http://www.unb.ca/cri/documents/CRI%20Constitution%20January%202005.pdf>" for program details.

<sup>12</sup> See details on the Canadian Scientific Advisory Secretariat (CSAS) at "[http://www.dfo-mpo.gc.ca/csas/Csas/Home-Accueil\\_e.htm](http://www.dfo-mpo.gc.ca/csas/Csas/Home-Accueil_e.htm)".

ii) the restoration of watersheds on the 1,100 km<sup>2</sup> Canadian Forces Base Gagetown, New Brunswick; iii) the development of guidelines for the protection of freshwater fish in Newfoundland and Labrador; iv) the establishment of guidelines for the planning and construction of culverts for fish passage in Quebec, and v) the removal of a number of dams and the installation of fishways on the Miramichi River, New Brunswick (Annex 7). Examples of initiatives led by a large number of stakeholders and government partners working in close collaboration, and assisted by DFO, include the Nova Scotia Adopt-a-Stream Program and a river liming project to neutralize acid waters in Nova Scotia (Annex 7).

Additionally, there have been many other notable achievements towards the conservation, restoration and development of Canada's Atlantic salmon habitat including: i) the success of the seven eastern Canadian provinces in reducing SO<sub>2</sub> emissions by more than 40% of the cap set out in the Canada-USA *Air Quality Agreement* for the period 1994-1999; ii) the federal government's announcement in 2006 that base metal smelters are required to prepare and implement *Pollution Prevention Plans* to reduce the releases of several toxic substances, including SO<sub>2</sub>; iii) an acid rain mitigation workshop, convened at the urging of NASCO, and at which participants from Canadian federal departments, the Nova Scotia and New Brunswick provincial governments, the USA and State of Maine governments and several non-government organizations reviewed different approaches for mitigating the impacts of acid rain (Marshall *et al* 2005), and iv) the ongoing efforts by DFO, in consultation with the five salmon producing provinces of Eastern Canada, First Nations and other Aboriginal groups, conservation organizations, industry and universities to develop Canada's renewed "*Policy for Conservation of Wild Atlantic Salmon*". The *Policy* will integrate the recent initiatives under DFO's HMP with new strategies for incorporating ecosystem values and monitoring, and integrated management planning into DFO's renewed conservation efforts for Canada's Atlantic salmon.

#### 4.2 Program Delivery/Performance

In 2004, DFO launched its 3-year '*Environmental Process Modernization Plan*' (EPMP) as part of its continual improvement of the HMP. It was aimed at making the HMP more effective, efficient, transparent, predictable and consistent in the delivery of its regulatory decisions. Key achievements under the *Plan* include:

- the new *Risk Management Framework* that is providing for a more transparent, predictable, consistent and thorough review of *referrals* (also see section 3.1);
- the development of *Operational Statements* (more than 20) to streamline the processing of low risk *referrals* and the harmonization of these statements with provincial *Watercourse Alteration Guidelines* in New Brunswick and Prince Edward Island (also see section 2.5);
- the enhancement of partnering arrangements with the provinces, First Nations and other Aboriginal groups, non-government organizations, industries and others to enhance communications, consultations and collaboration on areas of common interest;
- improved coherence in program delivery through:
  - o development of a suite of operational policies

- a strengthened governance system and new decision-making protocols for regulatory and environmental assessment decisions to ensure greater senior level engagement and oversight in the delivery of the HMP
- a mandatory training program for habitat management program staff;
- a new management model for the environmental assessment of major projects; and
- a strengthened capacity for fish habitat compliance monitoring.

## 5.0 THE WAY FORWARD

While there have been significant improvements in the delivery of Canada's management program for fish habitat, more are required to meet both the current and increasing pressures on Canada's aquatic ecosystems. It is widely acknowledged that such improvements need to be ecologically-based, precautionary and adaptive in nature to ensure that fish and fish habitat are protected in order to contribute to the goal of sustainable development. Improvements proposed include:

- i) Continuing the course of action set out in the *Environmental Process Modernization Plan* under DFO's HMP (e.g., refining further the *Risk Management Framework*, expanding capacity for compliance and effectiveness monitoring, and enhancing communication, cooperation and collaboration with existing partners, stakeholders and other interested parties);
- ii) Correcting weaknesses/ambiguities in the existing DFO HMP based on improved program performance measurement and reporting of successes and gaps under the HMP (e.g., strengthening the science support program, modernizing DFO's current *Policy for the Management of Fish Habitat* (DFO 1986) and amending the *Fisheries Act* to improve its effectiveness and efficiency for regulating impacts to fish and fish habitat);
- iii) Transforming the DFO HMP from a project-based or site-specific approach for regulating impacts to fish and fish habitat, to one that is founded on an ecosystem-based approach that considers the relative significance of the various threats to ecosystem functions. Under this transformation, the focus would shift from managing habitat for activities that threaten single fish species and fragments of fish habitat to managing more holistically, i.e. the cumulative impacts of multiple activities over large areas or ecological zones, and
- iv) Pursuing further significant reductions in SO<sub>2</sub> emissions from Canadian and USA sources. Current forecasts suggest that although pH is increasing in acid rain-stressed rivers of CU 15, recovery of base actions necessary for recovery of the ecosystem to near "pristine" conditions could take from 50-100 years and will require further significant reductions in acid emissions (Clair et al. 2004). In addition, ongoing work related to liming of rivers provides a potential means to mitigate acid rain impacts while ecosystems recover over time.



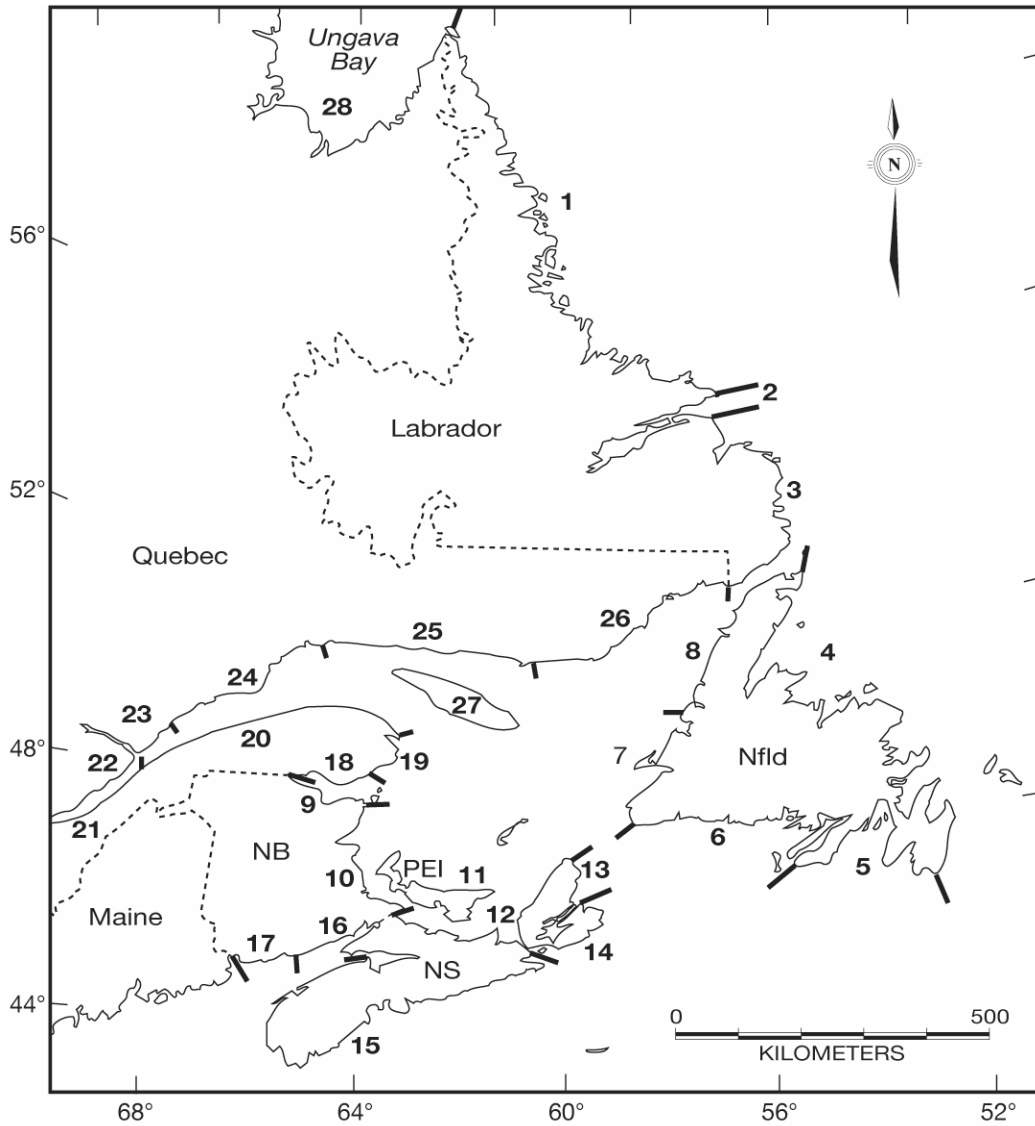
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### ANNEX 1

#### Provisional Conservation Units for Atlantic salmon in Atlantic Canada and Québec (DFO and MNRF *In prep a*)



## ANNEX 2

**Summary assessment of threats to Atlantic salmon (in terms of salmon affected and lost to habitat alterations)<sup>a</sup> in Atlantic salmon Conservation Units of Atlantic Canada and Québec (DFO and MNRF *In prep b*).**

Dark shading highlights '>30% of salmon affected'; light shading is '5-30% affected' and no shading is '<5% affected-often not applicable unassessed, uncertain.

Atlantic Salmon Conservation Unit	No. salmon rivers <sup>b</sup>	Salmon Affected : Spawners Lost													
		Regulated Habitat Alterations										Other			
		Municipal. waste water	Industrial effluents (pulp & paper, etc.)	Hydroelectric & water storage dams	Water extraction	Urbanization (hydrology)	Transportation Infrastructure (roads culverts & fish passage)	Aquaculture siting	Agriculture forestry mining	Dredging	Cumulative	Shipping transport	Air pollutants /acid rain	Ecosystem change	
1. North Labrador	28	L:L	L:L	L:L	L:L	L:L	L:L	L:L	L:L	L:L	L:L	L:L	L:L	L:L	LU:LU
2. Lake. Melville Labrador	20	L:L	L:L	L:L	L:L	L:L	M:M	L:L	L:L	L:L	L:L	L:L	L:L	L:L	LU:LU
3. South Labrador	41	L:L	L:L	L:L	L:L	L:L	M:M	L:L	L:L	L:L	L:L	L:L	- : -	L:L	LU:LU
4. NE Coast NF	127	M:M	L:L	M:M	L:L	L:L	M:M	L:L	M:M	L:L	L:L	L:L	L: -	- : -	LU:LU
5. SE Coast NF	49	L:L	L:L	L:L	L:L	L:L	M:M	L:L	M:M	L:L	L:L	L:L	U:U	MU:MU	LU:LU
6. South Coast NF	55	L:L	- :L	M:M	L:L	L:L	L:L	M:M	L:L	L:L	L:L	L:L	U:U	MU:MU	LU:LU
7. SW Coast NF	40	L:L	L:L	L:L	L:L	L:L	U:U	L:L	M:M	L:L	L:L	L:L	U:U	- : -	LU:LU
8. NW Coast NF	34	L:L	L:L	L:L	L:L	L:L	L:L	L:L	L:L	L:L	L:L	L:L	L:L	- : -	LU:LU
9. Northern NB	15	L:L	L:L	LM:LM	L:L	L:L	M:M	N/A	M:M	L:L	L:L	L:L	U:U	L:U	LU:LU
10. Central NB	25	LM:L	L:L	L:L	L:L	L:L	M:M	N/A	LM:L	L:L	L:L	L:L	U:U	L:U	LU:LU
11. PEI	5	L:L	N/A	MH:MH	L:L	L:L	MH:MH	L:L	MH:MH	L:L	L:L	L:L	U:U	U:U	LU:LU
12. NE NS	33	LM:LM	L:L	L:L	L:L	L:L	M:M	N/A	L:L	L:L	L:L	L:L	U:U	U:U	LU:LU
13. CB East Highlands	8	M:L	U:U	L:L	L:L	L:L	H:U	H:U	H:U	H:U	L:L	L:L	U:U	H:U	H:U
14. CB East Lowlands	21	H:U	U:U	L:L	L:L	L:L	H:U	H:U	H:U	H:U	L:L	L:L	U:U	H:U	H:U
15. Southern Upland NS	63	H:U	L:L	H:M	U:U	L:L	H:U	H:U	U:U	H:U	L:L	L:L	U:U	H:U	H:U
16. IBoF NS/NB	37	H:U	L:L	M:L	U:U	L:L	H:U	H:U	H:U	H:U	L:L	L:L	U:U	L:U	H:H
17. OBoF NB	17	H:U	H:U	H:M	MH:U	L:L	H:U	H:U	M:U	H:U	L:L	L:L	U:U	H:U	H:H

Atlantic Salmon Conservation Unit	No. salmon rivers <sup>b</sup>	Salmon Affected : Spawners Lost												
		Regulated Habitat Alterations										Other		
		Municipal. waste water	Industrial effluents (pulp & paper, etc.)	Hydroelectric & water storage dams	Water extraction	Urbanization (hydrology)	Transportation Infrastructure (roads culverts & fish passage)	Aquaculture siting	Agriculture forestry mining	Dredging	Cumulative	Shipping transport	Air pollutants /acid rain	Ecosystem change
18. Chaleur Bay PQ	5	L:L	L:L	N/A	L:L	L:L	L:L	N/A	L:L	- :-	L:L	- :-	L:L	L:L
19. Gaspé Peninsula PQ	10	U:U	U:U	N/A	N/A	L:L	L:L	U:U	U:U	- :-	L:L	U:U	U:U	U:U
20. Lower St. Lawrence N. Shore Gaspé PQ	9	L:L	N/A	L:L	L:L	L:L	L:L	N/A	L:L	- :-	L:L	- :-	L:L	L:L
21. Appalachian Region PQ	0													
22. Québec City Region PQ	3	L:L	U:U	U:U	U:U	U:U	L:L	U:U	U:U	U:U	U:U	U:U	U:U	M:M
23. Saguenay-Lac Saint Jean PQ	4	L:L	U:U	U:U	U:U	U:U	M:U	U:U	- :-	U:U	U:U	U:U	U:U	H:L
24. Upper North Shore PQ	12	N/A	N/A	L:L	L:L	N/A	N/A	N/A	UL:UL	N/A	- :-	N/A	N/A	U:U
25. Middle North Shore PQ	17	N/A	N/A	L:L	N/A	N/A	N/A	N/A	UL:UL	N/A	- :-	N/A	N/A	U:U
26. Lower North Shore PQ	21	N/A	N/A	L:L	N/A	N/A	N/A	N/A	N/A	N/A	- :-	N/A	N/A	U:U
27. Anticosti PQ	25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	U:U	N/A	- :-	N/A	N/A	U:U
28. Ungava PQ	4	L:L	N/A	N/A	L:L	L:L	L:L	L:L	L:L	L:L	L:L	U:U	U:U	U:U

a- Where 'salmon affected' symbol 'L' is < 5% of salmon in CU are affected; 'M' is 5-30% are affected, H is >30% are affected and 'U' is uncertain; 'salmon lost' symbol 'L' is < 5% of salmon spawners in CU are lost; 'M' is 5-30% are lost, H is >30% are lost and 'U' is uncertain; N/A = Not Applicable and "--" = Not Assessed.

b-Provisional

## ANNEX 3

Types of habitat alterations for which *Pathways of Effect* diagrams have been developed.

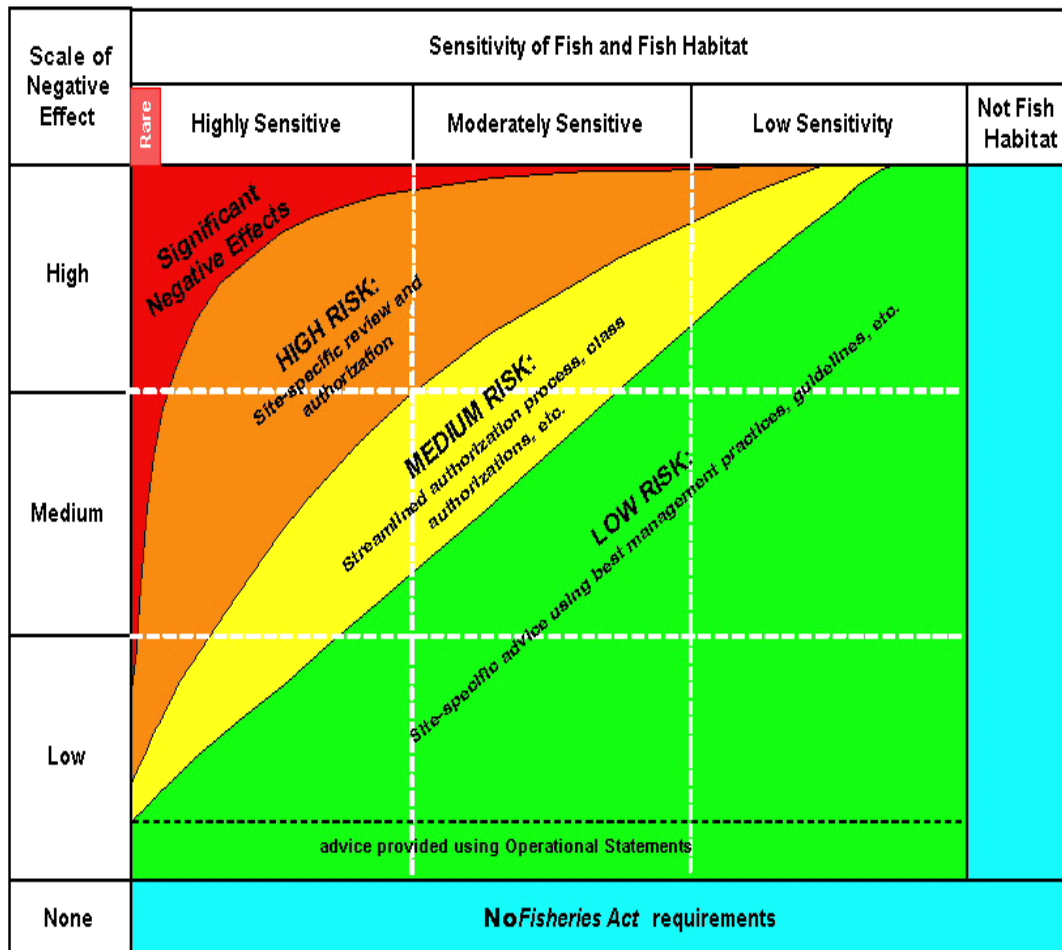
<b>Land-Based Activities</b>	<b>Vegetation Clearing</b>
	<b>Cleaning or maintenance of bridges or other structures</b>
	<b>Excavation</b>
	<b>Use of explosives</b>
	<b>Use of industrial equipment</b>
	<b>Streamside livestock grazing</b>
	<b>Riparian Planting</b>
	<b>Grading</b>
<b>In-Water Activities</b>	<b>Placement of marine finfish aquaculture site</b>
	<b>Addition or removal of aquatic vegetation</b>
	<b>Organic debris management</b>
	<b>Dredging</b>
	<b>Fish passage issues</b>
	<b>Marine seismic surveys</b>
	<b>Placement of material or structures in water</b>
	<b>Structure removal</b>
	<b>Wastewater management</b>
	<b>Water extraction</b>
	<b>Change in timing, duration and frequency of flow</b>

To access DFO *Operational Statements*, visit:

[http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/modernizing-moderniser/pathways-sequences/index\\_e.asp](http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/modernizing-moderniser/pathways-sequences/index_e.asp)

ANNEX 4

Risk Assessment Matrix for characterizing the level of risk of work/ development activities affecting fish and fish habitat.



For information on DFO's Risk Management Framework, visit:

[http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/modernizing-moderniser/risk-risques\\_e.asp](http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/modernizing-moderniser/risk-risques_e.asp)

ANNEX 5

**Types of activities that are of low-risk to fish and fish habitat, for which *Operational Statements* have been developed.**

- 1. Aquatic Vegetation Removal**
- 2. Beach Creation for Residential Use**
- 3. Beaver Dam Removal**
- 4. Bridge Maintenance**
- 5. Clear-Span Bridge**
- 6. Cottage Lot Development**
- 7. Culvert Maintenance**
- 8. Dock and Boathouse Construction**
- 9. High-Pressure Directional Drilling**
- 10. Ice and Snow Fill Bridges**
- 11. Isolated or Dry Open-cut Stream Crossings**
- 12. Isolated Pond Construction**
- 13. Maintenance of Riparian Vegetation in Right-of-Ways**
- 14. Moorings**
- 15. Off-Bottom Deepwater Shellfish and Kelp Aquaculture**
- 16. On and Near-Bottom Inter-tidal Shellfish Aquaculture**
- 17. Overhead Line Construction**
- 18. Public Beach Maintenance**
- 19. Punch and Bore Crossing**
- 20. Routine Maintenance Dredging**
- 21. Submerged Log Salvage**
- 22. Temporary Stream Crossings**
- 23. Underwater Cables**

To access DFO *Operational Statements*, visit:

[http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/modernizing-moderniser/epmp-pmpe/index\\_e.asp](http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/modernizing-moderniser/epmp-pmpe/index_e.asp)



## ANNEX 6

Number of *referrals*<sup>a</sup> by Province and frequency (in percent) of occurrence by “main work” category (see below) by Province, 2004 – 2007, inclusive. Subcategories restricted to those most relevant to waters and watersheds potentially frequented by Atlantic salmon.

Province <sup>b</sup>	Frequency of Referral by Province (%)										Total No. referrals (1-10)	Total all referrals
	Main cat. 1	Main cat. 2	Main cat. 3	Main cat. 4	Main cat. 5	Main cat. 6	Main cat. 7	Main cat. 8	Main cat. 9	Main cat. 10		
<b>NFL</b>	0.02	0.06	0.01	0.04	0.03	0.09	0.23	0.03	0.05	0.43	2,201	3,066
<b>NB</b>	0.04	0.13	0.05	0.08	0.00	0.01	0.12	0.04	0.09	0.43	867	1,093
<b>PEI</b>	0.00	0.27	0.10	0.04	0.00	0.00	0.07	0.06	0.17	0.29	195	220
<b>NS</b>	0.00	0.03	0.03	0.06	0.01	0.01	0.17	0.07	0.07	0.53	1,517	1,793
<b>PQ</b>	0.00	0.16	0.03	0.06	0.01	0.01	0.23	0.12	0.08	0.30	758	1,014
<b>Total</b>	0.02	0.09	0.03	0.05	0.01	0.04	0.19	0.06	0.07	0.44	5,538	7,186

<sup>a</sup> Referrals are not species specific.

<sup>b</sup> Where NFL = Newfoundland and Labrador; NB = New Brunswick; PEI = Prince Edward Island; NS = Nova Scotia and PQ = Québec (including those areas in which anadromous salmon do not/ have not exist(ed)).

Dark and light shading represent highest and second highest values, respectively.

Category Number	Main Work Category	Sub-Work Category
1	Aquaculture	Finfish Cage Culture; Land-based Culture including Hatcheries
2	Dredging	Dredging – New Dredging – Maintenance
3	Habitat Improvement	Fish Passage; Habitat Enhancement; Habitat Restoration Liming works
4	Instream Works	Aquatic vegetation removal - non-harvesting; Beaver dam removal; Debris removal; Channel Modifications; Drain and Irrigation Ditch Maintenance; Other
5	Mineral Aggregate, Oil & Gas Exploration, Extraction, Production - offshore	Exploration well offshore; Ocean Mining; Production well offshore; Seismic exploration in water
6	Mineral Aggregate, Oil & Gas Exploration, Extraction, Production - onshore	Exploration well onshore; Aggregate extraction; Hard Rock Mining; Open Pit Fossil Fuel Mining; Production well onshore; Seismic exploration on land; Tailings Impoundment Areas (TIA) and Dams
7	Shoreline Works (Foreshore, Streambank and Riparian Work)	Infilling; Shoreline Stabilization Treatment; Riparian Vegetation Management
8	Structures in Water	Effluent Outfall; Fish Weir; Marina; Water Intake
9	Water Management	Dam; Diversion; Dyke; Hydroelectric project; Ice Jam Removal; Irrigation Canal; Other; Ponds - offline and connected; Reservoir; Storm-water management; Water withdrawal
10	Watercourse Crossings	Bridges; Causeway; Culverts; Fords; Open cut crossing

## ANNEX 7

**Examples of special initiatives in the conservation, restoration and development of Atlantic salmon habitat in Eastern Canada.**1) Rattling Brook, Newfoundland, (CU 4)

DFO and Newfoundland Power Inc. are collaborating on the assessment of the options for re-establishing fish passage for salmonid migration in Rattling Brook. The impetus for the collaboration stems from community and DFO interest in the project.

Completed without a fishway in 1958, the Rattling Brook Hydroelectric Development is comprised of an 11.5 MW power plant, two storage dams of 884 m total length (maximum heights of 10.7 m) providing a total head of about 100 m, and a 1.7 km penstock. The development resulted in a largely dewatered channel between the dams and the power house (approx 2 km) and in the Rattling Brook's salmon stock being transferred to the nearby Great Rattling Brook, which itself had been partially obstructed by an early 20<sup>th</sup> century water storage dam. The incorporation of fish passage at Rattling Brook would re-open upwards of 238 km of streams and 33 km<sup>2</sup> of lakes and ponds to salmon production.

2) Memorandum of Understanding with Department of National Defense, Canadian Forces Base Gagetown, New Brunswick (CU 17)

DFO is partnering with the Department of National Defense to conduct annual habitat restoration and rehabilitation in the watercourses of Canadian Forces Base Gagetown, New Brunswick. The Base is centered on 11,000 km<sup>2</sup> of the Saint John River Basin and caters to armoured and infantry training which has for half a century altered and destroyed terrestrial and aquatic habitat. The recently signed Memorandum of Understanding has become the cornerstone for approximately \$200,000 in funding each year to plan, design and implement projects that compensate for that damage. As a result, many watercourses have been improved and various habitat restoration approaches have been tested. Monitoring efforts have shown varying degrees of success with different approaches, and the results have been used in the planning of new projects.

Projects have included:

- the installation of deflectors, revetment logs and groins to restore fish habitat on Falls Brook (the choice of 'structure' was based on a limiting factors study which identified locations and types of 'lacking' habitat);
- construction of riffles along a section of Coleman Brook to develop holding and spawning areas for migrating fish;
- construction of new stream channels in Taylor Brook<sup>13</sup> designed on the basis of geomorphology studies;
- improvements to a number of other smaller channels including instream water control riffles and bank deflectors and riparian planting and instream cover rocks

<sup>13</sup> See "[http://www.ceaa.gc.ca/050/Viewer\\_e.cfm?CEAR\\_ID=40619](http://www.ceaa.gc.ca/050/Viewer_e.cfm?CEAR_ID=40619)".

- to prevent continuing sedimentation and stream bank erosion and better long-term habitat for fish; and
- the design, development, installation and monitoring of oversized, concrete culverts to replace more traditional structures like multi-plate arches and large steel oval pipes. These cost-effective concrete culverts allow for the construction of a natural bottom within the pipe and as a consequence, provision of fish habitat and more efficient passage of fish.

3) Guidelines for Protection of Freshwater Fish Habitat in Newfoundland and Labrador (CUs 1-8)

‘*Guidelines for protection of freshwater fish habitat in Newfoundland and Labrador*’ (Gosse et al. 1998) was developed by DFO and private consultants to serve as a reference for planners, developers, contractors and regulatory agencies in addressing freshwater fish and fish habitat protection issues arising as a result of proposed project development activities. It has very successfully assisted planners, developers and contractors in providing the appropriate fish and fish habitat information required by regulators to review their respective work proposals. The document includes introductory sections on ‘legislation and policy’ and ‘information requirements’ before focusing on 17 ‘habitat protection and mitigation techniques’. The techniques include: erosion/sedimentation control; streambank stabilization; watercourse crossings; site preparation buffer zones and abandonment; instream work in the dry; dams; water withdrawal; seismic activities; linear development; blasting and use of explosives; hydroelectric developments; dredging; urban development; mineral exploitation; forest harvesting and related activities, etc.

4) Guidelines for the Planning and Construction of Culverts for Fish Passage in Québec (CUs 18-28)

Older style culverts and bridges crossing water courses have been known to obstruct fish passage, fragment fish habitat and reduce fish production capacity. In collaboration with the Québec Transport Department, Wildlife Québec, consultants and universities, DFO Québec Region developed two new guidelines for the construction or rebuilding of culverts complimentary to the habitat of the water course being crossed.

‘Recommandation pour la conception des traversées de cours d’eau où le libre passage du poisson doit être assuré- projets routiers et autoroutiers’ (DFO 2007c) details the planning and construction of culverts and bridges spanning long sections of stream while minimizing the *Harmful Alteration, Disruption or Destruction* (HADD) of fish habitat. For these structures the footings span the outside of the natural high water mark and thereby maintain original river area, substrate, habitats and fish passage conditions.

‘Bonnes pratiques pour la conception et l’installation de ponceaux permanents de moins de 25 mètres’ (DFO 2007d) outlines best practices and guidelines for the installation of shorter culverts (less than 25 m in length) such that the proponent can avoid HADDs and the obligation to obtain a *Section 35(2)* authorization under the *Fisheries Act*.

5) Miramichi River, New Brunswick (CU 10)

During the past few years, the Habitat Management Program with DFO Science, industry and communities have reopened more than a 1,000 km<sup>2</sup> of the Miramichi River watershed to migrant fish. A total of four dams have been removed from the White Rapids, Northwest Millstream and Tomogonops tributaries and a total of six fishways have been incorporated into dams, culverts and weirs in the Tomogonops, Barnaby and Renous river systems. Weirs have also been constructed to facilitate passage on Muzroll Brook (Cains River system) and Betts Mill Brook, tributary to the main Southwest Miramichi.

Monitoring and assessment of the effects of these dam removals by DFO's Habitat Management Program, DFO Science, industry, and community supporters has contributed to the development of a document detailing procedures, methods and guidelines for future dam removals.

6) Nova Scotia 'Adopt-a Stream' (CUs 12-15 and part of 16)

The 'Adopt-a-Stream' program is administered by the Nova Scotia Salmon Association and designed to help community-based volunteer organizations carry out projects to restore fish habitat and increase fish populations. The program, of which DFO Habitat Management is a part, coordinates an inter-agency review of project proposals and provides project funding, and technical support. Funding is largely derived from provincial sources, namely the 'Nova Scotia Sportfish Habitat Fund'.

The '2007 Adopt-a-Stream Report' to the 'Nova Scotia Sportfish Habitat Fund' indicates that the program has funded projects from 20 community groups<sup>14</sup>. Approximately 110,000 m<sup>2</sup> of instream fish habitat was restored, 66,000 m<sup>2</sup> of riparian habitat was protected and re-vegetated and 13,575 trees were planted in the riparian zones in a total of 50 watercourses across 24 watersheds. 'Adopt-a-Stream' coordinates with DFO to ensure community groups get the help they require to successfully carry out these projects.

7) Liming to Neutralize Acidity and Restore Habitat Productive Capacity in Nova Scotia (CU 15)

The Nova Scotia Acid Rain Campaign Committee (coordinated by the Nova Scotia Salmon Association and Atlantic Salmon Federation) has been developing a long-term liming strategy and setting out criteria for prioritizing all acid rain affected rivers in the province. A Memorandum of Understanding is being drafted to outline the roles and responsibilities of the various partners including the Nova Scotia Salmon Association, Atlantic Salmon Federation, Nova Scotia Department of Fisheries and Aquaculture, Fisheries and Oceans Canada, Environment Canada, Nova Scotia Power Inc., Nova Scotia Department of Environment, Eastern Shore Wildlife Association, Neenah Paper and Acadia University (DFO 2007b).

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<sup>14</sup> See "<http://www.gov.ns.ca/fish/sportfishing/extension/adopt.shtml>".

To demonstrate the potential application of lime dosers to mitigate the effects of acid rain on Nova Scotia's Southern Upland rivers and their ecosystems<sup>15</sup>, the Nova Scotia Salmon Association and its partners focused on the West River, Sheet Harbour. There, in 2005 at a cost of more than \$250,000, they built an access road, ran power and phone lines and installed a Norwegian-built 50-tonne capacity lime doser some 30 km upriver of the ocean<sup>16</sup>. Over the course of the first full year of operation, the doser was calibrated to automatically release sufficient powdered lime to raise the pH at the river mouth to 5.5. Monitoring through 2008 suggests increases in the abundance of aquatic invertebrates<sup>16</sup>.

#### 8) Le Programme de développement économique du saumon au Québec (UC 18-28)

This economic development plan for Atlantic salmon has been a major achievement in managing wildlife in Quebec. The program is the result of a significant partnership between the federal government (i.e. DFO and Canada Economic Development), the provincial government (i.e. Department of Environment and Wildlife and the Regional Development Secretariat), organizations like la Fondation de la faune du Québec, la Fédération québécoise pour le saumon atlantique, and more than 32 organizations that manage salmon rivers. More than \$31.5 million have been successfully invested in the enhancement of Quebec's salmon rivers under this program. The amount of \$5.2 million has been directed at the salmon habitat improvement projects, such as the construction of fish passage structures, the removal of obstructions to fish passage, and the development of spawning beds. In addition to its contribution to habitat improvement, the program has served to coordinate efforts to conserve and enhance Atlantic salmon stocks. Through the program, river managers are better equipped to manage their rivers on various levels.

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<sup>15</sup> See "<http://www.asf.ca/docs/issues/limedoser-2007.pdf>".

<sup>16</sup> See "<http://thechronicleherald.ca/Science/9009058.html>".