NASCO	**Council** ***Stressor Analysis – Overview and Outcomes from Canada's Approach***	**CNL(25)38** **Agenda item: 6.g)(i)**

NASCO Stressor Analysis
Overview and Outcomes from Canada's Approach

Introduction

The Canadian range of diadromous Atlantic salmon is roughly one-third the area of the total global range, and extends northward from 45° N to 60° N. Across this vast range, the key threats that impact Canada's Atlantic salmon are varied. Even climate change – a force that puts pressure on Atlantic salmon wherever they occur – has different impacts in different localities. For example, in the northern areas of its Canadian range, populations of Atlantic salmon may be increasing as waters warm.

With over 850 rivers that either currently support Atlantic salmon or did so in the past, Canada does not assess salmon abundance or threats in each one; it uses a variety of approaches to support its diverse management needs. Importantly, Canada relies on The Committee on the States of Endangered life in Canada (COSEWIC) to provide advice regarding the status of species that are nationally at risk of extinction or extirpation, including Atlantic salmon. COSEWIC is an independent, arms-length advisory panel to the Government of Canada, with members that include scientists drawn from academia, government, non-governmental organizations and the private sector. Based on the advice of COSEWIC, Canada currently recognizes 16 genetically distinct populations that are referred to as Designable Units (DUs) for Atlantic salmon: 15 of these are extant (existing), while one is extirpated (lost forever). A re-assessment of these populations is currently underway, to be published by COSEWIC in 2025.

In order to fulfill the North Atlantic Salmon Conservation Organization (NASCO) request for each Party / jurisdiction to *undertake and report the outcome of an objective stressor analysis* (CNL(44)14), Canada developed a quantification and ranking of threats for Atlantic salmon based on the DU-level advice developed by COSEWIC as part of its ongoing re-assessment process for Atlantic salmon. Although this data remains unpublished, permission was given to Canada to use updated, draft DU-level threats assessments, including a proposed reorganization of Canada's Atlantic salmon populations into 19 DUs, for the purpose of the NASCO stressors analysis.

Overview of approach

A consensus-based, expert-opinion approach was used by COSEWIC to derive scores for the scope and severity of threats to Atlantic salmon in each DU in Canada. The classification of threats used by COSEWIC is consistent with the World Conservation Union–Conservation Measures Partnership unified threats classification system. For the purpose of the NASCO stressor analysis, Canada compiled the scope and severity scores of threats in all DUs derived from the COSEWIC "threats calculator" analysis for Atlantic salmon across the Canadian range. Then, for each combination of scope and severity scores of assessed threats in each DU, assigned a midpoint impact value.

Based on the midpoint value assigned to each threat, Canada is exploring two approaches to provide an overall ranking of threats across the Canadian range of Atlantic salmon:

1. Ranking of threats weighted by number of DUs impacted;

2. Ranking of threats weighted by the relative abundance of salmon impacted.

Detailed methodology is provided in Annex A.

Key threats identified for Canada

A ranking of the top six threats to Atlantic salmon in Canada weighted by number of DUs impacted, and by the relative abundance of salmon in eastern Canada, is presented in Table 1.

Threat to Atlantic salmon	Ranking based on number of DUs impacted	Ranking based on relative population abundance	Description of threat, based on IUCN unified threats classification
Fishing & harvesting aquatic resources	1	1	Harvest from marine mixed stock fisheries (West Greenland and Canada) and in freshwater
Introduced genetic material	2	2	Interbreeding of fish with farmed or stocked salmon
Temperature extremes	3	3	Near-lethal and lethal river temperatures
Problematic native species/diseases	5	4	Increased disease prevalence in warmer waters and around aquaculture sites Increased abundance of native predators
Habitat shifting and alteration	4	5	Changing temperatures, marine productivity, and food availability impacting survival
Roads and railroads	6	6	Culverts can create barriers to fish movements

The top three threats to Atlantic salmon in Canada were found to be consistent, regardless of the approach taken, and include:

1. Fishing & harvesting aquatic resources was the highest ranked threat to Atlantic salmon, using either approach. "Fishing & harvesting aquatic resources "had the largest scope across DUs (13 DUs) and the highest proportion of the total abundance of salmon in eastern Canada exposed to the threat (30.2%). The impacts of this threat are associated with marine mixed stock fisheries at West Greenland, in continental waters of Canada, and in freshwater, and are of particular concern for salmon in northern DUs, such as Labrador.
2. Introduced genetic material was the second highest ranked threat to Atlantic salmon, using either approach. This threat was found to impact nine DUs, and approximately 13.9% of the total abundance of salmon in eastern Canada. "Introduced genetic material" was not scored for northern DUs as there are no current or planned activities that pose this threat in these regions. The two main sources of

introduced genetic material are farmed salmon escapees and stocking of hatchery salmon, with the relative importance of the two sources differing amongst DUs.

3. Temperature extremes was the third highest ranked threat to Atlantic salmon, using either approach. This threat was found to impact eight DUs and approximately 13.8% of the total abundance of salmon in eastern Canada. Concerns about temperature extremes focused mainly on rivers in Southern areas, where many rivers are already reaching near-lethal and lethal water temperatures for salmon. In northern areas, warming waters could potentially have a positive effects on salmon however, the gains could be offset by a mismatch in prey availability in the ocean.

Considerations

The use of existing COSEWIC threat assessments for Atlantic salmon DUs across eastern Canada provides a comprehensive and rigorous approach to ranking the scope and severity of threats to this species, in line with the needs of NASCO's 'stressors analysis'. However, there exist several relevant considerations that may influence Canada's prioritization of threats, i.e., the threats it will seek to mitigate through actions proposed in the fourth reporting cycle.

- As the COSEWIC/IUCN threat classification system is based on mechanisms and processes rather than specific activity, it is possible for threats stemming from any one activity to be reflected in more than one threat category. For example, the impact of industrial activities such as mining may be reflected in at least two threats (e.g., Commercial & industrial areas and Industrial & military effluents) that separately account for the footprint and pollutants from the industrial activity. Reciprocally, any one threat category may reflect inputs from different activities; for example the threat "Introduced genetic material' may result from either or both of commercial Atlantic salmon aquaculture or Atlantic salmon stocking activities. Different actions would be required to mitigate the two distinct sources of this threat.
- Climate change is not distinguished as a threat category unto itself, however two threats that ranked as important among eight DUs and 13.8% or 11.3% of the Canadian salmon population, respectively, were "Temperature extremes" and "Habitat shifting and alteration". Overall, Canada's approach may underestimate the scope and severity of climate change, as many threats related to climate change were classified as unknown by COSEWIC due to the uncertainty related to their impacts on salmon.
- Within some important threat categories, there exist activities that are outside of Canada's jurisdiction. Notably, Canada's top-ranking threat "Fishing & harvesting aquatic resources" includes fishing pressure from both international and domestic fisheries.
- If Parties / jurisdictions are requested to include a quantitative baseline for each threat, Canada could provide either (a) the number of DUs currently impacted by each threat or; (b) the relative abundance of salmon in eastern Canada currently impacted by each threat. The severity of impact could also be considered for use as a baseline, however there currently exists no process to collect data to assess change in severity over time. Further, Canada's reliance on the consensus-based, expert-opinion approach used by COSEWIC does not support a re-assessment or review of progress towards mitigation of threats (e.g., halfway through or at the end of the reporting cycle), unless synchronized with the broader COSEWIC reassessment process. Further consideration of assessing progress against a baseline for each threat would be required, should NASCO request this information.

- At this stage, Canada has identified two methods of ranking threats to Atlantic salmon across eastern Canada that rely on the COSEWIC threat assessments. Canada's decision on its final approach, its prioritization of threats, and its selection of mitigation actions as part of the fourth reporting cycle, will include consideration of relevant policy and legislation, Canada's new National Strategy to Ensure the Future of Atlantic Salmon, and further engagement of Indigenous peoples, provincial governments, and stakeholders.

Annex A
Threats to wild Atlantic salmon in eastern Canada

Threats to wild Atlantic salmon in eastern Canada

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INTRODUCTION

Background to NASCO's Stressors Analysis

In 2024, Council agreed to a Ten-Year Strategy and Action Plan, CNL(24)71rev. The Strategy identified that NASCO is uniquely positioned to provide leadership in addressing the range of threats to wild Atlantic salmon and support its conservation and recovery, being the only inter-governmental organization with regulatory competency for wild Atlantic salmon fisheries. Recognizing this unique position, Council agreed a Strategic Goal, which states: 'Within the next 10 years, NASCO's goal is to prioritise and drive actions necessary to slow the decline of wild Atlantic salmon populations and demonstrate that restoration is possible'. Given this new Goal, together with Council's continuing commitment to the implementation of NASCO's Resolutions, Agreements and Guidelines by the Parties / jurisdictions, Council agreed that a fourth reporting cycle should be developed, CNL(24)88, and agreed Terms of Reference for a Working Group on Future Reporting, CNL(24)63, to enable its development. It also agreed that each Party / jurisdiction should carry out a stressor analysis before June 2025, to enable an objective understanding of the key threats to wild Atlantic salmon in each Party / jurisdiction. These identified threats would then inform the fourth reporting cycle: the three stressors identified as highest risks through each Parties' analysis will form the basis for the actions they commit to. If any of the three stressors in each CCR are not one of the three highest priorities identified in the stressor analysis, a justification must be provided.

Canada's draft approach to ranking stressors

This working paper provides a quantification and ranking of threats to Atlantic wild salmon in eastern Canada based on consensus-based, expert-opinion analyses conducted by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as part of the recent re-assessment process of anadromous Atlantic salmon. The first assessment of status of Atlantic salmon by COSEWIC in eastern Canada was published in 2010 (COSEWIC, 2010). As part of the 10-year reassessment process, a series of meetings with jurisdictional experts in the summer and fall of 2023 was convened to quantify the impacts of threat categories on wild Atlantic salmon. A summary of threats for each DU[1] listed at the time are shown in Appendix Table 1. The incorporation of more extensive Indigenous knowledge into this process is underway but not yet complete. The updated complete COSEWIC assessment of the status of wild anadromous Atlantic salmon is expected to be completed in November 2025 at which time the detailed DU-level threats analysis calculators will be publicly available. Nevertheless, in order to allow Canada to provide NASCO with the best and most recent information available on threats to wild Atlantic salmon in Canada, COSEWIC shared their current threats analysis for the purpose of this exercise.

METHODS

Overview of COSEWIC threat classification system for Atlantic salmon

Threats are defined as the proximate activities or processes that have caused, are causing, or may cause in the future the destruction, degradation, and/or impairment of the entity being assessed (population, species, community or ecosystem) in the area of interest (globe, nation, or subnation); and for purposes of threat assessment, only present and future threats are considered (COSEWIC 2014). The classification of threats used in the calculator is based on the IUCN-CMP (World Conservation Union–Conservation Measures Partnership; Salafsky et al. 2008) unified threats classification system and it includes two levels of threats (Appendix Table 2). The eleven broadly defined "Level 1" threats encompass several specific "Level 2" threats that detail the mechanisms through which the populations of the species in a DU are affected by the threat (essentially these are the pathway of effects). The threats classification system is intended to be applicable to living organisms under consideration hence some categories of threats would not apply to Atlantic salmon specifically.

As this threat classification system is based on mechanisms and processes rather than specific activity, it is possible for threats of an activity to be reflected in more than one Level 2 threat. For example, the impact of industrial activities may be reflected in at least two threats (e.g., 1.2 Commercial & industrial areas and 9.2 Industrial & military effluents) that separately account for the footprint and pollutants from the industrial activity, respectively. Similarly, the interactions and threats to wild Atlantic salmon from finfish marine aquaculture are assessed in terms of the direct impacts of the footprint of the infrastructure on the physical habitat of salmon (Threat 2.4, Marine and freshwater aquaculture), from intensification of natural diseases and native parasites, such as sea lice (Threat 8.2 Problematic native species), and from introduction of genetic materials associated with escapees and introgression into wild salmon populations (Threat 8.3 Introduced genetic material).

Threats may be observed, inferred or projected to occur in the near term and are characterized in terms of scope, severity, and timing, with the threat "impact" calculated from scope and severity (COSEWIC 2014). The scope reflects the geographic extent or proportion of the population/species exposed to the threat and can range from Negligible (<1%) to Pervasive (71-100%) (Appendix Table 3). The severity reflects the level of damage to the proportion of the population, species or ecosystem exposed to the threat and can range from Neutral or Potential Benefit to Extreme (71-100%) (Appendix Table 4). Specific details on the categories used to score Scope and Severity can be found in COSEWIC (2014).

The scope and severity scores are combined to assign an overall threat impact category, with the impact defined as the anticipated level of population reduction or ecosystem degradation over the next three generations (Table 1). In some cases, a ranges of impact values may be used to express uncertainty in the threat assessment and may be appropriate for a Level 1 threat category when one or more of the Level 2 threats contained within have an assigned range value (COSEWIC 2014). Range values for the impact scores are from Tables 8 and 11 in Master et al. (2012) and COSEWIC (2014), except for the values associated with severity scores that spanned at least two categories (in italics). Although timing (immediacy) is recorded for threats, it is not used in the calculation of threat impact (COSEWIC 2014).

Derivation of overall impact score for threats impacting Atlantic salmon in Eastern Canada

A consensus-based, expert-opinion approach was used by COSEWIC to derive scores for the scope and severity of each Level 2 threat. We compiled the scope and severity scores for all 19 Designatable Units (DUs) derived from the Threats Calculator analysis for Atlantic salmon provided by the COSEWIC SSC chair

(COSEWIC SSC unpublished data). Then, for each combination of scope and severity scores of assessed threats in each DU, we assigned the midpoint impact values shown in Table 1, based on the values in Table 11 of Master et al. (2012). These midpoint values reflect the estimated median population reduction or ecosystem decline or degradation for each combination of scope and severity. Some severity scores included in the Atlantic salmon threats calculator incorporated a range of categories, and scores for these are not included in Table 11 of Master et al. (2012). Therefore, we averaged the mid-point values between the highest and lowest severity category associated with the scope category. For example, when scope was Pervasive and severity was Serious – Slight, the final value for this threat was the mean of the midpoint for the combination of Pervasive and Serious (46.0%) and Pervasive and Slight (5.5%) or 25.75% (Table 1); these values are represented in italics in Table 1. Scope or severity scores that were Negligible or Unknown were set at zero.

To derive an overall impact score for the Level 2 threats for salmon in eastern Canada overall, we first compiled population estimates for each DU based on the information provided in the draft COSEWIC status report. Population estimates were lacking for the four most northern DUs (Ungava Bay (1), Labrador (2A, 2B and 2C)). For the Ungava Bay DU, all threats were categorized as unknown or negligible therefore, abundance was not considered in the analysis. The Labrador region comprises 3 DUs but no DU specific abundance estimates were available. Therefore, we obtained the 5-year average estimates of spawners for the Labrador stock unit derived by ICES (2024) and divided it by the mean annual proportion of returns from 2008-2022 for each Salmon Fishing Area (SFA) with boundaries that are similar to each DU (i.e., DU-02A/SFA-1A = 20%; DU-02B/SFA-1B = 56%; DU-02C/SFA-2 and SFA-14B = 24%). Only limited information was available for three southern DUs (14A, 14B, and 15). For DUs 14A and 14B, we summed the population estimates for any index rivers in each DU (14A: East, Liscomb and St. Mary's; 14B: LaHave; Raab et al. 2021) and consider that these values represent minimum population sizes for each DU. For DU 15, we assumed a population size of 100 individuals based on the most recent assessment of status (DFO 2020) and local expert knowledge. Mid-point impact values and relative abundance can be found in Appendix Table 5.

The overall impact of each Level 2 threat which was scored at least Low in one DU on the Canadian range of Atlantic salmon was the impact score of each threat by DU, weighted by the relative abundance (in eastern Canada) of each DU, except Ungava Bay. The resulting overall impact values of each Level 2 threat was assessed relative to the impact categories in Table 1. We identified the Level 2 threats with the highest values as those that would have the largest effect on Canadian salmon populations (i.e. Newfoundland and Labrador, Quebec, New Brunswick, Prince Edward Island, and Nova Scotia). Additionally, we calculated the total abundance of salmon in eastern Canada impacted by each Level 2 threat for DUs that assigned an impact of Low to High-Medium.

RESULTS/DISCUSSION

The draft COSEWIC update proposes 19 DUs for anadromous Atlantic salmon in eastern Canada (Appendix Figure 1; Lehnert et al. 2023), with each DU representing discrete and evolutionary significant wild salmon populations. The DUs vary in geographic size (sum of watershed areas; 2,600 to 164,000 km^2), number of rivers (4 to 194), and the estimated total annual abundance of wild anadromous spawners (<100 to > 110,000 adult fish).

A total of 210 Level 2 threats were scored for impact across 19 DUs based on the combinations of scope and severity as provided in Table 1. Of these, 93 were assigned an impact value of at least Low, with only

one threat in DUs 15 and 16 (Introduced genetic material) that had an impact score of High-Medium and High-Low (Table 1, Figure 1). A total of 117 Level 2 threats across all DUs were scored with a scope and/or severity categorization as Negligible or Unknown; impact scores were set at 0 for these threats. The compiled dataset is preliminary and subject to change until final publication of the COSEWIC Status Report however, the overall ranking is expected to remain.

The most common threat with an impact score of at least Low identified across 13 DUs was "Fishing and harvesting aquatic resources"; fisheries (marine mixed stock fisheries at West Greenland, in continental waters of Canada, catch and release and retention fisheries in freshwater) continue and / or impacted salmon in these DUs (Figure 1). Although broad geographically, the impact of that activity in 13 DUs was categorized as Low (12 DUs) or Medium-Low (1 DU). Of the threats assessed, "Introduced genetic material" registered the highest threat impact scores (High-Medium and High-Low) in two DUs, and was scored as a threat in 9 DUs. For this threat category, the specific threat component related to introgression of genetic materials from aquaculture escapees was scored in four DUs, whereas directed releases of hatchery spawned fish was scored in five DUs. Climate change related impacts were noted in 8 DUs (Figure 1) although the impacts related to climate change were mostly scored as unknown, rather than not anticipated. Problematic native species / disease had scored impacts in 7 of 19 DUs with impacts ranging from Medium-Low (6 DUs) to Low (1 DU). For this category, the specific component of the threat was either sea lice and diseases from marine aquaculture in six DUs, or increased abundance of native predatory species (striped bass, seals) in six DUs.

Threat scores for salmon in eastern Canada

To identify key threats impacting the highest abundance of salmon in eastern Canada (instead of DU-level uniqueness), the estimated impact of 16 Level 2 threats were weighted by relative salmon abundance. In some DUs, abundance of salmon were less than 100 adult fish. Figure 2 presents the overall estimated impact of the threats on Atlantic salmon in Canada (except for DU-01). All the threats had abundance weighted mean impact scores of Low or higher (Figure 2). Figure 3 shows the total estimated abundance of Atlantic salmon impacted by the 16 Level 2 threats. A list of the six key threats to salmon, relative to salmon abundance, in eastern Canada is provided in Table 2. Table 3 provides the top six threats to salmon based on the DU-level and abundance-level approaches.

"Fishing & harvesting aquatic resources" had the highest abundance weighted mean impact score for eastern Canada, but the mean impact score for this threat was Low (Figure 2). This threat scored the highest mean impact of all the threats because it had the largest scope across DUs, identified in 13 DUs (Figure 1) and with the proportion of the total abundance of salmon in eastern Canada exposed to the threat with an impact of Low or higher of 30.2% (i.e. total estimated salmon abundance in 13 DUs that ranked this threat divided by the abundance estimate across all DUs; Figure 3). The impacts of this threat are associated with marine mixed stock fisheries at West Greenland, in continental waters of Canada, and in freshwater, and are of particular concern for salmon in northern DUs, such as Labrador.

"Introduced genetic material" was the threat that ranked third in the mean abundance weighted impact score for eastern Canada (Figure 2). The impact scores for this threat had the largest range of impacts across DUs, from Low to High Medium (Figure 1) and approximately 13.9% of the total abundance of wild salmon in eastern Canada were potentially exposed to this threat (Figure 3). This Level 2 threat was not scored for northern DUs as there are no activities increasing risk of fish disease nor planned stocking activities in these regions. This threat was scored for nine DUs with two main sources of introduced

genetic material, from farmed salmon escapees and stocking of hatchery salmon, the relative importance of the two sources differ among DUs. Interbreeding of wild fish with farmed or stocked hatchery salmon is known to negatively affect wild salmon fitness (Claussen and Philipp 2022) with the level of impact more severe with farmed salmon. Stocking of hatchery salmon was identified as a threat to wild salmon in eight of the nine DUs due to the risks associated with the reduced fitness of wild salmon that interact with hatchery salmon. Misguided hatchery practices exacerbates the impact of hatchery fish on wild salmon by contributing to a greater loss of resilience in wild salmon. Historical stocking programs were identified as threats to the genetic fitness and genetic diversity of wild salmon by decreasing their resilience to environmental changes. Farmed salmon escapees were listed as a threat to wild salmon populations in all six DUs with aquaculture activity (out of nine with impact scores).

Climate change: Many of the threats related to climate change were classified as unknown (Figure 1) due to the uncertainty related to their impacts on salmon however, the impact of these threats to salmon could be important. Two Level 2 threats that ranked as important among eight DUs and 13.8% or 11.3% of the Canadian population, respectively, were **"Temperature extremes"** and "**Habitat shifting and alteration"**. Concerns about temperature extremes focused mainly on rivers. Many rivers, from southern areas to Newfoundland, are already reaching near-lethal and lethal water temperatures for salmon. In northern areas, warming waters could potentially have a positive effects on salmon however, the gains could be offset by a mismatch in prey availability in the ocean. Concerns about habitat shifting and alteration were in both freshwater and marine environments. In the marine environment, direct and indirect impacts on salmon related to changing conditions at sea and their effect on survival were of concern. Factors such as ocean water temperatures, prey availability, changes in marine productivity were discussed.

"Problematic native species/disease" had the second highest mean abundance weighted impact score but it was also categorized as Low (Figure 2). This level 2 threat was scored in seven DUs and despite estimating that only 11.5% of the total abundance of salmon across DUs in eastern Canada was potentially impacted by this threat (Figure 3), it scored second overall because this threat had the largest number of DUs (i.e., 6) where impacts scored as Medium-Low (Figure 1). In all seven DUs, there was high concern related to diseases becoming more prominent, especially with warming waters. In particular, experts in six DUs with aquaculture activity identified the increasing levels of Infectious Salmon Anemia (ISA) as well as variants of ISA near aquaculture sites as a threat to wild salmon. The impacts of high sea lice concentrations around aquaculture sites in these six DUs were also of high concern. Native species, such as seals and Striped bass, were also of concern for their impact on salmon survival and these were considered most important in the southern areas of eastern Canada. The increased seal abundance was identified as a threat to salmon in all seven DUs although the large gap in seal/salmon interactions was acknowledged by the experts. Striped bass was identified as a threat in two of the seven DUs.

"Road and railroads" were identified as extensive across six DUs of the southern regions and ubiquitous throughout watersheds extending from estuaries to headwaters. The mean abundance weighted impact score is Low because abundance in these southern areas is currently much lower than historical values and now represents a small proportion (11.4%) of the total abundance of wild salmon in eastern Canada (Figure 3). The issue identified in this threat is malfunctioning culverts that create barriers to fish movement. This is especially true when not properly installed or maintained which prevents salmon from reaching spawning habitats and limits juvenile rearing habitats. Although fish habitat protection regulations are in place in all DUs, this was identified as an issue in all DUs where it is was scored. In

addition to old malfunctioning structures, some newly installed structured were also found to be impassable to fish. The impediment to fish movement is exacerbated during low flow conditions, which have been more severe in recent decades. Sediments produced by roads and railroads were accounted for in a separate threat.

CONCLUSION

In conclusion, a broad scale analysis was performed to generate a list of threats to wild Atlantic salmon in Canada by ranking key threats based on salmon abundance which adjust the level of threat overall for salmon in eastern Canada based on the number of salmon in each DU. However, Atlantic salmon populations are structured geographically and DUs capture unique clusters of populations. Important local DU-level differences exist and rivers which have depressed numbers of fish, especially those populations which are classified as threatened or endangered, may have threats that are quite impactful. Within these different DUs, salmon are subjected to local/regional threats, therefore, the broad scale analysis is masking locally important high-level threats.

Secondly, threats in the southern regions are more numerous and tend to be chronic with cumulative impacts however, their weighting in this analysis was lower because of the lower wild salmon abundance in recent decades compared to historical levels. Our analysis did not allow for addressing cumulative effects of threats, but our results do indicate that addressing some activities could have benefits for salmon impacted by several threats. For example, impacts from Aquaculture contribute to both **"Introduced genetic material"** and **"Problematic native species/disease"** so actions to manage this activity could address both threats and their cumulative effects. Lastly, while the threats calculator focuses on 'near-term' threats, many of the threats identified by experts may have played a role in the low fish abundance currently observed.

Indigenous Traditional Knowledge is being integrated in the COSEWIC threats analysis, a process expected to be complete by fall 2025. The incorporation of this knowledge may change some results although the overall list of key threats to salmon in eastern Canada is expected to remain.

ACKNOWLEDGEMENTS

We are very grateful to the COSEWIC Species Specialist Subcommittee Chair, Dr. Bruce Leaman, for sharing the draft threats calculator spreadsheets for the threats analysis by DU of Atlantic salmon of eastern Canada. We also thank Gérald Chaput (DFO Science Gulf Region) for his assistance in interpreting the threats analysis spreadsheets and discussions regarding the summarization of threats and weighting by abundance. The authors take sole responsibility for any errors in the compilation and interpretation of these analyses. We also thank Colin MacFarlane for initial discussions about data analysis.

Table 1. The impact categories, the midpoint (and range) of anticipated population reduction or ecosystem decline or degradation (%) based on the combination of scope and severity. Impact categories are from Master et al. (2012) and COSEWIC (2014). Colours represent the overall impact rank of each threat included in the analysis, with yellow = High – Medium, High – Low = green, Medium = teal; Medium – Low = blue, and Low = purple, and the number of Level 2 threats assigned to each impact category over the 19 DUs is indicated (N).

Severity (%)	Scope (%)			
	Pervasive	Large	Restricted	Small
Extreme	**Very High** 75.0 (50-100)	**High** 46.0 (22-70)	**Medium** 19.0 (8-30)	**Low** 5.5 (1-10)
Serious	**High** 46.0 (22-70)	**High** 29.5 (10-49)	**Medium** 12.0 (3-21)	**Low** 4.0 (1-7)
Serious – Moderate	***High-Medium*** *32.5* *N = 1*	***Medium*** *20.75*	***Medium-Low*** *8.5*	***Low*** *2.8*
Serious – Slight	***High-Low*** *25.75* *N = 1*	***Medium*** *16.5*	***Medium-Low*** *7.0*	***Low*** *2.25*
Moderate	**Medium** 19.0 (8-30) *N = 7*	**Medium** 12.0 (3-21) *N = 3*	**Low** 5.0 (1-9)	**Low** 1.6 (0.1-3)
Moderate-Slight	***Medium-Low*** *12.25* *N = 10*	***Medium-Low*** *7.75* *N = 1*	***Low*** *3.5*	***Low*** *1.05* *N = 1*
Slight	**Low** 5.5 (1-10) *N = 43*	**Low** 3.5 (0-7) *N = 3*	**Low** 2.0 (1-3) *N = 11*	**Low** 0.5 (<1) *N = 12*

Table 2. A list of the top six Level 2 threats for Atlantic salmon in Canada bases on impact scores weighted by the abundance of salmon in eastern Canada. A complete list of threats is provided in Figure 1 and 2.

Level 2 threat	Impact (DUs ≥ Low)	% Population impacted	Details
Fishing & harvesting aquatic resources	Low to Medium-Low (13)	30.2%	Harvest from marine mixed stock fisheries (West Greenland and Canada) and in freshwater
Introduced genetic material	Low to Medium-High (9)	13.9%	Interbreeding of wild fish with farmed or stocked salmon
Temperature extremes	Low to Medium-Low (8)	13.8%	Near-lethal and lethal river temperatures
Problematic native species/diseases	Low to Medium-Low (7)	11.5%	Increased disease prevalence in warmer waters and around aquaculture sites Increased abundance of native predators
Habitat shifting and alteration	Low to Medium (8)	11.4%	Changing temperatures, marine productivity, and food availability impacting survival
Roads and railroads	Low (6)	11.3%	Culverts can create barriers to fish movements

Table 3. A list of the top six Level 2 threats for Atlantic salmon in Canada ranked by Designable Unit (DU) and by the abundance of salmon in eastern Canada. A complete list of threats is provided in Figure 1 and 3. It is important to note that many climate change-related threats were scored as unknown.

Level 2 threat	Rank based on DU-level	Rank based on abundance	Details
Fishing & harvesting aquatic resources	1	1	Harvest from marine mixed stock fisheries (West Greenland and Canada) and in freshwater
Introduced genetic material	2	2	Interbreeding of wild fish with farmed or stocked salmon
Temperature extremes	3	3	Near-lethal and lethal river temperatures
Problematic native species/diseases	5	4	Increased disease prevalence in warmer waters and around aquaculture sites Increased abundance of native predators
Habitat shifting and alteration	4	5	Changing temperatures, marine productivity, and food availability impacting survival
Roads and railroads	6	6	Culverts can create barriers to fish movements

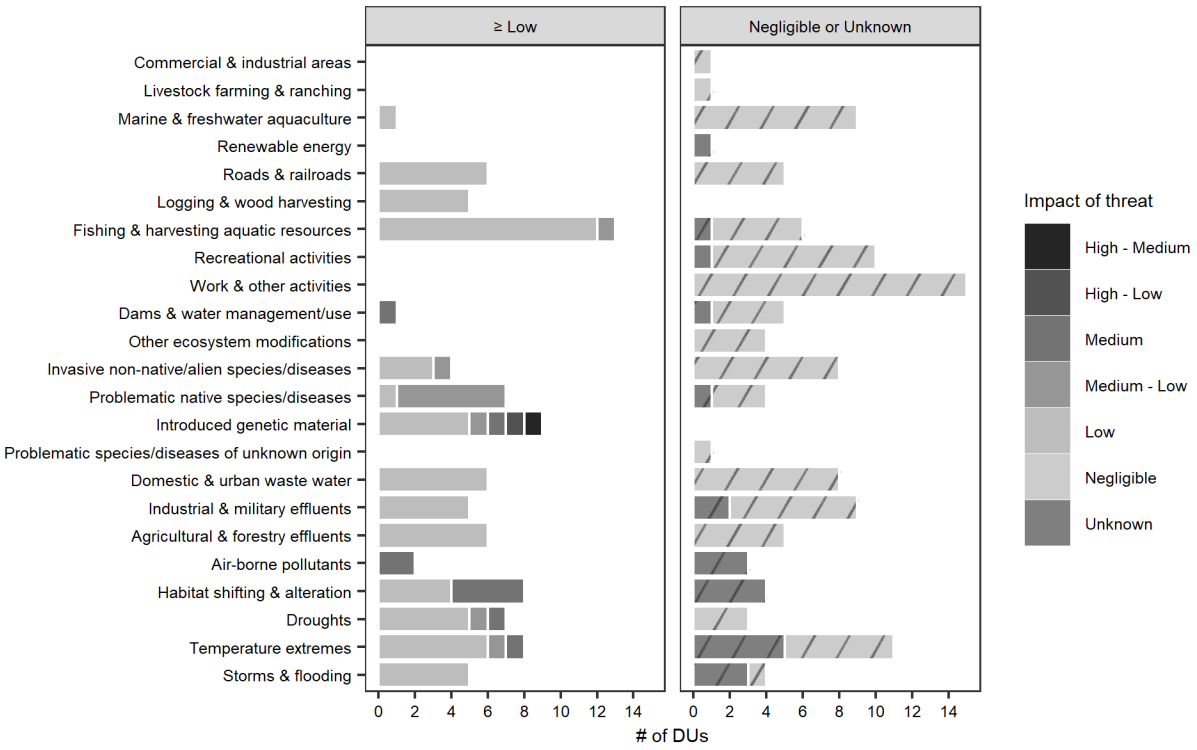

Figure 1. The Level 2 threats identified for Atlantic salmon in Canada and the number of Designatable Units (DUs) that assigned an impact scores of Low to High-Medium (left panel) and Negligible or Unknown (right panel). Colours represent the overarching threat impact category determined by the scope and severity scores in the threats calculator.

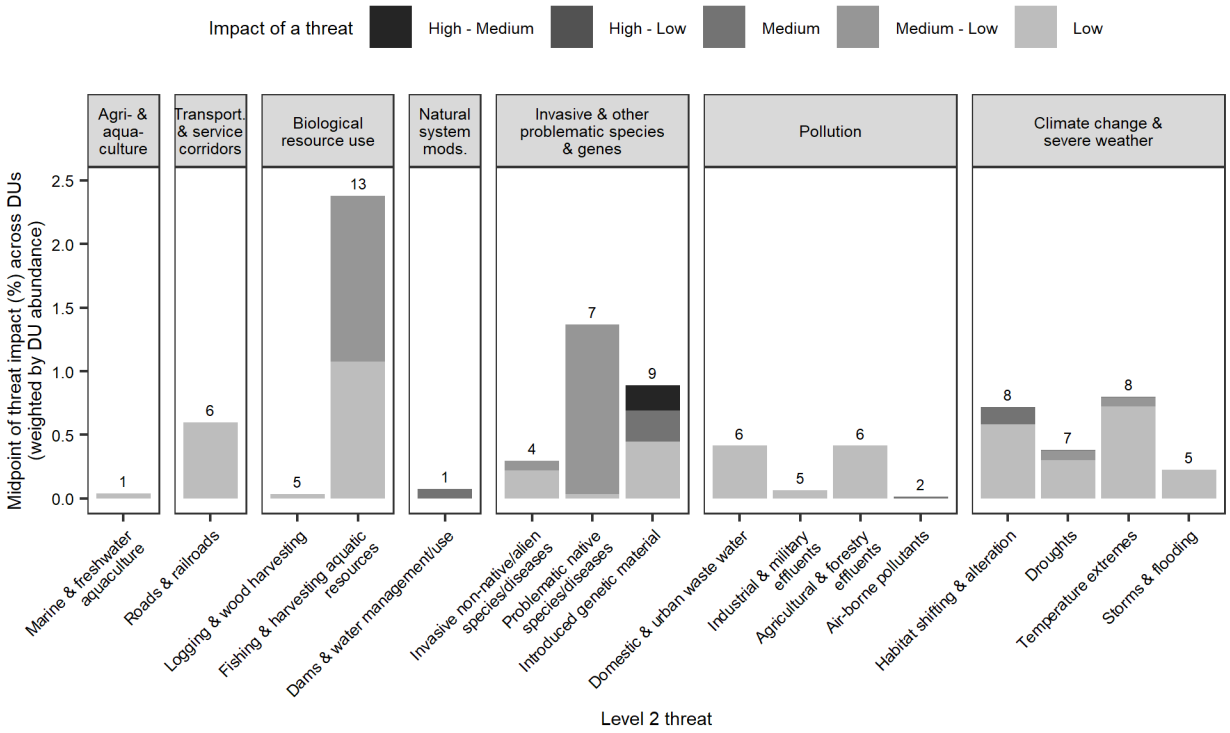

Figure 2. The total estimated impact of 16 Level 2 threats within seven Level 1 threat categories for Atlantic salmon among the 18 Designatable Units in Canada (DU-01 not included due to no abundance data). The number of DUs that gave an impact rank of Low to High-Medium is indicated above each bar. Colours represent the overarching threat impact category determined by the scope and severity scores in the threats calculator for each DU.

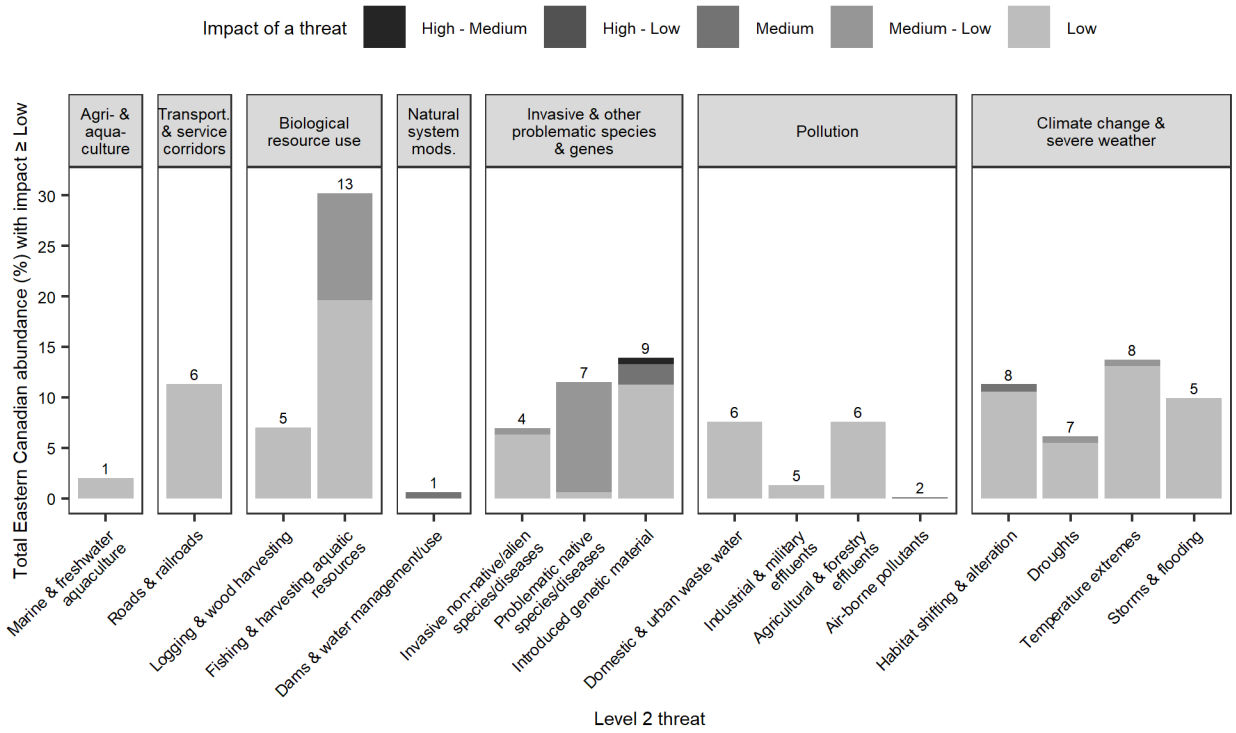

Figure 3. The total estimated % abundance of Atlantic salmon in 18 Designatable Units in Canada impacted by the 16 Level 2 threats within seven Level 1 threat categories. DU-01 was not included due to no abundance data. The number of DUs that gave an impact rank of Low to High-Medium is indicated above each bar. Colours represent the overarching threat impact category determined by the scope and severity scores in the threats calculator for each DU.

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Appendix Table 1. Summary of threats to Atlantic salmon by Designatable Unit assessed by COSEWIC (2010) as threatened or endangered and the assessment of threats from the respective recovery potential assessments. The geographic extent of some DU's used in COSEWIC (2010) have been altered in the draft COSEWIC reassessment and status update (Lehnert et al. 2023), and the revised DU structure was used in the analysis presented above.

Designatable Unit	Reference	Threats conclusion
DU-04 South Newfoundland (Threatened) *Now DU-04A and 04B*	COSEWIC (2010)	Recreational and illegal fisheries, the commercial fishery in St. Pierre and Miquelon, ecological and genetic interactions with escaped domestic Atlantic Salmon, and poorly understood changes in marine ecosystems resulting in reduced survival during the marine phase of the life history
	DFO (2013a)	Persistent low marine survival potentially resulting from illegal fisheries, mixed-stock marine fisheries and by-catch, ecological and genetic interactions with escaped domestic Atlantic Salmon, and changes in marine ecosystems
DU-09 Anticosti Island (Endangered)	COSEWIC (2010)	Poor marine survival related to substantial but incompletely understood changes in marine ecosystems
	DFO (2013c)	Strong natural variations in river water levels and the particular geological structure of this area could be limiting factors for this DU, along with a lower survival rate during the marine phase
DU-13 Eastern Cape Breton (Threatened)	COSEWIC (2010)	Recreational fishing, habitat loss, and poorly understood changes in marine ecosystems resulting in reduced survival during the marine phase
	DFO (2014a)	Threats in the freshwater included illegal fishery removals and several others with a medium level of concern. Three threats in the marine environment (salmonid aquaculture, marine ecosystem changes, diseases and parasites) were assessed with a high level of concern
DU-14 Southern Uplands Nova Scotia (Endangered) *Now DU-14A and 14B*	COSEWIC (2010)	Freshwater habitat degradation resultant of acidification, habitat loss, recreational fishing, poorly understood changes in marine ecosystems resulting in reduced survival during the marine phase of the life history, and ecological and genetic interactions with escaped domestic Atlantic Salmon
	DFO (2013b)	Threats to persistence and recovery in freshwater environments identified with a high level of overall concern included: acidification, altered hydrology, invasive fish species, habitat fragmentation due to dams and culverts, and illegal fishing and poaching. Threats in estuarine and marine environments identified with a high level of concern included salmonid aquaculture and marine ecosystem changes

Designatable Unit	Reference	Threats conclusion
DU-15 Inner Bay of Fundy (Endangered)	COSEWIC (2010) and DFO (2008)	Depressed population phenomena, associated with low genetic variability and susceptibility to inbreeding depression, as well as the limited potential to form schools during sensitive migration phases when exposed to predation, are considered important limitations to population recovery and persistence. Threats in freshwater environments included changes in environmental conditions, contaminants, barriers to passage, and freshwater fisheries. Threats in estuarine and marine environments included interactions with farmed and hatchery salmon, ecological community shifts, environmental shifts, fisheries, salmonid aquaculture and marine ecosystem changes
DU-16 Outer Bay of Fundy (Endangered)	COSEWIC (2010)	historically suffered from dams that impeded spawning migrations and flooded spawning and rearing habitats, and other human influences such as pollution and logging, that have reduced or degraded freshwater habitats. Current threats included poor marine survival related to substantial but incompletely understood changes in marine ecosystems, and negative effects of interbreeding or ecological interactions with escaped domestic salmon from fish farms
	DFO (2014b)	Hydro-power generation dams were considered to be the most limiting threat to salmon population persistence. In freshwater, illegal fishing activities were of high concern whereas physical habitat modifications, contaminants, invasive fish species, historical stocking practices, constraints to connectivity and numerous terrestrial activities were of medium concern. Marine threats of high concern included shifts in marine conditions associated with temperatures, currents and predator prey interactions, and threats from aquaculture practices (disease and parasites)

Appendix Table 2. COSEWIC Threat Assessment Level 1 and Level 2 descriptions and examples to guide the assessment (COSEWIC guidance, unpublished).

COSEWIC Threat Number	COSEWIC Threat Description	COSEWIC Threat Definition	Examples
1	**Residential and commercial development**		
1.1	Housing & urban areas	New footprints of human cities, towns, and settlements including non-housing development typically integrated with housing	Footprints of urban areas, suburbs, villages, vacation homes, shopping areas, offices, schools, hospitals, floating homes
1.2	Commercial & industrial areas	New footprints of factories and other commercial centers	Footprints of manufacturing plants, shopping centers, train and ship yards, airports *Note: Shipping lanes and flight paths are not included in this category*
1.3	Tourism & recreation areas	New tourism and recreational sites with a substantial footprint	Footprints of ski areas, golf courses, beach resorts, cricket fields, county parks, campgrounds *Note: This is just the footprint of new recreational areas, effects of the activities will be under 6.1*
2	**Agriculture & aquaculture**	***Note: This section is focused on direct land conversion, threats from chemicals, run-off and sedimentation should be dealt with in 9.3***	
2.1	Annual & perennial non timber crops	Crops planted for food, fodder, fiber, fuel, or other uses	Footprints of farms, plantations, orchards, vineyards, mixed agroforestry systems
2.2	Wood & pulp plantations	Stands of trees planted for timber or fiber outside of natural forests, often with non-native species	Footprints of silviculture, Christmas tree farms
2.3	Livestock farming & ranching	Domestic terrestrial animals raised in one location on farmed or non-local resources (farming); also domestic or semi-domesticated animals allowed to roam in the wild and supported by natural habitats (ranching)	Footprints of cattle feed lots, dairy farms, cattle ranching, chicken farms etc.
2.4	Marine & freshwater aquaculture	Aquatic animals raised in one location on farmed or non-local resources; also hatchery fish allowed to roam in the wild	Footprints of shrimp or fin fish aquaculture, fish ponds, hatchery salmon, artificial algal beds *Note: This is the impact from the foot print itself, threats from disease/sea lice/introduced genetics are scored in section 8.*
3	**Energy production & mining**	***Note: This section is focused on footprints and activities on those footprints***	
3.1	Oil & gas drilling	Exploring for, developing, and producing petroleum and other liquid hydrocarbons	oil wells, deep sea natural gas drilling, oil spills occurring on work sites *Note Pipeline impacts go under 4.2*

COSEWIC Threat Number	COSEWIC Threat Description	COSEWIC Threat Definition	Examples
3.2	Mining & quarrying	Exploring for, developing, and producing minerals and rocks	coal mines, alluvial gold panning, gold mines, rock quarries, gravel extraction *Note: Chemical runoff from any of these activities goes under section 9.2*
3.3	Renewable energy	Exploring, developing, and producing renewable energy	geothermal power production, solar farms, wind farms, tidal farms. *Note: This does not include hydroelectric projects, they will be dealt with in section 7.2*
4	**Transportation & service corridors**		
4.1	Roads & railroads	Surface transport on roadways and dedicated tracks	highways, secondary roads, logging roads, bridges and causeways, road kill, fencing associated with roads, railroads *Note: Off-road vehicles will be dealt with in section 6.1 and any impacts from runoff will be dealt with in 9.1*
4.2	Utility & service lines	Transport of energy and resources	electrical and phone wires, aqueducts, oil and gas pipelines *Note: Oil spills from pipelines should go in 9.2 Industrial & Military Effluents.*
4.3	Shipping lanes	Transport on and in freshwater and ocean waterways	dredging, canals, shipping lanes, wakes from cargo ships, log booms, barges, stranding due to ship waves, dredging and other activities that maintain shipping lanes.
4.4	Flight paths	Air and space transportation	Flight paths *Note: this does not include airports, this was included in 1.2 Commercial & Industrial Areas.*
5	**Biological resource use**		
5.1	Hunting and collecting terrestrial animals	killing or trapping terrestrial wild animals	bushmeat hunting, trophy hunting, fur trapping, insect collecting, honey or bird nest hunting, predator control, pest control, persecution
5.2	Gathering terrestrial plants	harvesting plants, fungi, and other nontimber/nonanimal products	wild mushrooms, forage for stall fed animals, orchids, rattan, control of host plants to combat timber diseases
5.3	Logging and wood harvest	Harvesting trees and other woody vegetation for timber, fibre, or fuel	clear cutting of hardwoods, selective commercial logging of ironwood, pulp operations, fuel wood collection, charcoal production *Note: Felling trees to clear agricultural land goes in the appropriate category in 2. Agriculture & Aquaculture. If it is a few timber species that are planted on a rotation cycle, it belongs in 2.2 Wood & Pulp Plantations. If it is multiple species or enrichment plantings in a quasi-natural system, it belongs here. Log booms are not considered here, but under section 4.3. Any impacts from runoff or effluents goes in 9.3.*
5.4	Fishing & harvesting aquatic resources	Harvesting aquatic wild animals or animal products for commercial, recreation, subsistence, research, or cultural purposes, or	trawling, blast fishing, spear fishing, shellfish harvesting, whaling, seal hunting, turtle egg collection, live coral collection, seaweed collection, recreational fisheries, commercial fisheries, FSC fisheries

COSEWIC Threat Number	COSEWIC Threat Description	COSEWIC Threat Definition	Examples
		for control/persecution reasons; includes accidental mortality/bycatch	
6	**Human intrusions & disturbance**		
6.1	Recreational activities	People spending time in nature or traveling in vehicles outside of established transport corridors, usually for recreational reasons	off-road vehicles, motorboats, jet-skis, snowmobiles, ultralight planes, dive boats, whale watching, mountain bikes, hikers, birdwatchers, skiers, pets in rec areas, temporary campsites, caving, rock-climbing
6.2	War, civil unrest, & military exercises	Actions by formal or paramilitary forces without a permanent footprint	armed conflict, mine fields, tanks and other military vehicles, training exercises and ranges, defoliation, munitions testing *Note: This category focuses on military activities that have a large impact on natural habitats, but are not permanently restricted to a single area. Permanent military bases should go under 1.2 Commercial & Industrial Areas.*
6.3	Work & other activities	People spending time in or traveling in natural environments for reasons other than recreation, military activities, or research	law enforcement, drug smugglers, illegal immigrants, species research, vandalism
7	**Natural systems modifications**		
7.1	Fire & fire suppression	Suppression or increase in fire frequency and/or intensity outside of its natural range of variation	fire suppression to protect homes, inappropriate fire management, escaped agricultural fires, arson, campfires, fires for hunting
7.2	Dams & water management	Changing water flow patterns from their natural range of variation either deliberately or as a result of other activities	dam construction, dam operations, sediment control, change in salt regime, wetland filling for mosquito control, levees and dikes, surface water diversion, groundwater pumping, channelization, artificial lakes
7.3	Other ecosystem modifications	Other actions that convert or degrade habitat in service of “managing” natural systems to improve human welfare	land reclamation projects, abandonment of managed lands, rip-rap along shoreline, tree thinning in parks, beach construction, removal of snags from streams, effects on the hydrological regime from forestry and mountain pine beetle, changes in food web composition
8	**Invasive & other problematic species & genes**		
8.1	Invasive non-native/alien species	Harmful plants, animals, pathogens, and other microbes not originally found within the ecosystem(s) in question and directly or indirectly introduced and spread into it by human activities	feral cattle, household pets, zebra mussels, introduction of species for biocontrol, pike, spiny ray fish, non-native diseases
8.2	Problematic native species/diseases	Harmful plants, animals, pathogens, and other microbes that are originally found within the ecosystem(s) in question, but have become “out-of-balance” or “released” directly or indirectly due to human activities	overabundant native predators, overabundant algae due to loss of native grazing fish, native plants that hybridize with other plants *Note: It is a bit of a judgement call as to when a species becomes "problematic" (also referred to as species being "outside its natural range of variation").*

COSEWIC Threat Number	COSEWIC Threat Description	COSEWIC Threat Definition	Examples
8.3	Introduced genetic material	Human altered or transported organisms or genes	pesticide resistant crops, hatchery salmon, restoration projects using nonlocal seed stock, genetically modified insects for biocontrol, genetically modified trees, genetically modified salmon
9	**Pollution**		
9.1	Household sewage & urban waste	Water-borne sewage and non-point runoff from housing and urban areas that include nutrients, toxic chemicals, and/or sediments	discharge from municipal waste treatment plants, leaking septic systems, untreated sewage, oil or sediment from roads, fertilizers and pesticides from lawns and golf-courses, road salt *Note: This category does not include major industrial discharge, which falls under 9.2 Industrial & Military Effluents. It does include chemicals and next generation* *pollutants (caffeine or pharmaceuticals) in household waste streams. Agricultural runoff is not included here, but below in 9.3*
9.2	Industrial and military effluents	Water-borne pollutants from industrial and military sources including mining, energy production, and other resource extraction industries that include nutrients, toxic chemicals, and/or sediments	toxic chemicals from factories, illegal dumping of chemicals, mine tailings, arsenic from gold mining, leakage from fuel tanks, PCBs in river sediments, oil pipeline spills, pulp mill runoff
9.3	Agriculture and forestry effluents	Water-borne pollutants from agricultural, silvicultural, and aquatic systems that include nutrients, toxic chemicals, and/or sediments including the effects of those pollutants on the site where they are applied	nutrient loading from fertilizer runoff, herbicide runoff, manure from feedlots, nutrients from aquaculture, soil erosion, log boom pollution *Note: Wind erosion of agricultural sediments or smoke from forest fires goes in 9.5 Air-Borne Pollutants.*
9.4	Garbage and solid waste	Rubbish and other solid materials including those that entangle wildlife	municipal waste, litter from cars, flotsam and jetsam from recreational boats, waste that entangles wildlife, construction debris, abandoned fishing gear, micro plastics *Note: This category generally is for solid waste outside of designated landfills – landfills themselves should go in 1.2 Commercial & Industrial Areas. Likewise, toxins leaching from solid waste - for example, mercury leaking out of a landfill into groundwater - should go in 9.2 Industrial & Military Effluents.*
9.5	Air-borne pollutants	Atmospheric pollutants from point and nonpoint sources	acid rain, smog from vehicle emissions, excess nitrogen deposition, radioactive fallout, wind dispersion of pollutants or sediments, smoke from forest fires or wood stoves
9.6	Excess energy	Inputs of heat, sound, or light that disturb wildlife or ecosystems	noise from highways or airplanes, sonar from submarines that disturbs whales, heated water from power plants, lamps attracting insects, beach lights disorienting turtles, atmospheric radiation from ozone holes

COSEWIC Threat Number	COSEWIC Threat Description	COSEWIC Threat Definition	Examples
10	**Geological events**	***Note: Strictly speaking, geological events may be part of natural disturbance regimes in many ecosystems. But they need to be considered a threat if a species or habitat is damaged from other threats and has lost its resilience and is thus vulnerable to the disturbance.***	
10.1	Volcanoes	Volcanic events	eruptions, emissions of volcanic gasses
10.2	Earthquakes/tsunamis	Earthquakes and associated events	earthquakes, tsunamis
10.3	Avalanches/landslides	Avalanches or landslides	avalanches, landslides, mudslides *Note: sedimentation related directly to landslides are considered here, but all anthropogenic sources of sediment are considered in section 9*
11	**Climate change & severe weather**		
11.1	Habitat shifting & alteration	Major changes in habitat composition and location	sea-level rise, desertification, tundra thawing, coral bleaching, shifts in the hydrological regime due to climate change *Note: The effects of the "blob" will be considered here, including marine temperature effects*
11.2	Droughts	Periods in which rainfall falls below the normal range of variation	severe lack of rain, loss of surface water sources
11.3	Temperature extremes	Periods in which temperatures exceed or go below the normal range of variation	heat waves, cold spells, temperature changes, disappearance of glaciers/sea ice *Note: Freshwater temperature impacts will be considered here, but marine temperature impacts will be considered in 11.1 as part of the "blob" effects*
11.4	Storms & flooding	Extreme precipitation and/or wind events	thunderstorms, tropical storms, hurricanes, cyclones, tornados, hailstorms, ice storms or blizzards, dust storms, erosion of beaches during storms, changes in the flood regimes due to climate change *Note: The effects of increased flooding due to the modification of catchment surfaces (ex. from logging) should be discussed in section 7.3*

Appendix Table 3. Categories and the ranges used to define scope of the threat (COSEWIC 2014).

Scope: proportion of the total number of salmon in the DU that are exposed to the threat	
Category	Range
Pervasive	Affects all or most (71–100%) of the total population or occurrences
Pervasive-Large	*31-100%*
Pervasive-Restricted	*11-100%*
Large	Affects much (31–70%) of the total population or occurrences
Large-Restricted	*11-70%*
Large-Small	*1-70%*
Restricted	Affects some (11–30%) of the total population or occurrences
Restricted-Small	1–30%
Small	Affects a small (1–10%) proportion of the total population or occurrences
Negligible	Affects a negligible (< 1%) proportion of the total population or occurrences

Appendix Table 4. Categories and the ranges used to define severity of the threat (COSEWIC 2014).

Severity: level of damage to the species or ecosystem from the threat that can reasonably be expected with continuation of current circumstances and trends (including potential new threats)	
Category	Range
Extreme	Within the scope, the threat is likely to destroy or eliminate the occurrences of an ecological community, system, or species, or reduce the species population by 71–100%
Serious	Within the scope, the threat is likely to seriously degrade/reduce the affected occurrences or habitat or, for species, to reduce the species population by 31–70%
Moderate	Within the scope, the threat is likely to moderately degrade/reduce the affected occurrences or habitat or, for species, to reduce the species population by 11–30%
Slight	Within the scope, the threat is likely to only slightly degrade/reduce the affected occurrences or habitat or, for species, to reduce the species population by 1–10%
Negligible	Within the scope, the threat is likely to negligibly degrade/reduce the affected occurrences or habitat or, for species, to reduce the species population by < 1%.
Neutral or Potential Benefit*	Within the scope, the “threat” is likely to improve or not affect occurrences or habitat or, for species, to be neutral or to improve (a net benefit) the species population by > 0%).

Appendix Table 5. Impact scores by threat and Designatable Unit and relative abundance of Atlantic salmon used to derive the relative abundance weighted impact score by threat for Atlantic salmon in eastern Canada. Impact score are as follows: L = Low, M = Medium, H = High, N = Negligible and U = Unknown. N and U are only presented for Level 2 threats that were given at least one impact score of Low or higher, a complete list can be found in Figure 1.

DU	Level 2 threat																Relative abundance*
	Marine & freshwater aquaculture	Roads & railroads	Logging & wood harvesting	Fishing & harvesting aquatic resources	Dams & water management/use	Invasive non-native/alien species/diseases	Problematic native species/diseases	Introduced genetic material	Domestic & urban waste water	Industrial & military effluents	Agricultural & forestry effluents	Air-borne pollutants	Habitat shifting & alteration	Droughts	Temperature extremes	Storms & flooding	
1				N		N			N	N			U		U		unknown
2A				N		N									U		54,800
2B				U	U	N				U					U		153,440
2C				M-L (12.2%)		N	N								U		65,760
3				N	N	N			N						N		107,870
4A	N	N		L (5.5%)			M-L (12.2%)	L (3.5%)	N	N	N				N		15,329
4B	L (2%)			L (5.5%)			M-L (12.2%)	M (12%)			N		L (5.5%)		N	N	12,478
5		N		N					N	N					N	L (2%)	56,842
6				N											N		58,500
7		N		L (5.5%)					N	N			U	N	U		5,509
8	N	N		L (5.5%)			N	L (0.5%)	N	N	N		L (5.5%)	N	L (5.5%)		11,204
9				L (5.5%)			U		N	N	N		L (5.5%)	L (5.5%)	N		2,837

10	N	N		L (5.5%)	N	N		L (0.5%)	L (5.5%)	L (5.5%)	L (5.5%)		U	M-L (12.2%)	M-L (12.2%)	U	3,644
12	N	L (5.5%)		L (5.5%)		N	N		N	N	N		U	L (5.5%)	L (5.5%)	U	26,856
13	N	L (5.5%)	L (0.5%)	L (5.5%)	N	L (3.5%)	M-L (12.2%)	L (5.5%)	L (5.5%)	U	L (5.5%)	U	L (5.5%)	N	L (5.5%)	U	38,879
14A	N	L (0.5%)	L (2%)	L (5.5%)		N	M-L (12.2%)	L (1%)	L (2%)	L (0.5%)	L (2%)	M (12%)	M (19%)	L (5.5%)	L (5.5%)	L (5.5%)	390
14B	N	L (0.5%)	L (0.5%)	L (5.5%)	N	L (3.5%)	M-L (12.2%)	M-L (7.8%)	L (2%)	L (0.5%)	L (2%)	M (19%)	M (19%)	M (19%)	M (19%)	L (5.5%)	230
15	N	L (0.5%)	L (0.5%)	L (5.5%)		L (2%)	M-L (12.2%)	H-L (25.8%)	L (2%)	L (0.5%)	L (2%)	U	M (19%)	L (5.5%)	L (5.5%)	L (5.5%)	100
16	N	L (2%)	L (0.5%)	L (5.5%)	M (12%)	M-L (12.2%)	L (5.5%)	H-M (32.5%)	L (5.5%)	L (5.5%)	L (5.5%)	U	M (19%)	L (5.5%)	L (5.5%)	L (5.5%)	3,735

* ICES abundance estimate for Labrador (274,000) was divided by the mean annual proportion of returns to the Salmon Fishing Area (SFA) with boundaries most closely associated with each DU: DU-02A/SFA-1A = 20%; DU-02B/SFA-1B = 56%; and DU-02C/SFA-2 and SFA-14B = 24%.

Appendix Table 5. Impact scores by threat and Designatable Unit and relative abundance of Atlantic salmon used to derive the relative abundance weighted impact score by threat for Atlantic salmon in eastern Canada. Impact score are as follows: L = Low, M = Medium, H = High, N = Negligible and U = Unknown. N and U are only presented for Level 2 threats that were given at least one impact score of Low or higher, a complete list can be found in Figure 1.

* ICES abundance estimate for Labrador (274,000) was divided by the mean annual proportion of returns to the Salmon Fishing Area (SFA) with boundaries most closely associated with each DU: DU-02A/SFA-1A = 20%; DU-02B/SFA-1B = 56%; and DU-02C/SFA-2 and SFA-14B = 24%.

Appendix Figure 1. Designatable Units for anadromous Atlantic salmon in eastern Canada (COSEWIC 2025 pending).