



Fisheries and Oceans
Canada

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PORTRAIT OF FISH HABITAT RESTORATION

Final Report

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Ce rapport est aussi disponible en français.

This public opinion research report presents the results of a qualitative study conducted by Leger Marketing Inc. for the Department of Fisheries and Oceans Canada (DFO). The qualitative study was conducted between December 8, 2023, and March 25, 2024.

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Summary

Leger Marketing Inc. (Leger) is pleased to present to Fisheries and Oceans Canada (DFO) this report on the results of a qualitative study designed to provide a portrait of fish habitat restoration. This report was prepared by Leger Marketing Inc., which was contracted by the DFO (contract no. CW2329669 awarded September 7, 2023).

1.1 Background and Objectives

Several threats are contributing to the decline of freshwater and marine ecosystems in Canada. Habitat degradation and loss, including changes in flow and fish passage conditions, are often observed. Restoration provides an opportunity to mitigate these pressures on habitats and ecosystems. The Government of Canada recognizes the importance of restoration in improving ecosystem health, supporting climate change mitigation and adaptation strategies, preserving biodiversity and protecting species at risk. Fisheries and Oceans Canada (DFO) contributes to Canada's international commitments to ecological restoration, such as the Aichi Targets of the UN Convention on Biological Diversity and the UN Sustainable Development Goals for 2030.

The Fish and Fish Habitat Protection Program for the Quebec Region aims to implement communication activities whose primary purpose will be to provide a preliminary portrait of the restoration needs of Quebec's aquatic habitats. Restoration concerns and priorities (species, habitats and interventions) will then be identified.

Public opinion research (POR) will be conducted among a wide range of habitat restoration practitioners in Quebec to gather the relevant information needed to lay the foundations for this portrait.

Objectives

Consult with target stakeholders to obtain relevant information based on their knowledge and expertise in aquatic ecosystems. Specifically, to provide a general portrait of fish habitat in terms of restoration from a summary description by region based on, but not limited to, the following elements:

- Species, locations and ecosystem functions important to fish and fish habitat.
- Findings, knowledge, needs and issues related to aquatic habitats.
- Threats to fish habitat and restoration opportunities that address the root causes of degradation.
- Existing or potential restoration/rehabilitation opportunities.

1.2 Methodology

Qualitative research – In-depth interviews

Individual interviews were conducted with specialists and/or practitioners in aquatic habitat management, conservation and/or restoration.

The qualitative study provided an in-depth exploration of fish habitat needs, threats and restoration opportunities.

The study targeted seven areas identified by the DFO.

Area	Administrative region	Number of interviews conducted
1	Bas-Saint-Laurent (01)	8
1	Gaspésie–Îles-de-la-Madeleine (11)	
2	Saguenay–Lac-Saint-Jean (2)	3
2	Côte-Nord (09)	
2	Nord-du-Québec (10)	
3	Capitale-Nationale (03)	7
3	Mauricie (04)	
4	Outaouais (07)	6
4	Abitibi-Témiscamingue (08)	
4	Lanaudière (14)	
4	Laurentides (15)	
5	Estrie (05)	8
5	Chaudière-Appalaches (12)	
5	Centre-du-Québec (17)	
6	Montréal (06)	5
6	Laval (13)	
6	Montérégie (16)	
7	Provincial scope – across Quebec	8

Leger was responsible for recruiting participants and conducting interviews. The list of interviewees was provided by the DFO. The Department contacted the interviewees in advance to inform them of the upcoming communication from Leger and the reason for the interview. The study population was organized broadly into the following categories:

- NGOs whose mandates involve aquatic ecosystems (ZIP committees, watershed organizations, etc.)
- Researchers and experts

Thirty-eight interviews were conducted with NGOs. Seven were conducted with researchers.

The interviews were structured using a guide designed by Leger, based on an outline provided by the DFO.

Forty-five interviews were conducted by a senior Leger professional and took on average approximately 45 minutes to complete.

The interviews were conducted in the official language of the interviewees' choice (French or English).

A \$150 incentive was provided to encourage participants to take part in the in-depth interviews.

All in-depth interview sessions were moderated and supervised by a senior Leger researcher assisted by a research analyst. The discussion guide (available in Appendix A.2) was semi-structured. It allowed the moderator to provide a framework for the discussion and ensured that an array of themes was covered while leaving sufficient room for participants to express themselves and provide a detailed account of their experiences, ideas, opinions and perceptions.

Qualitative research provides an overview of the opinions of a population or group, rather than a percentage measure of the opinions expressed, as would a quantitative study.

1.3 Notes on Interpretation of the Research Findings

The views and observations expressed in this document do not reflect those of the DFO. This report was compiled by Leger based on the research conducted specifically for this project. Qualitative research provides an overview of the opinions of a population or group, rather than a percentage measure of the opinions expressed, as would a quantitative study. The results of this type of research should be considered purely indicative. No conclusions about the general population can be inferred from the results of this type of research.

Some limitations of this research must also be highlighted:

- The importance of ecosystem function has received little attention due to the difficulty in obtaining this information.
- The profile of the participants interviewed and the location to which their knowledge applies meant that the results of the study focused more on freshwater than on marine environments.
- Due to the semi-structured nature of the discussions, some of the information shared by participants applied to aspects outside the DFO's mandate. Where relevant, this information has been included in the study results.
- The geographical scope of some participants' knowledge extended beyond the specific area for which they were approached, so information in one section may sometimes include elements relating to other areas.
- As participation in the interviews was voluntary, the number of participants differs from one area to another, influencing the scope of the information collected and the diversity of viewpoints across areas.

1.4 Overview of the Findings

State of knowledge

Study participants demonstrate a range of knowledge on the conservation and restoration of aquatic environments in Quebec, influenced by their professional, academic and experiential backgrounds. Their self-assessed knowledge level varies from modest to excellent. When they describe their knowledge level as average, it is mainly due to the large size of certain regions, difficulty accessing them or to ecosystem complexity, rather than lack of experience or involvement in issues related to the region's aquatic habitats.

Although some participants may not have formal training in biology, close collaboration with specialists and significant involvement in their organization's activities give them advanced knowledge of the issues related to their area's aquatic habitats.

Habitat protection and threats

In addition to aquatic habitats already protected by regulation, several aquatic habitats were mentioned. The list included both large and small watercourses as well as a variety of water bodies. The importance of these habitats stemmed from their ecological value (crucial areas for biodiversity and the survival of threatened species), their economic value (fishing or tourism), their social role (drinking water supply) and their role as recreational areas.

The level of pressure and degradation of the listed aquatic habitats varies depending on their location and nature. Participants identified several forms of degradation and pressure presumed to result from human activities and environmental change. Dredging, coastal development and urbanization appear to be disrupting natural habitats, modifying currents and affecting aquatic wildlife and the migration of species such as salmon. Climate change appears to be affecting water temperature, acidification and hydrological regimes, and therefore threatening biodiversity. Agriculture and urbanization appear to be contributing to degradation of water quality through pollutant runoff, while shoreline erosion and the introduction of invasive species may be putting ecosystems out of balance. Habitat fragmentation by human infrastructure and industrial and domestic pollution appears to be aggravating these impacts. Such pressures are thought to be exacerbated by inappropriate water management practices, increased vessel traffic, chemical pollution and other factors.

It was also noted that, although some habitats benefit from regulatory protection, it is not systematically applied in many cases. As a result, some habitats may continue to suffer degradation due to a lack of sufficient controls to ensure compliance with the legislation.

General focus areas

The areas covered are the focus of major efforts to conserve aquatic habitats, including targeted conservation and restoration initiatives, awareness campaigns to educate the public about ecological issues and research and monitoring programs to assess the state of aquatic environments and species present.

Priority areas

Many participants identified priority areas for aquatic habitat restoration and conservation, including habitats impacted by industry, areas subject to erosion and sedimentation and areas affected by intensive agriculture. The need for urgent restoration work is highlighted, particularly to address the effects of pollution and degradation caused by nutrients and pesticides, and to improve stormwater management in urban areas. Specific efforts are also needed to extend protected areas and sustainably manage agricultural land to limit its impact on aquatic ecosystems. Conservation is urgently needed in areas where agriculture and residential development are exacerbating pollution and habitat fragmentation.

In relation to the identification of priority areas for restoration projects, stakeholders raised a number of considerations. One group favoured an approach focused on removing the causes of environmental degradation, rather than implementing restoration measures. These participants stressed that restoration efforts cannot be successful while the underlying threats or pressures persist. They also argued that eliminating the sources of degradation would give the environment the opportunity to return to its original natural state. Other participants suggested they did not have—or did not yet have—the necessary data to identify the level of habitat degradation in their areas in order to set priorities. Finally, a few other participants mentioned that different ecosystems are interlinked, making it difficult to prioritize one area over another.

Valued aquatic species

Many valued aquatic species were cited for their vital role in ecosystems, economic importance to fisheries and significance in conservation efforts. However, these species face multiple threats, such as degradation of their natural habitat due to coastal development, climate change, pollution and increased vessel traffic, which jeopardize their survival.

Completed restoration projects

In Quebec, a series of restoration initiatives were implemented to address ecological concerns related to aquatic habitats, including restoring aquatic connectivity and spawning grounds and controlling invasive species. Specific initiatives have also been carried out to restore natural habitats and increase resilience to extreme weather events, such as improved protection of riparian strips, beach nourishment and revegetation of eroded coastal areas.

Success factors

Restoration project key success factors include close collaboration and partnership between various players, such as government agencies, non-governmental organizations (NGOs), local communities and the private sector, which promote the effective sharing of resources and knowledge. Stable and sufficient funding is also crucial to launch and sustain initiatives over the long term. Active involvement of local communities and environmental awareness play a fundamental role in strengthening support and participation in restoration efforts. In addition, adaptive project planning and management, based on rigorous scientific monitoring and ongoing evaluation, are essential to adjust actions to changing conditions and maximize their effectiveness.

Challenges associated with carrying out projects

Restoration projects present several challenges, among which a lack of funding and resources stand out as a major obstacle, often limiting the scope and effectiveness of initiatives. Difficulties in collaboration and coordination between the various partners, caused by diverging interests or poor communication, can also jeopardize project implementation. Community or landowner resistance as well as regulatory and administrative constraints can delay or hamper restoration

actions. Furthermore, a lack of monitoring or thorough evaluation makes it difficult to fully understand the effectiveness of interventions, limiting the ability to adjust strategies and learn from previous experiences.

Turnkey or easy-to-implement restoration projects

Although turnkey restoration projects are relatively rare due to requirements such as financing and environmental approvals, some more accessible restoration initiatives have been highlighted in this report. These include transplanting eelgrass to rehabilitate marine habitats, revegetating watercourse banks to limit erosion and sediment accumulation, restoring watercourses following regulatory violations, shoreline cleaning to remove plastic, and so on.

Large-scale restoration projects

A number of potential large-scale restoration projects were cited in this report. These ambitious initiatives include, for example, restoring habitats along the St. Lawrence River and improving river connectivity by removing obsolete dams or improving conditions for fish passage, essential for the free movement of aquatic species.

1.5 Political Neutrality Statement and Contact Information

Leger certifies that the final deliverables fully comply with the Government of Canada's political neutrality requirements outlined in the *Policy on Communications and Federal Identity of the Government of Canada* and the *Directive on the Management of Communications*.

Specifically, the deliverables do not include information on electoral voting intentions, political party preferences, standings with the electorate or performance ratings of a political party or its leaders.



Signed:

Christian Bourque, Senior Researcher

Leger Marketing Inc.

Detailed results

General findings

The following points present some of the important issues raised by participants, but unrelated to a particular area:

- The vast majority of the participants consulted play an active role in strategic planning for aquatic habitats in their region. Many of them contribute to regional roundtables, fostering a collaborative approach. They also maintain close relations with various partners, enabling them to discuss the challenges specific to their territory and to implement joint actions.
- Some participants advocated addressing the origins of environmental degradation rather than considering restoration actions, suggesting that removing the causes of degradation would provide a chance for the environment to regenerate naturally.
- Overall, there is a lack of systematic documentation on restoration projects, mainly due to insufficient funding for monitoring initiatives and assessing their impact.
- While some participants are relatively well informed about various restoration projects, there is no centralized repository of all projects undertaken in a region. This lack of centralized documentation also extends to restoration opportunities and identification of areas requiring priority intervention, even if certain stakeholders are initiating projects to qualify different habitats within their territory.
- Some participants stressed the need for communication between different levels (municipal, provincial, federal) to align actions and capitalize on the knowledge and expertise at each level.
- All participants are open to further discussion with the DFO regarding aquatic habitats in Quebec and the establishment of restoration priorities. They were also all willing to share relevant public documentation.

The following comments from discussions with participants illustrate the above points:

- “It would be great if the provincial and federal governments as well as the organizations that manage the territory could circulate information so that we are all on the same page.”
- “In our experience, this is a lot of ground to cover. We give it a shot, but we have no idea what we are going to find because there is no data available, or it just doesn’t exist.”
- “Common sense dictates that if we start restoring habitats, we also have to take steps to stop further degradation, otherwise we are just repeating the same cycle.”

Area 1: Bas-Saint-Laurent, Gaspésie–Îles-de-la-Madeleine

Scope of participants' knowledge:

The knowledge of participants from these regions covers a variety of geographical areas, mainly around the St. Lawrence River in the Bas-Saint-Laurent and Gaspésie–Îles-de-la-Madeleine regions, as well as interprovincial areas between Quebec and New Brunswick. The actions of the organizations represented by some participants range from coastal areas to marine waters, while others are committed to the conservation and restoration of freshwater habitats, particularly through the management of watersheds, wetlands and watercourses.

State of knowledge:

Participants describe knowledge of their territories as containing a variety of perspectives and being influenced by their professional, academic and field experience. They rate it from modest to excellent.

When participants assess their knowledge level as modest, it is due to the complexity of environmental issues, and when they perceive it as excellent, it is in consideration of their solid experience or that of their organization in the region.

Important habitats and locations:

Participants identified several important aquatic sites in their organization's territory:

- **Kamouraska Islands area:** This is a critical area for beluga birthing and is therefore of particular ecological importance for the reproduction of this threatened species.
- **Zones within a 5-km radius of the Magdalen Islands:** These ecologically valuable areas, rich in commercial resources, are also essential to support local economies.
- **Matane and surrounding area:** This area is mentioned for the increased presence of blue whales and other large whales.
- **South shore of the St. Lawrence Estuary:** Important area for belugas, especially females and their young.
- **Salmon rivers (Nouvelle River to Malbaie River):** These rivers are valued for their Atlantic salmon populations.
- **Matapedia River:** Its management is complex due to the fact that it crosses several municipalities and due to varying regulations.
- **Matapedia Lake:** The central role of this lake and the small lakes around it (e.g., Noir Lake, Malcom Lake) in drinking water supply and local biodiversity makes this water system a conservation priority.
- **Rivière-du-Loup and Cacouna areas:** Important areas for striped bass and smelt.
- **Salmon rivers:** Cap-Chat River, Sainte-Anne River, Madeleine River, Dartmouth River, York River and Saint-Jean River.
- **Watersheds and small coastal streams:** Sixteen major watersheds that flow into the Gulf of St. Lawrence, as well as some forty smaller watersheds and several coastal streams that flow under Route 132 and into the sea. These elements cover more than a hundred watersheds in the region and are essential to understanding the region's aquatic dynamics.

Some habitat types were mentioned without any indication of their location:

- **Small watercourses:** Important habitat for aquatic biodiversity, particularly for fish reproduction.
- **River estuaries and marshes:** Key areas for biodiversity, including fish spawning.
- **Wetlands and adjacent forests:** Their roles in filtering water, preventing erosion and as habitats for wildlife underline the general importance of these areas for the health of aquatic ecosystems.

Degradation or pressure in the habitats mentioned:

The threats and pressures on aquatic habitats identified by participants arise in a variety of ways, significantly impacting ecosystem health and species survival.

- **Dredging and coastal development:** Natural habitat disturbance, marine current alteration and water quality degradation impact aquatic wildlife and migration of species such as salmon.
- **Climate change:** Changes in water temperature and hydrological regimes, acidification and winter ice reduction affect aquatic biodiversity and species life cycles.
- **Agriculture and urbanization:** These activities contribute to the degradation of water quality through nutrient, pesticide and other pollutant runoff, as well as to the reduction of wetlands and riparian strips that are vital to filter water and provide wildlife habitat.
- **Shoreline erosion:** Increased impervious surfaces due to urbanization, removal of native vegetation and sometimes inappropriate agricultural practices cause an increase in sedimentation and harm aquatic habitats.
- **Invasive species:** Local ecosystem imbalance through the introduction of non-native species threatens the survival of endemic species and alters aquatic communities.
- **Aquatic habitat fragmentation:** Dams, roads and other infrastructure fragment habitats, hinder species migration and alter natural hydroic flux.
- **Pollution from industrial and domestic activities:** Discharge of toxic substances into water from urban, industrial and agricultural areas degrades water quality and affects ecosystems.
- **Inadequate water management practices:** Reduced water availability for aquatic ecosystems due to inappropriate management of water resources.
- **Increased vessel traffic:** Noise pollution disrupts marine mammal communication, and collision risks can lead to animal injury or death.
- **Chemical pollution:** Accumulation of contaminants, such as PCBs and DDT, in marine mammal tissues causes health problems, including reduced fertility.
- **Change in physicochemical conditions:** Changes in water parameters, such as temperature variations and dissolved oxygen levels, have a direct impact on ecosystems.
- **Human development:** Urbanization, coastal development and human infrastructure contribute to aquatic habitat fragmentation and loss.
- **Impact of specific human activities:** Unpaved and ATV watercourse crossings contribute to erosion and sediment input, degrading fish habitat.
- **Impact of forest management and culverts:** Forest management and culverts may affect aquatic habitats. Logging and a dense forest road system are likely to contribute to erosion and sediment deposition in these habitats, thereby harming their quality.

Locations and habitats already receiving significant attention:

A number of aquatic areas already receiving significant attention were mentioned:

- **Matapedia Lake:** Focus on biodiversity conservation, water quality and salmon habitats, with initiatives to reduce pollution, protect riparian strips and manage water resources.
- **Matapedia River:** With a focus on biodiversity and salmon population conservation projects, efforts include improving water quality, restoring aquatic habitats and sustainably managing fish resources.
- **Wetlands:** These areas are targeted for their role in water filtration, erosion prevention and as wildlife habitats, with measures taken to prevent urban and agricultural development, promote ecological restoration and raise awareness.
- **Small watercourses and streams:** Characterization, restoration and protection efforts are being taken to maintain the ecological function of these aquatic habitats and support breeding species.
- **Cascapedia River:** A project led by Quebec's protected areas network and involving the Conseil de l'eau Gaspésie Sud aims to establish an action plan to enhance the river.
- **Bonaventure River:** The Conseil de l'eau Gaspésie Sud and the Mission Rivière organization are collaborating to promote riverbank protection and the creation of a protected area on nearby public territory.
- **Ouelle River:** The ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs (MELCCFP) has implemented a rainbow smelt recovery plan, coordinating actions to restore habitats such as eelgrass beds and spartina marshes, which are crucial for conservation and ecological restoration.
- **Large eelgrass beds and vast tidal marshes:** These ecosystems are considered essential for the spawning and nursery habitats of various species.
- **Sainte-Anne River:** The river mouth in the town of Sainte-Anne-des-Monts was identified as a site requiring shoreline stabilization work due to erosion and land loss.

Priority locations and habitat types:

Priority areas for aquatic habitat restoration and conservation include:

- **Areas affected by erosion and sedimentation:** Areas where shoreline erosion and sedimentation are problematic need to be addressed to reduce these negative impacts on aquatic ecosystems, with a focus on watercourse development and sedimentation management, and particularly on problematic watercourse crossings, including forest road culverts, which require immediate attention to reduce negative impacts on aquatic habitats.
- **Southern area of Matapedia Lake:** This area requires restoration work due to the impact of agriculture on the lake's tributaries, with measures such as the installation of wider riparian strips and sustainable management of farmland to limit runoff and pollution.
- **Areas affected by intensive agriculture:** Areas experiencing increased nutrient and pesticide pollution due to intensive farming should be targeted for the promotion of sustainable agricultural practices and the protection of buffer zones.
- **Stormwater management in residential areas:** The importance of stormwater management in urban areas is emphasized to reduce its impact on aquatic ecosystems, with projects including the creation of green infrastructure.

- **Other problematic water bodies:** There are water bodies affected by sawmills in the area.

Most degraded areas:

In addition to the areas mentioned above, other degraded areas were cited:

- **Navigation channels affected by dredging:** These areas are particularly degraded due to dredging activities, requiring priority interventions to rehabilitate affected aquatic habitats and improve water quality.
- **Impact of human activities around the Magdalen Islands:** The significant impact of human activities on island environments is mentioned, with the need to adopt ecological restoration measures such as revegetation or eelgrass transplantation to minimize environmental damage.

Restoration potential:

Specific restoration opportunities were mentioned:

- **Restoration of marshes converted to farmland:** Historically, the use of aboiteaux and the creation of dykes to prevent saltwater intrusion has transformed marshes into agricultural areas, resulting in a significant loss of essential habitats. Efforts are now being made to restore these marshes, especially those that are being abandoned, in order to recover their natural ecological functions.
- **Invasive alien plant control:** The presence of these species in certain marshes requires targeted action to preserve or restore these ecosystems.

Aquatic species

Several valued aquatic species were mentioned:

- **American eel and smelt:** Valued for their conservation status and role in the food chain. Threatened by coastal development, dredging, coastal artificialization, climate change, rising water temperatures and shoreline degradation.
- **Lobster, crab, scallop:** High commercial value supporting the local economy.
- **Herring, mackerel, halibut:** Important to the local economy and fishing communities.
- **Right whale, great white shark:** Essential for the conservation of marine ecosystems. Threatened by pollution, vessel traffic and climate change.
- **St. Lawrence Estuary beluga:** Vulnerable to noise and chemical pollution, affecting communication, feeding and reproduction.
- **Blue whale:** Vessel strike and disruption risk due to underwater noise. Climate change affects prey distribution.
- **North Atlantic right whale:** Threatened by vessel strikes and fishing gear entanglement. Awareness and education are necessary to reduce these threats.
- **Atlantic salmon:** Valued for recreational fishing. Critical habitat threatened by degradation, fragmentation, warming waters and migration barriers.
- **Brook trout:** Important for sport fishing. Threatened by habitat degradation, warming waters and the impact of forestry activities.

- **Sea trout:** Generating interest among fishers, this species is present in both marine and freshwater environments. It is generally caught at the mouths of rivers.

Restoration work:

Several restoration projects were mentioned:

- **Beach nourishment and revegetation:** Initiatives to restore eroded beaches, such as at Bic National Park and Rimouski Bay, by adding sand and planting native vegetation.
- **Eelgrass habitat restoration:** Initiative to enhance marine biodiversity at Pointe-au-Père.
- **High tide protection:** Implemented in Sainte-Flavie following the 2010 high tides, these measures aim to increase coastal resilience to extreme events.
- **Tidal dykes in Saint-André-de-Kamouraska:** 2019–2021 project focused on reducing erosion and managing invasive alien species to protect coastal areas.
- **St. Lawrence Estuary:** Restoration of coastal habitats on the south shore of the estuary.
- **Project to facilitate American eel run.**
- Multiple restoration projects involving the **recovery of lost fishing gear.**
- **Regreening:** Efforts to stabilize shorelines and improve water quality, while providing habitats for local wildlife.
- **Stormwater management:** Measures taken, especially in urban areas, to reduce the impact of runoff on aquatic ecosystems.
- **Redevelopment of grounds and parking lots:** Specific actions taken to limit runoff into watercourses, such as facilitating water infiltration and filtration.
- **Forest road and crossing upgrades:** Measures taken near the Bonaventure River to improve access while reducing impacts on aquatic ecosystems.

Restoration work success or failure:

Most of the projects discussed were successful, except for a few that had mixed results due to:

- Lack of in-depth knowledge or sufficient funding for preliminary studies.
- Some extreme weather events, which presented challenges (e.g., uprooting of recently improved structures), highlighting the need to anticipate these hazards in project planning.
- Poor estimation of hydrodynamic conditions.

Success factors:

- **Strong collaboration:** Establish effective communication channels with local stakeholders, RCMs (Regional County Municipalities) and municipalities to facilitate collaboration and mutual understanding.
- **In-depth understanding of the issues:** Possess detailed knowledge of environmental solutions and issues in order to tailor projects to specific site needs.
- **Close collaboration with experts:** Work with experts and organizations in the field to benefit from their expertise and experience.
- **Community engagement:** Actively include local communities and First Nations in projects to ensure relevance and acceptance.

- **Local ownership and engagement:** Involve landowners directly in projects to ensure effective implementation and maintenance.
- **Awareness and involvement:** Organize information campaigns to raise awareness and involve local communities in conservation efforts.

The following comments from discussions with participants illustrate the above points:

- “We were able to share with other people in the network who had done this in other environments and who showed us certain techniques, so partnerships are definitely a great idea. The same goes for the fact that we were able to work closely with researchers who gave us advice.”
- “I would say that planning is essential. We started with small projects and learned as we went along. At first, we didn’t always have the right methods or contacts in the research community. Now, with experience, we have improved our planning and approach.”

Restoration project challenges:

Restoration project challenges identified by participants are varied and include:

- **Complexity of aquatic ecosystems:** Difficulty in predicting the impact of restoration actions due to the intrinsic complexity of these ecosystems.
- **Lack of funding and resources:** Limited funds to launch and support restoration initiatives.
- **Diffuse pollution management:** Diffuse pollution issues that are complex and difficult to address effectively.
- **Lack of prior knowledge:** Restoration project optimization hindered by a lack of sound scientific data.
- **Challenges in acquiring permits:** Complex logistical and administrative processes, even if facilitated by collaboration with key partners.
- **Adaptation to specific environments:** Projects need to be tailored to local conditions and the specific needs of the target ecosystem.
- **High cost of preliminary studies and specifications:** Project planning made difficult by significant upfront costs, especially for small municipalities and organizations with limited budgets.
- **Lack of qualified personnel:** Projects limited by a lack of in-house skills required for effective implementation.
- **Project sustainability:** Major challenge to ensure long-term monitoring and adaptive management of restored sites to ensure sustainable success.

The following comments from discussions with participants illustrate the above points:

- “All funding programs finance only 60% or 80% of a project. We apply for funding when we have a chance, but often we can’t, because we don’t have the other 20% or 40%.”
- “With the current climatic conditions, which are somewhat unpredictable, there have been extreme events in recent years. Newly installed culverts have even been ripped out by unexpected high flow caused by these extreme weather events.”

Turnkey restoration opportunities:

It was mentioned that turnkey restoration opportunities are rare, as most of them require substantial preparation, including financing and environmental approval processes, which can be long and complex. A number of easy restoration opportunities were nevertheless mentioned:

- Eelgrass transplantation
- Improved runoff management
- Revegetation of watercourse banks to reduce erosion and sediment input.
- Creation of model riparian strips: Development of demonstration areas in collaboration with municipalities to illustrate shoreline management practices and serve as an example for riparian owners and other stakeholders.

Large-scale restoration opportunities:

A few large-scale restoration opportunities were mentioned:

- **Matapedia Lake lock project:** This project responds to the urgency raised by incidents of mass fish mortality and seeks to facilitate the migration of aquatic species.
- **Forest roads and culverts** pose a complex challenge due to their impact on aquatic ecosystems.
- **Marshes in the Kamouraska region** have significant potential for large-scale restoration projects, particularly due to the presence of large dykes.
- **Cap-Chat River:** The riprap in Cap-Chat River requires significant intervention to be repositioned in a more suitable location.
- **Sainte-Anne River:** This project (bank stabilization work at the river mouth) aims to address erosion and land loss issues while seeking to restore habitat in an environmentally responsible manner.

Area 2: Saguenay–Lac-Saint-Jean, Côte-Nord, Nord-du-Québec

Scope of participants' knowledge:

Participants' knowledge covered a wide geographical area, from coastal and marine environments in northern and eastern Quebec to freshwater systems and specific marine mammal habitats. A number of specific areas were mentioned:

- Area from Port-Cartier to Basse-Côte-Nord, including areas such as Anticosti Island and the Mingan Archipelago.
- Haute-Côte-Nord, specifically in freshwater environments, from Tadoussac-Sacré-Cœur to the community of Pessamit. This area includes the watersheds from Moulin à Baude River to Betsiamites River.
- Gulf of St. Lawrence area, with a particular focus on protecting marine mammals. This expertise extends around Sept-Îles and as far as Port-Cartier.

State of knowledge:

Participants expressed sound knowledge of their territory and its related threats through significant experience and commitment. However, knowledge is described as varying from poor to average in some cases (northerly regions, Basse-Côte-Nord), due in part to the difficulty of accessing and monitoring large and isolated areas.

Important habitats and locations:

Participants identified several important aquatic habitats in their organization's territory:

- **Beach coasts:** Critical areas for the coastal ecosystem, currently being monitored to assess their ecological health and identify restoration needs, in particular to preserve habitats essential to many marine species.
- **Capelin spawning grounds:** Important breeding grounds for capelin, requiring special attention to ensure continuity of their role in the marine ecosystem. Characterization projects are underway in these areas to ensure their protection and restoration in the event of disturbance.
- **Salt marshes:** As rich ecosystems that are home to a diversity of species, salt marshes are crucial for water filtration and supporting biodiversity. Initiatives are underway to better understand their current state and determine the interventions needed to preserve them.
- **Eelgrass and macroalgae beds:** These seagrass beds are fundamental to the health of coastal ecosystems, as they serve as nurseries for many marine species. Study efforts aim to assess the impact of human and environmental activities on their distribution and vitality.
- **Salmon rivers (Escoumins, Laval, Betsiamites):** Essential for salmon reproduction, these rivers are monitored for their ecological and economic importance. The health of these rivers has a direct impact on salmon survival and aquatic biodiversity.
- **Wetlands and peatlands:** These habitats play a vital role in regulating water cycles, filtering pollutants and preventing flooding.
- **Gobeil Lake and Jérôme Lake:** The presence of invasive alien species, such as Eurasian watermilfoil, threatens biodiversity and water quality.
- **Sept-Îles Bay:** The bay is affected by industrialization.
- **Moisie River:** Known for its ecological importance, particularly for salmon runs, Moisie River is facing a decline in salmon populations. Conserving this habitat is key to preserving biodiversity and supporting local ecosystems.

Degradation or pressure:

The region's aquatic and coastal areas are experiencing various forms of degradation and pressure depending on their geographic location. They are primarily affected by human development and environmental changes:

- **Coastal squeeze and impact of urbanization:** The construction of infrastructure directly along the water, particularly in areas where cities and towns have been established, creates a phenomenon known as coastal squeeze. This process limits the space for coastal environments to naturally adapt to the impacts of climate change, such as erosion and rising water levels, confining them between the rising sea and human developments.
- **Industrialization and maritime activities in Sept-Îles:** As an industrial centre with significant vessel traffic, Sept-Îles is the site of specific disturbances related to accidental spills and impacts on marine mammals. The area is also affected by the loss of fishing gear, increasing the risk of collisions and negative interactions with marine wildlife. Intense harbour activity results in noise pollution that disrupts the communication and navigation patterns of marine mammals, as well as other aquatic species, with potential impacts on their survival and reproduction.
- **Exacerbated effects of erosion and rising water levels:** These phenomena are intensified by global warming, threatening the integrity and adaptability of coastal habitats. Erosion, in particular, significantly alters the size and composition of coastal marshes and beaches, which are essential for biodiversity.
- **Motorized vehicle traffic in sensitive habitats:** The use of motorized vehicles, including snowmobiles during the winter, in vulnerable areas such as beaches and marshes results in vegetation destruction and ecosystem disruption, directly contributing to erosion and degradation of these habitats.
- **Anthropogenic changes to the Betsiamites River:** The construction of dams and other infrastructure along this river has radically altered its fluvial dynamics disrupting the local ecosystem and negatively impacting the river's biodiversity and ecological continuity.
- **Invasive alien species:** The introduction and spread of invasive species, such as Eurasian watermilfoil in Gobeil Lake and Jérôme Lake, pose a major threat to native aquatic ecosystems, compromising biodiversity and deteriorating water quality.
- **Urbanization and development around resort lakes:** Increased construction, including secondary homes around lakes, is creating a host of environmental pressures, including wastewater pollution, accelerated shoreline erosion and natural habitat transformation, often exacerbated by a lack of compliance with environmental standards.
- **Risks associated with the introduction of species from southern Quebec:** The use of live bait in fishing could facilitate the introduction of species from southern Quebec into Haute-Côte-Nord ecosystems, creating risks of competition for resources with endemic species such as salmon, trout and eel, and potentially destabilizing local ecosystems.
- **Increased shoreline erosion:** The interaction of human activities with the effects of climate change is accelerating shoreline erosion, destroying vital coastal habitats for many marine and river species and reducing ecosystem resilience to environmental disturbances.
- **Wastewater treatment** in the region is also seen as a major issue, requiring discussion and coordinated action with municipalities and other government authorities to ensure a positive impact on the marine environment.

Locations and habitats already receiving significant attention:

A number of aquatic areas already receiving significant attention were mentioned:

- **Around Anticosti Island:** An ambitious initiative is seeking to establish a marine protected area around Anticosti Island, which, although recognized by UNESCO for its land portion, is now drawing attention to the need to preserve its surrounding aquatic habitats.
- **Local action in Uashat:** A collaboration between the Uashat Band Council and the ZIP Committee is focused on the restoration and preservation of a spit in front of the Uashat community, located in Sept-Îles Bay. This specific initiative demonstrates strong community engagement to protect a particularly vulnerable coastal habitat, underlining the importance of local action in protection efforts.
- **Priority salmon rivers:** The Escoumins, Laval and Betsiamites rivers are receiving special attention and investment in research and restoration due to their critical importance to the salmon life cycle. The specific funding allocated to these areas reflects the ecological and economic value of salmon rivers, highlighting their roles in regional biodiversity and the local economy.
- **Peatland rehabilitation:** Restoration projects have been launched to rehabilitate these vital ecosystems. Actions include plugging drainage systems and the replanting of native vegetation to restore the original ecological functions of peatlands.
- **Protection of the estuary archipelago:** An initiative led by the ministère de l'Environnement et de la Lutte contre les changements climatiques to establish a marine protected area around this archipelago, reflecting a significant government initiative for the conservation of marine biodiversity in this strategic region.
- Identification of Corossol Island and the archipelago as **important sites for seabirds**.

Priority target areas:

The following areas were identified by participants as requiring priority attention and conservation measures due to various environmental and anthropogenic factors:

- **River mouths with dams:** These areas are critical due to the impact of water flow variations on salinity and water chemistry, which can affect adjacent aquatic habitats.
- **Residential and industrialized areas:** The interaction between human activities and aquatic environments in these areas requires detailed assessment, considering challenges posed by the continued presence of disturbance sources.
- **Betsiamites River:** Identified as a priority area due to significant alteration by human activities, including dam construction.
- **Pointe Noire:** This area is subject to significant pollution from industrial discharge. Important as a spawning ground for certain fish species and frequented by harbour porpoises, it is affected by pollution and vessel traffic, underscoring the urgent need for remedial action.
- **Saguenay River and east side of Sainte-Marguerite River:** Shoreline erosion is a widespread problem affecting various areas along the coast, with an area east of the Sainte-Marguerite River particularly affected. The need to address shoreline erosion is critical to preserve coastal habitats and protect local biodiversity.
- **Port-Cartier area:** Pollution is a major issue in this region. It is exacerbated by the proximity of a factory directly by the sea. Local environmental impacts require specific interventions to reduce pollution and protect marine and coastal ecosystems.

Most degraded areas:

The most degraded areas identified by participants reflect the areas mentioned above that should be targeted as priorities, including:

- **Betsiamites River:** Significantly impacted by human activities.
- **Pointe Noire:** This area is subject to significant pollution from industrial discharge and vessel traffic.
- **Shoreline erosion:** A widespread phenomenon affecting various coastal areas, with particularly severe erosion east of the Sainte-Marguerite River. Managing this erosion is complex, especially due to the presence of adjacent human infrastructure.
- **Port-Cartier area:** Significant pollution, largely due to industrial presence.
- **Coastal marshes:** Although seagrass beds in the area are in good health, coastal marshes are subject to erosion, which alters their size. This erosion is a natural challenge, making it difficult to respond without affecting adjacent infrastructure.
- **Other areas:** There is concern about less studied ecosystems, such as headwater lakes or fishless lakes, where lack of information prevents full understanding and effective protection.

Restoration potential:

Some participants pointed out that a major dilemma in restoring aquatic environments is the ongoing presence or increase of disturbance sources despite efforts made under the current economic environment.

Participants highlighted the following points:

- The identified restoration opportunities mainly concern the management of minor disturbances such as motorized vehicle traffic impacts on sensitive habitats, such as beaches and marshes. This traffic, including the use of snowmobiles in winter, can result in vegetation loss and affect the structure of local ecosystems. In response to these minor disturbances, restoration projects that could include transplanting or planting native plants to rehabilitate these degraded environments are being considered.
- Restoration initiatives require strong communication and awareness-raising with the local population to change rooted social behaviours and reduce the impact of recreational activities on natural environments. Divisions within communities, particularly between residents and beach users, underline the complexity of implementing environmental protection measures that respect the different interests involved. According to some participants, all restoration projects must consider not only ecological interventions but also awareness-raising and education efforts to ensure the sustainability of these actions.

Aquatic species

Several valued aquatic species were mentioned:

- **Salmon:** Vital to Indigenous communities, salmon is at the heart of local traditions and economy. Human activities, such as dam construction, have profoundly affected its habitat, threatening its survival and requiring measures to restore its watercourses.
- **American eel:** Dams and pollution are contributing factors to its vulnerability.

- **Marine mammals:** Their importance for regional tourism underlines the need to protect their habitats from threats such as noise pollution and vessel strikes. Managing interactions between seals and whales is also crucial, given the impact of seal overpopulation on whale food resources.
- **Capelin:** Although its population is currently considered stable in the Gulf of St. Lawrence, vigilance is still required to monitor its status, given its key role in the marine food chain.
- **Brook trout and yellow perch:** These species are also important for the commercial activities of outfitters.
- **Mussels (possibly freshwater pearl mussels):** Their mention underscores the richness of aquatic biodiversity and the importance of protecting bottom habitats, which are crucial for water filtration and supporting other species.

Restoration work:

Several restoration projects were mentioned:

- **Val Marguerite (near Sept-Îles):** This project aims to clear a collapsed private riprap on a beach, which is blocking the vital capelin spawning area. To restore this essential habitat, action is being taken to remove these obstacles using machinery. This project is the result of a partnership between local stakeholders and the ministère des Transports. A revegetation phase is planned after the mechanical intervention to fully rehabilitate the beach and support the return of capelin and other species dependent on this habitat for breeding.
- **Pointe-aux-Anglais:** This area is experiencing significant erosion that poses a double challenge: the threat to Route 138 and the negative impact on the beach used by capelin as a spawning ground. The budget allocated to this project exceeds one million dollars.
- **Anticosti Island at Port-Menier:** The restoration project to improve habitat connectivity for key species such as American eel, brook trout and salmon was implemented through the construction of fish ladders and weirs in an artificial watercourse. While the project was successful in improving habitat connectivity, thereby facilitating fish movement, it was met with mixed results due to unforeseen erosion effects on the channel structure, attributed to its original fragility.
- **Escoumins River restoration project:** This project, carried out in partnership with the Université de Chicoutimi, is described as a long-term undertaking. It included sampling and a master's project based on the river. The river had previously been straightened with bulldozers and therefore required restoration work.
- **Recovery of ghost fishing nets:** This initiative aims to remove lost or abandoned nets that continue to capture and harm marine life.
- **Coastal restoration to combat erosion:** Efforts have been made to stabilize shorelines and protect coastal habitats. These include reseeding plant species such as sea lyme grass, which are effective in preventing erosion through their ability to hold soil with their roots.

Restoration work success or failure:

- **Val Marguerite:** The project was a resounding success, mainly because the beach was able to be returned to its natural state after the rehabilitation work. The local community also appreciated seeing the beach in its natural state, which demonstrates the importance of ecological restoration for residents.
- **Pointe-aux-Anglais:** Despite the project's success, results were somewhat mixed due to a major storm that damaged part of the infrastructure. However, major stream redirection structures remained in place, ensuring maintained functionality despite the challenges posed by extreme weather conditions.

- **Anticosti Island:** The Anticosti Island project had mixed results, mainly due to the construction of weirs in an artificial watercourse that potentially exacerbated the erosion effect on the channel structure. However, the fish ladder installed for aquatic species worked well.
- **Escoumins River restoration project:** The project is ongoing, with pre- and post-intervention documentation efforts to measure restoration effectiveness.

Success factors:

Several success factors were highlighted by participants:

- **Collaboration with partners:** Project success depends on the ability to create effective partnerships with various stakeholders, including government entities, non-governmental organizations and local communities. This collaborative approach brings together different expertise and resources to achieve restoration objectives.
- **Intervention adaptability:** The ability to adapt to unforeseen circumstances and adjust action plans according to actual conditions in the field is crucial. Restoration projects need to be flexible in order to respond effectively to the challenges encountered during their implementation, such as extreme weather conditions or changes in site ecological conditions.
- **Consultation and social acceptability:** Consulting local communities and gaining their acceptance is essential to project success. Interventions must consider the concerns and interests of affected communities to ensure restoration support and active participation.
- **Expertise:** Specific expertise of the partners involved in wetland restoration is highlighted as a key to success.

The following comments from discussions with participants illustrate the above points:

- “Communities have a particular attachment to their coastal environment, which is very sensitive. It was therefore necessary to hold consultations well in advance.”
- “We carried out studies prior to the modifications. The idea is to repeat these studies after the modifications to obtain quantitative data to determine whether this restoration project has been successful.”

Restoration project challenges:

Participants identified several challenges in carrying out restoration projects:

- **Restoration site identification:** Finding the right sites for restoration is a challenge, especially when the disturbance source is strong and beyond the organization’s capabilities. There is a desperate need for fundamental knowledge to determine which environments to restore.
- **Community attachment to coastal environments:** Coastal environments are highly sensitive and require a thorough consultation process with local communities. Obtaining social acceptance for restoration work is not always easy.
- **Communication with communities:** Interactions with fishers and Indigenous communities present challenges with respect to communication and mutual understanding, influencing project effectiveness.
- **Departmental permits:** Obtaining the permits needed to carry out the work is often a long and complex process.

- **Financing schedule constraints:** The timelines associated with the steps required to complete the work do not always match funding timelines. Unforeseen events and additional delays create constraints, particularly when funds cannot be transferred from one fiscal year to the next, despite a multi-year agreement.
- **Financial barriers:** The limited availability of financial resources is a major challenge, hampering the ability to carry out restoration initiatives. Even small projects involve significant costs, making them difficult to implement due to budgetary constraints.
- **Legal constraints:** Restoration projects are often hampered by strict regulatory requirements, requiring permissions and compliance that can delay or limit the scope of restoration initiatives.
- **Expertise:** Limited access to restoration expertise is a challenge that hinders project implementation.

The following comments from discussions with participants illustrate the above points:

- “Dialogue between the region’s different partners and levels of government is also a hindrance.”
- “There is a certain amount of red tape and regulatory requirements, but we deal with it.”
- “We lack knowledge when selecting environments to restore. Once we have selected one, there are costs associated with it, and then you need expertise. We are a long way from major centres, so that adds to the cost of this expertise.”

Turnkey restoration opportunities:

Restoration opportunities that are easy to implement include shoreline cleaning, in particular to remove plastic, an action that is considered relatively simple to organize and can have a significant positive impact on the environment.

Large-scale restoration opportunities:

Interest in improving the connectivity of American eel habitats has been expressed, but full funding for these initiatives has yet to be secured. A particular challenge also concerns dams, many of which are not equipped with fish ladders for aquatic species.

Area 3: Capitale-Nationale, Mauricie

Scope of participants' knowledge:

Participants' knowledge covered a broad geographical area, with specific areas of action mentioned:

- **Segment of the St. Lawrence River** in the Trois-Rivières and Bécancour area to Neuville and Saint-Antoine-de-Tilly.
- **Jacques-Cartier River and its sources:** The river runs 177 kilometres through several municipalities and areas of interest, including sites such as Pont-Rouge, Donnacona and Neuville. Saint-Joseph Lake is also mentioned as a significant waterbody.
- **Large area extending west to Charlevoix,** with a focus on watersheds contributing to the St. Lawrence River.
- **Region around Saint-Pierre Lake:** Located between Montréal and Trois-Rivières, this area is a widening of the St. Lawrence River.
- **Capitale-Nationale region** and watercourses: Including Saint-Charles River and other major watercourses, highlighting the importance of environmental and community issues.
- South Shore and North Shore rivers in the Capitale-Nationale region.
- From Saint-Augustin Lake east to Beauport River.

State of knowledge:

Participants were knowledgeable in their respective fields. Their varied expertise covered a wide range of aspects related to the management, study and conservation of aquatic environments, from watercourse management and conservation to the specific study of biodiversity and physical characteristics of aquatic habitats.

Important habitats and locations:

Several areas were identified by participants as important:

- **Saint-Paul Lake, the mouth of Godefroy River and Valdor Island** are highlighted as crucial habitats for aquatic biodiversity, particularly for the reproduction of various fish species.
- **Jacques-Cartier River:** It is highlighted for its essential role as habitat for Atlantic salmon and other species.
- **Saint-Joseph Lake:** It is known for its native lake trout population, which is vital to the region's biodiversity. The lake, a significant waterbody, plays an important role for aquatic wildlife and water quality.
- **Floodplains and Saint-Pierre Lake:** Highlighted for their vital importance in ecosystem balance, with special attention to Saint-Pierre Lake for its exceptional biodiversity and UNESCO recognition.
- **St. Lawrence River:** Described as Quebec's main artery, essential to human life and the ecosystem, underlining its importance for transportation, navigation and the economy.
- Areas upstream of Quebec City's drinking water intake.
- **Beauport tidal flats and intertidal area:** Highlighted for their unique ecological importance for bird conservation and the presence of a unique but unprotected freshwater intertidal marsh.
- **Saint-Charles Lake and Jacques-Cartier River:** Identified as crucial areas for drinking water supply and biodiversity conservation.
- **Other small streams:** Often overlooked but essential ecological role.

- **Headwater streams north of Quebec City:** Saint-Augustin Lake, Beauport River, Hurons River, Nelson River, Saint-Charles Lake and Durant Lake are important because they influence the rest of the aquatic habitats further south.

Degradation or pressure:

Degradation and pressure mentioned by participants revolved around:

- **Agricultural activities and pollution:** Agricultural inputs (i.e., pesticides and fertilizers) leading to habitat loss and degradation, expansion of corn and soybean crops around Saint-Pierre Lake increasing pressure on ecosystems and contamination linked to agricultural and industrial activity, particularly in areas such as the Cap-Rouge River.
- **Human development and urbanization:** Modifications to riparian strips, increased boating activities, residential expansion and urbanization around watercourses worsening shoreline erosion and pollution, and construction of new neighbourhoods without sufficient consideration for aquatic conservation.
- **Specific pressure on aquatic resources: commercial fishing with nets** at the mouth of the Godefroy River is reducing fish populations, and navigation on Saint-Joseph Lake is putting pressure on water quality and aquatic habitats.
- **Inadequate shoreline and watercourse management:** Inappropriate human intervention, such as dyke construction and watercourse channelization.
- **Industrial and port projects:** The expansion of port activities is increasing pressure on aquatic environments.
- **Overall impacts of climate change:** Rising temperatures and variations in precipitation are exacerbating existing problems and posing new challenges to aquatic species survival and ecosystem stability.

Locations and habitats already receiving significant attention:

Participants mentioned a number of locations that are of particular interest or already the focus of efforts:

- **Saint-Paul Lake and the mouth of Godefroy River:** Key area for yellow perch reproduction.
- **Valdor Island:** This area is of particular interest due to the scarcity of its north shore wetlands.
- **Les Chenaux RCM aquatic habitats:** Conservation efforts due to its rich biodiversity and scarcity of aquatic habitats, underlining the need for preservation actions.
- **Mouth of the Bécancour River and Montesson Island:** These areas are targeted for their significant conservation interventions.
- **Jacques-Cartier River:** Atlantic salmon restoration initiatives are underway, including collaboration with municipalities to create a riparian corridor aimed at reducing human impacts and promoting environmentally responsible land use planning.
- **Saint-Joseph Lake:** Action is being taken to limit navigation and preserve the lake trout population.
- **Watershed protection efforts:** Growing interest in watershed conservation, particularly at Saint-Pierre Lake, with collaboration between NGOs, foundations and government entities.
- **Beauport tidal flats:** A conservation action plan is underway.
- **Shoreline restoration in the Maizerets area of Quebec City:** Citizen engagement for public consultation and ecological restoration.
- **Quebec City water intake:** Efforts to protect the resource. Source protection plan in preparation.
- **Saint-Augustin Lake:** Establishment of a lake protection committee by the City of Saint-Augustin.

Priority locations and habitat types:

Certain areas were identified by participants as priorities:

- **Floodplain around Saint-Pierre Lake:** Critical due to its vulnerability to agricultural pressure and the need to balance ecosystem needs with agricultural activities.
- **Areas subject to agricultural intensification:** Areas where intensification of commercial farming contributes to erosion and sedimentation, requiring improved management to protect water quality and habitats.
- **Urban areas:** Expanding areas requiring green infrastructure solutions to manage soil sealing and reduce pollutant discharge, emphasizing the importance of sustainable stormwater management.
- **Areas affected by industrial and port projects:** Areas affected by industrial and port development, especially around major centres, requiring measures to minimize environmental impacts.
- **Saint-Pierre Lake watershed:** Reducing pollution, including agricultural pollution, which is a major source of impact on the lake's ecosystem. Large-scale measures are needed to regulate land use and agricultural activity in order to minimize environmental impact.
- **Small agricultural watercourses:** Important despite their size, these watercourses are under significant pressure from intensive agriculture, requiring conservation efforts to maintain the overall health of aquatic ecosystems.
- **Quebec City water intake basin:** Important for drinking water supply.

Most degraded areas:

The areas identified by participants as the most degraded are:

- **Mouth of the Godefroy River:** Deteriorated in particular by commercial fishing and the presence of fishing nets.
- **Around Saint-Paul Lake and other watercourses:** Negative impacts of intensive agriculture leading to loss of essential aquatic habitats, such as seagrass beds, and contributing to erosion and sedimentation.
- **Mouth of the Jacques-Cartier River and St. Lawrence River:** Degradation due to shoreline artificialization resulting from past industrial activities, altering natural aquatic ecosystems.
- **Sainte-Catherine and Shannon areas:** Areas particularly affected by urbanization and industrial development, resulting in degradation of aquatic environments.
- **Small agricultural watercourses:** Heavily impacted by agricultural intensification, causing significant erosion and sedimentation, negatively affecting water quality and habitats.
- **Areas around Saint-Pierre Lake:** Significant pressure from agricultural intensification, degrading water quality and aquatic habitats. These areas are threatened by high turbidity affecting aquatic plants (macrophytes) essential to piscifuna, due to sedimentation and nutrient inputs.
- **Growing urban environments:** The often-inadequate management of urban stormwater contributes to watercourse pollution and degradation through soil sealing.
- **Areas affected by port and industrial activities:** Expansion near major centres exacerbates pressure on aquatic environments through pollutant discharge and habitat modification.
- **St. Lawrence River (fish mobility):** Disruption of fish migration corridors caused by human activities, including navigation and noise pollution.
- **Saint-Augustin Lake:** Threatened primarily by agricultural activity as well as urban sprawl.

Restoration potential:

Areas identified as having significant potential for restoration include:

- **Mouth of the Jacques-Cartier River with the St. Lawrence River:** Potential to rehabilitate a former industrial site to restore the natural environment.
- **Des Prairies River and Charles River:** Need for restoration work to improve water quality and restore natural habitats along shorelines.
- **Areas around Saint-Augustin (Charland River):** Restoration is important due to soil degradation and erosion.
- **Sainte-Catherine and Shannon areas:** Areas with highly degraded shorelines require shoreline and aquatic habitat restoration to improve the environmental condition.
- **Shoreline and aquatic habitat restoration:** Shoreline and wetland protection and restoration initiatives to improve water quality and provide vital habitats for wildlife.
- **Cap-Rouge River, Des Hurons River:** Restore freedom to watercourses. Make shorelines more natural.
- **Peatlands at the outdoor resort near Sainte-Foy:** Close channels to restore peatlands.
- **Isabelle Marsh:** Closure of trails and irrigation canals.

Other important measures were mentioned:

- **Improving farming practices:** Adoption of sustainable farming methods to reduce erosion, sedimentation and diffuse pollution in agricultural watersheds.
- **Sustainable urban stormwater management:** Implementation of green infrastructure solutions to better manage stormwater, reduce impervious surfaces and promote infiltration.
- **Limiting the impact of port and industrial activities:** Adoption of environmental best practices to reduce the impact of port and industrial developments on aquatic ecosystems.

Aquatic species:

Several valued or important species were mentioned:

- **Yellow perch:** Threatened mainly by the loss of vital aquatic seagrass beds for spawning and protecting juveniles, caused by eutrophication from agricultural nutrients and pollution. Overfishing with unsuitable nets is also detrimental to yellow perch and can affect these species through accidental capture.
- **Bridle shiner:** Listed as an at-risk species, requiring special attention for its conservation.
- **Northern pike and walleye:** Valued for their contribution to biodiversity and in sport and commercial fishing.
- **Atlantic salmon.**
- **Rainbow trout.**
- **American eel:** Threatened particularly by dams, which impede migration, representing a major challenge to the species' survival.
- **Brook trout:** This species has little tolerance to the presence of competing species. Allopatric areas are therefore necessary for brook trout to thrive. Such areas have exceptional ecological value.
- **Smelt, lake and Atlantic sturgeon:** Valued species for sportfishing.
- **Amphibians (e.g., four-toed salamander):** Threatened species.

Other threats to several species were mentioned:

- **Habitat degradation:** Attributed to urban and industrial development and unsustainable agricultural practices, reducing spawning and feeding areas.
- **Water quality:** Deteriorated by pollution, sediment inputs and eutrophication, harming the health and survival of aquatic populations.
- **Poor stormwater management:** Insufficient in urban areas, leading to erosion and sedimentation that damage aquatic ecosystems.

Restoration work:

Restoration projects mentioned include:

- **Valdor Island project:** The project aimed to increase the size of a culvert to improve connectivity for fish. The project was initially successful but experienced complications. Overall, it was positive, with significant improvement in aquatic connectivity.
- **Atlantic salmon population restoration:** The project aims to reintroduce and increase the Atlantic salmon population in the Jacques-Cartier River, which has been impacted by dams. This is an ongoing project, positively considered for its potential impact on the river's biodiversity and ecology.
- **Thermal refuge projects:** This project aims to create cold-water areas for salmon and other species during warmer periods. This is a planned or ongoing project to improve survival conditions of species sensitive to high temperatures.
- **Shoreline restoration in Saint-Gabriel-de-Valcartier:** The project aimed to tackle erosion and invasive plants along the Jacques-Cartier River through grading and revegetation. The project was a success, using phytotechnology techniques to stabilize and restore shorelines.
- **Restoration projects on the Champlain River:** The project aims to reduce shoreline erosion through reforestation of steeply sloped areas degraded by grazing.
- **Agricultural sector improvement:** The project aimed to stabilize shorelines and adopt improved agricultural practices to reduce erosion and pollution. However, these efforts have sometimes been thwarted by the expansion of large-scale farming. These initiatives are nevertheless important for watercourse health.
- **Salmon habitat restoration:** Salmon habitat restoration efforts focused on the Jacques-Cartier, Malbaie, Gouffre and Charlevoix rivers. These projects have been successful.
- **Dam removal:** The project involved the removal of two obsolete dams on the Beauport River to allow fish passage. The project is considered a success.
- **Redevelopment of riparian strips:** The project was carried out in the Rouge River watershed and is considered a success from an ecosystem revitalization perspective.
- **Natural flow restoration:** The project was carried out on Sainte-Barbe Stream and is considered a success.

Restoration work success or failure:

Most of the projects mentioned were considered successful, with the exception of a few agriculture-related projects, the results of which were considered mixed because they have not reached the intensity required to significantly impact aquatic environment quality. Although efforts have been made (e.g., installation of hedgerow windbreaks, application of

riprap, introduction of cover crops), these measures have often been implemented too sparsely to bring about noticeable change.

Success factors:

The success of the above-mentioned projects was supported by several factors:

- **Funding:** The availability of financial resources is critical to the implementation and success of projects, although securing funding can be a major challenge.
- **Government support and authorizations:** The ease in obtaining environmental permits and the active support of government authorities for certain projects were fundamental.
- **Community engagement and awareness:** Engaging the local community and raising awareness on the importance of conservation are key to building support and participation in restoration initiatives.
- **Inter-institutional collaboration:** Cooperation between various organizations, including NGOs and government agencies, plays a crucial role in ensuring effective and sustainable restoration efforts.
- **Monitoring and ongoing evaluation:** Regular monitoring and project evaluation allow for strategy adjustment over time, ensuring an adaptive and responsive approach to emerging challenges.
- **Strategic location:** Careful selection of project sites, particularly upstream of watersheds, maximizes the positive impact on water quality and habitat restoration for the entire ecosystem.
- **Appropriate scale:** Projects designed on a manageable scale are more likely to result in controlled implementation and effective monitoring, making it easier to adapt strategies as needed.
- **Upstream studies:** Necessary to ensure plan appropriateness.
- **Multidisciplinary team:** Bringing together the different areas of expertise needed to carry out the project (biologists, engineers, etc.).

The following comments from discussions with participants illustrate the above points:

- “For this project, we held consultations and awareness-raising activities to ensure that the initiative would be well received and fully embraced by the community.”
- “First, these projects must be located as far upstream as possible, in small watersheds of no more than ten square kilometres, at the headwaters, and they require sufficient intervention intensity.”

Several challenges were mentioned by participants:

- **Monitoring and maintenance:** Maintaining post-restoration ecological benefits can be compromised by nonconforming actions, particularly on the part of farmers.
- **Regulatory and administrative complexity:** Lengthy approval processes can significantly delay field interventions.
- **Logistical limitations:** Physical and spatial constraints may limit the restoration options available in some areas.
- **Financial resources:** Insufficient funding is a major obstacle to large-scale projects.
- **Program duration and longevity:** The limited duration of funding programs does not always correspond to the time required for effective ecosystem restoration, which can affect the continuity and long-term success of projects.

- **Stakeholder engagement:** Engaging stakeholders on the long-term, especially in rural and farming communities, is a challenge, particularly when support programs come to an end.
- **Conflict with farmland use:** Converting farmland into natural areas for restoration can be complex, given the economic importance of agriculture.
- **Tackling urban development:** In urban areas, development pressure makes it difficult to conserve and restore natural habitats, often requiring costly land purchase.
- **High cost of land acquisition:** The high price of land in urban areas represents a significant financial barrier to restoration projects, limiting the capacity of conservation organizations to act.
- **Coordination of project schedules with various suppliers.**

The following comments from discussions with participants illustrate the above points:

- “We applied for funding. Unfortunately, we were told that there are a lot of applications this year, and our application was turned down.”
- “There is enormous development pressure in the areas surrounding Quebec City. Cities rely heavily on taxes as their main source of funding.”

Turnkey restoration opportunities or projects that are easier to carry out:

Few participants mentioned opportunities for turnkey restoration projects or projects that are easier to carry out. The following projects were however mentioned:

- **Restoration of watercourses following a regulatory violation:** A citizen who has altered a watercourse out of ignorance is legally required to restore the environment. This provides an opportunity for rapid intervention to rehabilitate and restore the aquatic habitat.
- **Saint-Pierre Lake:** This lake is a prime area for restoration projects, due to its ecological importance and intervention potential.

Large-scale restoration opportunities:

For large-scale restoration projects, it was mentioned that wetlands that have been isolated from the river due to dyking or other human interventions represent a significant opportunity for restoration. Once reconnected, these areas can once again serve as crucial fish habitats, promoting biodiversity and ecological resilience.

There are restoration opportunities upstream in the watershed, but they face financial challenges. The land in question is currently privately owned and needs to be acquired before restoration projects can be implemented.

Area 4: Outaouais, Abitibi-Témiscamingue, Lanaudière and Laurentides

Scope of participants' knowledge:

The participants' knowledge extends mainly across Quebec, focusing on key regions such as Outaouais, Lanaudière and Laurentides, as well as along the St. Lawrence River upstream of Quebec City. Their initiatives and actions cover specific watersheds, including those of Nord River and Assomption River, with strong involvement in aquatic conservation and restoration projects.

State of knowledge:

Participants describe their knowledge level of their territories mostly as significant or average, depending on their professional experience, their involvement in conservation and restoration initiatives along with the duration of their involvement in their respective regions. They see themselves as having significant or average knowledge, with an inclination to actively engage in their field of expertise and contribute positively to the management and conservation of aquatic environments in Quebec, and particularly in their territory.

Important habitats and locations:

Participants identified several important aquatic habitats in their territories, including:

- **St. Lawrence River:** St. Lawrence River was identified as a critical habitat, particularly for its role in supplying drinking water, its biodiversity and as a navigation route. The portion upstream of Quebec City was mentioned by participants as being of particular importance.
- **Nord River and Assomption River:** These rivers are mentioned for their ecological importance in the Lanaudière and Laurentides regions, serving as sources of drinking water and areas of significant biodiversity.
- **Wetlands and peatlands:** Wetland conservation is considered a priority due to its role in water filtration, carbon storage and as habitats for various wildlife and plant species. Peatlands, in particular, are valued for their ability to store carbon and contribute to the fight against climate change.
- **Spawning areas and fish habitats:** Protecting and restoring fish habitats is essential to maintaining aquatic biodiversity. Spawning areas are specifically identified as habitats requiring conservation measures to ensure fish population survival and renewal.

Degradation or pressure:

Threats and pressures on aquatic habitats identified by participants include:

1. **Urbanization and residential development:** Urban expansion and residential development are cited as factors contributing to soil sealing, habitat fragmentation and increased surface runoff, leading to degradation of water quality and aquatic habitats.
2. **Intensive agriculture:** Intensive agricultural practices, including the use of pesticides and chemical fertilizers, have been identified as sources of pollution that adversely affect water quality in watercourses and wetlands, endangering aquatic flora and fauna.

3. **Invasive species:** The introduction and spread of invasive species in aquatic environments are considered a major threat to biodiversity. These species can alter aquatic ecosystems, compete with native species for resources and alter food chains.
4. **Climate change:** The effects of climate change, including temperature variations, changes in precipitation patterns and the increased frequency of extreme weather events (such as floods and droughts), are perceived as significant threats to aquatic habitat stability and resilience.
5. **Pollution:** Pollution from a variety of sources, including urban wastewater, industrial discharge and agricultural runoff, is a major concern for the health of aquatic ecosystems. Nutrient pollution, in particular, can lead to eutrophication, which is harmful to aquatic life.

Locations and habitats already receiving significant attention:

Important aquatic habitats mentioned by participants in the territory covered by their organization include:

- **The St. Lawrence River**, particularly the portion upstream of Quebec City, is recognized for its essential role as a drinking water source, habitat for diverse aquatic species and an important waterway.
- **Nord River and Assomption River** were mentioned for their ecological importance in the Lanaudière and Laurentides regions. These rivers play a crucial role in providing drinking water and serving as areas of significant biodiversity.
- **Wetlands and peatlands** are valued for their ability to filter water, store carbon and provide habitats for various plant and animal species. Conservation of these environments is seen as a priority for maintaining ecosystem services and helping fight climate change.
- **Spawning areas and fish habitats** are also identified as essential to maintaining aquatic biodiversity and require conservation measures to ensure fish population survival and renewal.

Priority target areas:

According to participants, priority areas for aquatic habitat conservation and restoration include:

- **Urban and peri-urban areas:** Increasing urbanization has been identified as a major source of pressure on aquatic habitats. Urban and peri-urban areas, where soil sealing and surface runoff increase aquatic environment pollution and degradation, should be targeted for restoration and conservation actions.
- **Farmland:** Intensive farming practices, contributing to nutrient and pesticide pollution, are recognized as threatening the health of watercourses and wetlands. Farmland requires action to reduce the environmental impact of agriculture on aquatic habitats.
- **Wetlands and peatlands:** These ecosystems, which are essential for biodiversity, water regulation and carbon storage, are among the most threatened. Their restoration and protection are considered crucial, especially given the impacts of climate change.
- **Shorelines and riparian areas:** Protecting and restoring riparian areas, particularly those of the Nord River, Assomption River and St. Lawrence River, are a priority to maintain water quality, prevent erosion and conserve habitats for aquatic and riparian wildlife.
- **Areas affected by invasive species:** Managing and controlling invasive species in aquatic habitats is essential for preserving native biodiversity and ecosystem health.

Valued aquatic species:

Participants mentioned several valued species within their territories, highlighting the importance of these species to local biodiversity and the need to protect their habitats. These species include:

- **At-risk species** (e.g., lake sturgeon, American shad, freshwater mussels, crappie, bridle shiner): Some fish species are particularly valued because of their at-risk status or their importance to aquatic biodiversity. Conservation and restoration efforts aim to protect these species and improve their habitats to ensure their survival and reproduction.
- **Threatened or vulnerable plant and animal species:** Participants also stressed the importance of protecting various threatened or vulnerable plant and animal species. Preserving these species means protecting natural environments, such as wetlands and peatlands, which play a crucial role as habitats for these species.
- **Water quality indicator species:** Certain aquatic species are considered water quality indicators. Their presence or absence can provide valuable information on the health status of aquatic ecosystems. Water quality monitoring projects often target these species to assess the impact of human activities on aquatic habitats.

Species specifically mentioned include:

- **American eel:** Dams and other barriers block their critical migration routes, which are essential for breeding, while pollution and habitat loss due to urbanization also affect their survival.
- **Copper redhorse:** Habitat degradation through sedimentation and agricultural pollution threatens spawning areas, and the loss of wetlands reduces the quality of habitats available for their life cycle.

Restoration work:

Participants mentioned several restoration projects focused on aquatic and terrestrial conservation, restoration and management. Here is clarification about these projects, based on available information:

- **Watercourse and wetland restoration projects:** Participants contributed to initiatives to restore degraded rivers and wetlands. These projects may include re-naturalizing shorelines, creating or restoring wetlands as natural buffers to filter runoff and reconnecting river meanders to restore natural hydrological processes.
- **Invasive species control:** Specific actions have been taken to eradicate or control invasive species in aquatic ecosystems. These can include manual eradication campaigns, the use of biological control methods or outreach to local communities about the impacts of invasive species.
- **Planting and reforestation projects:** Some participants implemented planting projects along watercourses and wetlands to restore native vegetation, stabilize soils, improve water quality and provide habitats for wildlife.
- **Water quality monitoring programs:** Initiatives to monitor and assess water quality in rivers, lakes and wetlands were carried out to identify sources of pollution, evaluate the effectiveness of restoration measures and guide future actions.

In addition to restoration work, some participants also mentioned **environmental education and awareness-raising** efforts. Some projects also include a public awareness and education component on the importance of aquatic environment conservation, the threats to these ecosystems and individual and collective actions that can contribute to their preservation.

Success factors:

Participants identified several key factors contributing to the success of aquatic and terrestrial restoration projects. Focusing on those mentioned several times, the following is a summary of key success factors:

- **Cross-sector collaboration:** Cooperation between various stakeholders, including government agencies, NGOs, local communities and the private sector, is often cited as essential. This collaboration promotes knowledge sharing, resource allocation and effective project implementation.
- **Community involvement:** Engaging local communities in restoration projects is crucial to their success. Awareness-raising, education and direct citizen involvement in restoration activities strengthen public support for conservation initiatives and ensure their acceptance and longevity.
- **Science-based approach:** The use of scientific and technical data to guide restoration actions is fundamental. This includes conducting preliminary studies to understand the ecological dynamics of sites, identifying target species and threats and monitoring and evaluating project results.
- **Adaptability and adaptive management:** The ability to adapt to changing conditions and project results is a key factor. Successful projects are often those that incorporate an adaptive management approach, allowing strategies and actions to be adjusted as knowledge and conditions on the ground evolve.
- **Stable and sufficient funding:** Adequate financial resources are essential to cover the costs of restoration activities and ensure their continuity. Funding may come from various sources, including government grants, private sector support and community contributions.
- **Long-term vision and strategic planning:** The most effective restoration projects are those that are part of a long-term vision and integrated into strategic planning. This ensures that restoration efforts contribute significantly to overall ecosystem conservation and the achievement of broader environmental goals.

The following comments from discussions with participants illustrate the above points:

- “I think these are successes because they are really developing good techniques. There needs to be a mechanism for sharing best practices, particularly in relation to invasive alien species.”
- “The key to this success, I believe, is the ministère de la Faune’s initial attitude for getting us involved. We took over to make the project a little more fruitful, have more control over it and ensure monitoring.”

Restoration project challenges:

Participants also identified several factors that can contribute to the failure of aquatic restoration projects. The following is a summary of the main failure factors mentioned:

- **Lack of financial resources:** Insufficient funding is often mentioned as a major constraint, limiting the ability to implement ambitious restoration actions or ensure project longevity.
- **Lack of collaboration and coordination:** Difficulties in establishing effective collaboration between the various stakeholders involved, including government agencies, NGOs, local communities and the private sector, can impede restoration project implementation and success.
- **Community resistance:** Lack of awareness or engagement by local communities can lead to resistance or lack of support for restoration projects, reducing their effectiveness or social acceptability.

- **Unsuitable or rigid approaches:** Restoration approaches that fail to consider the unique ecological aspects of sites or lack the flexibility to adapt to changing conditions can lead to unsatisfactory results.
- **Insufficient data or monitoring:** The absence of solid reference data to guide project planning, together with a lack of monitoring and results evaluation, can result in the inability to adjust strategies and measure the effectiveness of restoration actions.
- **Impact of uncontrolled human activities:** The continuation of harmful human activities, such as pollution, unplanned urbanization and excessive resource exploitation, even in restoration areas, can negate the benefits of conservation efforts.
- **Regulatory or bureaucratic issues:** Regulatory obstacles, administrative delays or governance issues can complicate the implementation of restoration projects and limit their scope or effectiveness.

The following comments from discussions with participants illustrate the above points:

- “Requests for authorization, especially when they involve a watercourse or a shoreline, are quite complicated and time consuming. There is a lot of repetitive paperwork to deal with.”
- “We didn’t have solid knowledge. Access to information wasn’t great. In the field, it was difficult to understand the watercourses, where the water was coming from, what was contributing to which watercourse.”

Turnkey restoration opportunities

Participants identified several turnkey restoration opportunities (i.e., projects that are ready for implementation and have high potential for success). These opportunities focus on specific interventions that can be rapidly deployed to improve the health of aquatic and terrestrial ecosystems. Key opportunities mentioned include:

- **Riparian restoration:** Planting native vegetation along watercourse shorelines to stabilize soils, filter pollutants and provide habitats for wildlife is considered a turnkey action. These projects can be carried out with the participation of local communities and have an immediate impact on water quality and biodiversity.
- **Invasive species control:** The identification and elimination of invasive species in aquatic and wetland environments are projects ready for implementation. These actions help restore natural ecosystem dynamics and promote resilience and biological diversity.
- **Creation and restoration of wetlands:** The construction of new wetlands or the restoration of degraded ones are projects with significant ecological benefits, particularly in terms of water regulation, water filtration and support for biodiversity.
- **Improved connectivity of aquatic habitats:** Removing or modifying physical barriers (such as dams or weirs) to restore the free movement of aquatic species is a turnkey opportunity. These projects contribute to the health of fish populations and the diversity of aquatic ecosystems.

Large-scale restoration opportunities:

The large-scale restoration opportunities identified by participants include ambitious projects designed to have a significant impact on the conservation and rehabilitation of aquatic and terrestrial ecosystems on a broader scale. Some of these opportunities include:

- **Reconnecting watercourses and river systems:** Projects to restore ecological connectivity of watercourses (e.g., removing or modifying obsolete dams, restoring meanders, reconnecting floodplains) are major projects. These initiatives promote the free movement of aquatic species, natural sediment dynamics and improved water quality.
- **Restoring wetland functionality on a large scale:** Restoring or creating vast wetlands regulates water flux, filters pollutants and provides crucial habitats for many species. These projects often involve rehabilitating agricultural or urban land into functional natural environments.
- **Reforestation and plant restoration initiatives:** Reforestation and restoration of native vegetation along watercourses and in wetlands over large areas can have a positive impact on soil erosion, water quality and biodiversity.
- **Climate change adaptation:** Projects to strengthen the resilience of aquatic ecosystems to climate change, such as the implementation of nature-based solutions to manage flood and drought risks, are of great importance and require an integrated, large-scale approach.

Area 5: Estrie, Chaudière-Appalaches and Centre-du-Québec

Scope of participants' knowledge:

Participants' knowledge and initiatives cover ecologically and culturally diverse regions. Efforts are focused on the conservation and restoration of aquatic environments in areas such as:

- Saint-Pierre Lake; Nicolet, Saint-François, Bécancour, Chaudière and Yamaska watersheds;
- the Chaudière-Appalaches region;
- the Estrie region;
- the Centre-du-Québec region.

These initiatives encompass a variety of approaches, from integrated watershed management to agricultural rehabilitation, demonstrating a thorough understanding of local ecological challenges and site-specific strategies for aquatic habitat preservation.

State of knowledge:

Participants rated their knowledge level on aquatic environment conservation and restoration as average to very significant, reflecting a diverse range of expertise in Quebec. Some participants had specialized expertise in specific fields, such as aquatic invasive plants or the coordination of scientific projects relating to fish and fish habitat. Participants' expertise came from their initial training, close collaboration with technicians and engineers in biology or water engineering or from their role in the organization.

Important habitats and locations:

The following is a summary of important aquatic sites and habitats in the region, as mentioned by participants.

These points underline the diversity and ecological importance of aquatic habitats in the region as well as the challenges posed by human activities and the need for appropriate conservation and restoration measures.

- **Saint-Pierre Lake and surrounding areas:** Identified as areas of critical importance for biodiversity, these sites are facing issues related to intensive farming practices and physical barriers.
- **Mégantic Lake and Chaudière River:** These sites are considered key areas for biodiversity and water regulation.
- **Floodplains around Saint-Joseph-de-Beauce:** These are areas of ecological interest.
- **Mouth of the Etchemin River:** Important for various fish species, including American eel, this site faces water quality issues related to upstream farming activities.
- **Nicolet River and its tributaries:** These sites are experiencing pressure and degradation due to agriculture and urban development.
- **Saint-Pierre Lake shoreline:** The shoreline is affected by the transformation of grasslands into farmland.
- **Yamaska watershed:** The lakes in this watershed are used as drinking water intakes and are all considered important.
- **Yamaska River:** Key habitat for aquatic wildlife, especially upstream.
- **Riparian and adjacent areas:** These areas act as “sponges” to prevent flooding. They are heavily disturbed by agriculture. Chaudière River was cited as particularly affected by flooding and human activities.

- **Various types of wetlands:** River sections with economically or ecologically important species.

Degradation or pressure:

Threats and pressures to aquatic habitats in the region, as mentioned by participants, arise in a variety of ways:

- **Erosion, sedimentation and pollution:** Primarily from agriculture and urbanization, causing degradation of water quality and critical habitats in riparian areas and adjacent aquatic environments. This is the case, for example, in Etchemin River and upstream agricultural areas where the accumulation of contaminants and the intensive use of pesticides negatively impact water quality and fish habitats. Another example of this type of pressure is present in the downstream part of the Yamaska watershed.
- **Changes in water temperature and bottom structure:** These changes cause degradation in areas with warm water and sandy bottoms, affecting rapids and slow-flowing areas, and impacting various types of fish habitats.
- **Intensive agriculture and industrial discharge:** Threat to spawning grounds, juvenile rearing areas and feeding habitats in Saint-Pierre Lake and its tributaries, which are critical habitats for species such as smallmouth bass, walleye and northern pike.
- **Lack of riparian strips,** particularly in À La Scie River and in Grande Plée Bleue.
- **Transformation of grasslands into farmland** and wetland drainage, reducing aquatic biodiversity, particularly in the nearshore of Saint-Pierre Lake and in the lowlands.

Locations and habitats already receiving significant attention:

Areas of significant interest for aquatic habitat restoration and conservation, according to participants, include:

- **Chaudière River and Etchemin River:** Specific areas between Saint-Georges and Lévis for Chaudière River, and between Saint-Anselme and Lévis for Etchemin River, were mentioned for their advanced state of degradation due to intensive agriculture, the loss of wetlands in certain areas and the impacts of urbanization.
- **Areas with targeted restoration actions:** Bulstrode River, the Trois-Lacs area and the central area of Nicolet River were identified for their environmental degradation. Action plans are in place and funding is available to facilitate the restoration of these three areas.
- **Saint-Pierre Lake and its tributaries:** These areas are a priority due to their rich biodiversity and ecological importance, with a focus on aquatic habitat rehabilitation and pollution control.
- **Massif du Sud:** This area already benefits from a natural reserve, with ongoing efforts to expand its size to counter the effects of economic development, logging and tourism.
- **Areas of interest for agricultural sustainability and species conservation:** The importance of sustainable farming practices, projects with Indigenous communities involving key species such as eel and habitat restoration initiatives for certain fish species were mentioned.
- **Yamaska watershed:** Lakes with local action plans, upstream areas for the protection of drinking water sources and areas requiring increased collaboration for ambitious restoration projects were identified as key areas.

Priority locations and habitat types:

Areas that should be prioritized for restoration and conservation efforts, as discussed, are as follows:

- **Chaudière River and Etchemin River:** Between Saint-Georges and Lévis (Chaudière River) and between Saint-Anselme and Lévis (Etchemin River) due to significant problems such as loss of riparian strip quality, intensive farming, over-fertilization and loss of wetlands.
- **Area around Saint-Pierre Lake and its tributaries:** This area includes Saint-François River, Nicolet River and Bécancour River. These areas are essential for aquatic biodiversity. They are also vulnerable to human activities such as intensive farming and the impacts of hydroelectric dams, requiring targeted action to improve water quality and restore habitats.
- **Saint-Pierre Lake nearshore and agricultural lowlands:** Significant degradation observed due to conversion of grasslands into farmland, with significant impact on aquatic habitats. The majority of wetlands in these agricultural areas have been drained, resulting in habitat loss for aquatic wildlife and development challenges.
- **Watershed headwaters and drinking water supply lakes:** These areas are priorities for water supply and aquatic habitat conservation. Protecting and restoring upstream habitats and small peripheral watercourses under heavy agricultural pressure is crucial to improving water quality and habitat for aquatic species.

Restoration potential including planned or ongoing projects:

Several potential restoration sites or projects were mentioned by participants, including:

- Riparian habitat restoration and invasive species control: The focus is on restoring degraded riparian habitats and controlling invasive species, with the active support of watershed committees. Wetland creation and restoration are also identified as important initiatives, despite legislative and technical challenges.
- Initiatives around Trois-Lacs, Nicolet Lake and upstream of Beaudet Reservoir for Bulstrode River are considered key opportunities. These projects aim to restore aquatic habitats and protect biodiversity.
- Projects to improve ecological conditions around Saint-Pierre Lake include working with farmers and authorities to promote sustainable practices. Specific management plans, such as those for sturgeon in Drummondville as well as interventions relating to eel and dam identification to facilitate fish migration are also mentioned.
- River revitalization and use of aquatic protection funds: The revitalization of the Clinton and Arnold rivers to restore them to a more natural state and the use of environmental damage funds to finance stormwater management and aquatic protection projects were mentioned.
- Improved habitats for certain fish species: A major ongoing project related to climate change and farming practices aims to improve small percidae habitats in the Nicolet region as well as collaborative efforts with Indigenous communities on eel.
- Yamaska watershed restoration projects: Initiatives such as navigation regulations on certain water bodies, restoration upstream of Boivin Lake and land acquisition by municipalities to create public spaces and restore aquatic environments are identified. Specific projects to renaturalize watercourses and improve water and habitat management were also discussed.

Valued aquatic species:

Valued aquatic species, as mentioned, range from fish to amphibians, and reflect the ecological, economic and recreational importance of these species in their respective ecosystems. The following is a summary of the valued species:

- **At-risk fish and aquatic species:** Efforts are made to protect and restore habitats for at-risk, threatened or vulnerable species, including fish such as percidæ, river redhorse and eel, as well as other species such as salamanders and bank swallows.
- **Yellow perch and ducks:** Specific interventions are aimed at improving the accessibility and quality of yellow perch habitats around Saint-Pierre Lake as well as wildlife management of ducks, highlighting their ecological and recreational importance.
- **Brook trout:** This game fish is popular with anglers and contributes to recreational fishing activity in the region, underlining their value for monitoring population status and for local biodiversity.
- **American eel and Etchemin Lake trout:** These species are valued due to their special concern status and unique habitat, with conservation and restoration efforts being undertaken to protect them from anthropogenic pressures.
- **Exploited and game species:** The importance of eel, yellow perch, lake sturgeon, brown bullhead, pike and muskellunge, as well as brook trout and brown trout stocking activities, reflects a diversity of recreational, economic and conservation interests.
- **Wood turtle and sportfishing species:** Wood turtle is valued for conservation efforts as an indicator of ecosystem quality. The species targeted by sportfishing, although not specifically named, are important for recreation and the regional economy, despite pollution issues.

Restoration work:

Restoration work carried out in various territories reflects a combination of initiatives to improve aquatic habitat quality and support biodiversity, including:

- **Improved water quality and flow management:** Projects around Saint-Pierre Lake have included water flow management for sturgeon reproduction and habitat restoration for American eel, demonstrating a proactive approach based on collaboration between different organizations.
- **Watercourse revitalization:** Restoration efforts on the Clinton and Arnold rivers aim to restore them to a more natural state following agricultural development, with hydrological studies developed to identify areas of interest.
- **Watercourse natural habitat restoration:** Compensation projects have been undertaken to redefine watercourses, often in agricultural areas, to correct past anthropogenic changes and restore natural aquatic habitats.
- **Improving habitats for small percidæ:** A significant project in the Nicolet River aims to restore and improve habitats for species such as walleye and yellow perch, with a focus on improving riparian strips and agricultural practices.
- **Eel habitat restoration efforts,** in collaboration with Indigenous communities, highlighting an inclusive, multi-sectoral approach to environmental challenges.
- **Change in watercourse maintenance methods:** An effort to improve municipal watercourse maintenance practices has been made in order to reduce negative impacts on the aquatic ecosystem and adopt more environmentally friendly approaches.

Restoration work success or failure:

Success factors

Key success factors for aquatic restoration projects, as mentioned in the discussions, underline the importance of an integrated, collaborative approach. Here are essential elements that were mentioned several times:

- **Involvement of owners and local communities:** The engagement and active participation of landowners and local communities is critical to the success of restoration initiatives. Their involvement promotes sustainable development and ensures strong local support.
- **Cross-sector collaboration:** Project success depends on effective collaboration between different partners, including environmental organizations, governments, private companies and Indigenous groups. Multi-stakeholder cooperation makes it possible to address restoration challenges holistically.
- **Use of scientific and traditional knowledge:** The combination of modern scientific knowledge with traditional knowledge enriches project planning and execution. It improves intervention suitability and the understanding of local ecosystems.
- **Adequate funding and resources:** Project success also depends on access to sufficient funding and qualified human resources. These elements are necessary to carry out studies and field interventions as well as to ensure effective monitoring.
- **Effective planning and project management:** Rigorous planning, including clear and measurable objectives, and careful project management are essential to achieve desired outcomes and ensure the longevity of restoration efforts.
- **Adaptability and continuous learning:** Flexibility to adapt to changing conditions and the ability to learn from previous experiences are vital to continuously improve restoration strategies.
- **Regionalization of efforts:** Projects that are specifically tailored to regional needs are more likely to succeed. This targeted approach addresses the unique needs and challenges of each ecosystem.
- **Awareness-raising and community engagement:** Raising awareness of environmental issues and engaging local communities in restoration projects strengthens public support and promotes the long-term success of initiatives.

The following comments from discussions with participants illustrate the above points:

- “There are also social factors, such as involving the owner. This doesn’t necessarily guarantee success, but the owner will strive to maintain the layout.”
- “The lake is heavily overgrown with an aquatic plant, generating dissatisfaction. Together with the residents’ association, we put in place an environmentally responsible control project. It turned out to be a success, but it didn’t happen overnight. I call it the lab because we tried a lot of things. Sometimes it works, sometimes it doesn’t.”

Restoration project challenges:

The main difficulties experienced in restoration projects, as mentioned by participants, encompass a wide range of financial, administrative and environmental challenges:

- **Insufficient financial resources and costs:** Funding is consistently cited as a major obstacle, with high costs for restoration projects and a general lack of financial resources to adequately support them.
- **Climate hazards:** Extreme weather conditions, such as heat waves or floods, can seriously compromise restoration project results, underlining the vulnerability of these initiatives to environmental change.
- **Owner involvement:** Landowner engagement is critical to the success of projects; their lack of involvement or support can be a significant barrier.
- **Post-restoration monitoring:** Limited funding for post-restoration monitoring activities makes it difficult to assess the effectiveness of projects and measure their impact on aquatic ecosystems.
- **Complex and slow administrative processes:** Administrative procedures to obtain the necessary authorizations can be lengthy and complicated, delaying or even jeopardizing restoration projects.
- **Inadequate project design:** Design errors can lead to failure, particularly when projects are not properly adapted to local conditions or ecological needs.
- **Lack of planning and long-term vision:** The absence of careful planning and a long-term vision that integrates all potential impacts, including climate change, can limit the effectiveness and sustainability of projects. Difficulty in adopting an integrated approach adapted to the entire watershed and its uses can hinder restoration project success.
- **Funding program restrictions:** Limitations imposed by funding programs, such as restricted hourly rates and administrative fees, as well as competition for access to funds, are also challenges.
- **Land use planning challenges:** In some regions, the territorial reality (mostly privately owned land and farmland) limits the options available for ambitious restoration projects.

The following comments from discussions with participants illustrate the above points:

- “The reality is that there is still a lot of work to be done. We have to keep moving forward and fight the system, economic development, the government, everything that is in place. There is a will, but there is also a strong ‘not-in-my-backyard’ attitude.”
- “They just consider a 500-meter perimeter around the work area. They don’t consider what happens upstream. But we know that everything that happens upstream will end up having a cumulative effect downstream.”

Turnkey or large-scale restoration opportunities

The turnkey restoration opportunities identified by participants revolve around specific projects and areas where interventions can be rapidly implemented for a positive impact on aquatic environments:

- **Projects around Trois-Lacs and Nicolet Lake:** These areas, already supported by accumulated knowledge and action plans, are identified as ready to initiate new restoration projects. The area upstream of Beaudet Reservoir for Bulstrode River, as well as the central section of the Nicolet River and areas along the south shore of Saint-Pierre Lake, are also mentioned as having potential for restoration initiatives.
- **Revitalization of Clinton and Arnold rivers:** These projects aim to restore the rivers to a more natural state, after historic modifications for agriculture. This represents a significant opportunity to restore these watercourses and improve the aquatic habitat environment.

- **Improved riparian strips and farming practices:** A major project underway in the Nicolet region aims to adapt the management of riparian strips and farming practices to tackle the impacts of climate change. This project is seen as a major effort to protect and restore aquatic habitats, particularly for small percidae.
- **Navigation regulation and ecological improvement projects:** Although not exactly turnkey restoration projects, initiatives to regulate navigation on certain water bodies and adopt more environmentally friendly watercourse maintenance methods represent important opportunities for the conservation of aquatic ecosystems.
- **Rehabilitation of reservoirs on Saint-Pierre Lake:** This major project involves the redevelopment of dykes to improve water levels and has significant potential for ecological restoration, although concerns have been raised about its management approach.

Area 6: Montréal, Laval and Montérégie

Scope of participants' knowledge:

Participants cover a variety of geographic areas, mainly around various regions and watersheds in Quebec, including in Estrie and Montérégie as well as around Coaticook and Brome-Missisquoi.

State of knowledge:

One participant described their knowledge level as average. Others interviewed in this region didn't specifically identify their level, but based on what they said and their experiences, they have in-depth expertise and are significantly involved in the conservation and restoration of aquatic environments in Quebec.

Important habitats and locations:

In the area covered by the participants' organizations, several important aquatic habitats were mentioned. These habitats include several aquatic environments, such as lakes, located mainly in regions such as Estrie and Montérégie. Floodplains and riparian wetlands were also mentioned for their critical importance in conserving aquatic habitats. Furthermore, Îles de la Paix in Saint-Louis Lake were identified as migratory bird sanctuaries and national wildlife areas, playing an essential role for biodiversity, including both aquatic and terrestrial species. Erosion was mentioned as a significant threat to these habitats. These environments are vital to maintaining the ecological health and biodiversity of these territories.

Degradation or pressure:

Based on discussions, several threats and pressures on aquatic habitats were identified, including:

- Erosion is a major threat to islands and lakeshores, reducing the size of habitats available to aquatic and terrestrial flora and fauna.
- Invasive species disrupt local ecosystems, creating an imbalance that can adversely affect native species and the quality of aquatic habitats.
- The impact of human activities, such as urban and industrial development, can lead to water pollution, natural habitat destruction and watercourse alteration.
- Agricultural activities, which contribute to increased nutrient and sediment input to watercourses, affect water quality and may result in eutrophication of aquatic environments.
- Climate change can alter water regimes, increase the frequency and intensity of extreme weather events and influence the distribution of aquatic species.

Locations and habitats already receiving significant attention:

According to participants, areas or sites of significant interest for the conservation and restoration of aquatic habitats include:

- Mountainous areas and forest massifs in the Estrie region, particularly around Sherbrooke and Mégantic, recognized for their significant potential for aquatic habitats and importance for biodiversity.

- Agricultural areas in the Coaticook region and around Brome and Bromont lakes, as well as in the Yamaska area, where the impact of agriculture on water quality and aquatic habitats is a major concern.
- Îles de la Paix in Saint-Louis Lake, valued for their role as a migratory bird sanctuary and national wildlife reserve, but also threatened by erosion and changing water levels.
- Marshes and floodplains, particularly those affected by human and farming activities, which are essential for maintaining biodiversity and the ecological functions of aquatic habitats.

Priority locations and habitat types:

According to participants, priority areas for aquatic habitat conservation and restoration include:

- **The mountainous regions and forest massifs in the Estrie region**, particularly around Sherbrooke and Mégantic, for their rich biodiversity and sensitive aquatic ecosystems.
- **Agricultural areas** in the Coaticook region and around Brome and Bromont lakes, as well as the Yamaska sector, where agriculture has a significant impact on water quality and natural habitats.
- **Îles de la Paix** in Saint-Louis Lake, a biodiversity reserve and critical wetland facing erosion and changes in water levels.
- **Marshes and floodplains** affected by urban and agricultural development, essential for water filtration, flood storage and as habitats for various species.

Most degraded areas

The most degraded areas or aquatic environments in the region, as identified by participants, include:

- Watercourses located in agricultural areas, or their alteration for agricultural purposes, has led to sedimentation problems, nutrient pollution and loss of biodiversity due to lack of riparian strips and watercourse straightening.
- Areas affected by erosion, particularly around Îles de la Paix in Saint-Louis Lake, where changing water levels and human activities have significantly eroded shorelines, threatening the stability of aquatic and terrestrial habitats.
- Habitats affected by invasive species, which degrade water and habitat quality, disrupt local ecosystems and threaten native species.
- Urban and industrialized areas, where development has led to water pollution, natural habitat destruction and watercourse alteration, with negative consequences for biodiversity and aquatic environment quality.

Restoration potential

Potential restoration sites or projects cited by participants include:

- Restoration of **watercourses in agricultural areas**, where there is a need to restore natural meanders, establish riparian strips and manage sedimentation and nutrient pollution.
- Protection and **restoration of the shorelines of Îles de la Paix** in Saint-Louis Lake, to counter erosion and preserve these critical habitats for biodiversity.
- Interventions to control or eliminate **invasive species** that threaten local ecosystems, with a focus on environmentally responsible strategies.
- Implementation of projects in **urban and industrialized areas** to improve water quality, restore natural habitats and reduce the environmental impact of human developments.

Aquatic species

Participants mentioned that **salmonid species** are often indicators of water quality and play a crucial role in aquatic ecosystems.

Other species of interest were mentioned:

- **Migratory birds**, which depend on wetlands and aquatic habitats for nesting and feeding during their migration.
- **Amphibians**, such as some frog species, are sensitive to changes in their environment and serve as indicators of ecosystem health.
- **Reptiles**, including turtle species, require specific habitats for reproduction and survival.

Restoration work:

Restoration work in the region includes a variety of initiatives to improve the quality of aquatic habitats and support biodiversity. These initiatives include:

- **Restoration of watercourses in agricultural areas**, which involves actions such as reintroducing natural meanders, establishing riparian strips to filter nutrients and reduce sedimentation and tackling the negative impact of agriculture on water quality.
- **Shoreline stabilization projects** to combat erosion, particularly in sensitive areas such as Îles de la Paix in Saint-Louis Lake. These projects aim to protect habitats from land loss and preserve aquatic ecosystem structure.
- **Controlling invasive species**, with specific interventions to limit their spread and impact on local ecosystems, using ecologically responsible methods to restore the balance of natural habitats.
- **Efforts in urban and industrialized areas** to reduce pollution, improve stormwater management and restore natural habitats degraded by development. These projects often include creating or restoring wetlands as natural water filtration tools.

Restoration work success or failure:

Success factors

Success factors for restoration projects, as repeatedly cited by participants, include:

- **Collaboration and partnership:** Restoration project success is often attributed to effective collaboration between various entities, such as government agencies, NGOs, universities, local communities and landowners. These partnerships make it possible to share resources and knowledge as well as maximize restoration efforts.
- **Funding and financial support:** Access to stable and sufficient sources of funding is crucial for the implementation and longevity of restoration projects. Government subsidies, private business support and community contributions are key to getting restoration initiatives off the ground and keeping them going.
- **Community engagement and awareness-raising:** Active involvement of local communities and raising awareness of the importance of aquatic ecosystems play a fundamental role in the long-term success of projects. Environmental education and citizen participation strengthen local support and encourage sustainable behaviours.

- **Adaptive planning and management:** The ability to adapt methods and strategies in response to changing conditions and monitoring results is essential. A flexible approach makes it possible to adjust restoration actions to maximize their effectiveness and positive impact on the environment.
- **Scientific monitoring and evaluation:** Rigorous monitoring programs to assess the effectiveness of restoration projects are a key factor in their success. The data collected helps to understand the ecological impacts of interventions and inform future decisions.

The following comments from discussions with participants illustrate the above points:

- “What made this project successful is that there’s a mining company that has a big deposit in the area, but it’s really proactive in terms of restoration and investment in environmental protection. The company financed part of the project.”
- “There were funds available to restore the old areas, so we were able to carry out these projects.”

Restoration project challenges:

Restoration project failure factors mentioned by participants mainly include:

- **Lack of funding and resources:** Insufficient or unstable funding can impede the implementation or continuity of restoration projects, limiting their scope and effectiveness.
- **Collaboration and coordination difficulties:** Challenges in working with partners due, for example, to diverging interests or lack of communication, can jeopardize project delivery.
- **Community or landowner resistance:** Lack of support or opposition from local communities and landowners can be a major obstacle, especially when projects require changes in land use or access to resources.
- **Regulatory and administrative constraints:** Navigating complex regulatory frameworks and administrative procedures can delay or impede restoration initiatives.
- **Lack of monitoring and evaluation:** Failure to rigorously monitor and evaluate the impact of restoration projects can lead to an underestimation of their effectiveness or the repetition of errors in future projects.
- **Underestimating ecological complexities:** Failure to fully understand or consider the complexity of ecosystems can lead to inappropriate interventions that fail to achieve restoration objectives or have unanticipated adverse effects.

The following comments from discussions with participants illustrate the above points:

- “Engineers and biologists were involved in the project, but they don’t speak the same language and didn’t understand each other.”
- “When it comes to restoring a forest environment, let’s just say it sounds less ‘sexy’ to elected officials. At any rate, it requires a little more willpower to secure funding. I think that’s one of the reasons why fewer projects are launched.”

Turnkey restoration opportunities:

A number of easy restoration opportunities were mentioned:

- **Restoring riparian strips:** Creating or strengthening vegetated riparian strips along watercourses to filter pollutants, control erosion and provide habitats for wildlife.
- **Rehabilitation of straightened watercourses:** Reintroduction of meanders in watercourses that have been straightened for agriculture or other human activities, in order to restore their natural dynamics and enhance aquatic and riparian biodiversity.
- **Controlling or eliminating invasive species:** Targeted projects to control or eradicate invasive species that threaten local ecosystems, using methods that minimize the impact on native species and the environment.
- **Creation or restoration of wetlands:** Creation of artificial wetlands or restoration of degraded wetlands to improve water quality, increase biodiversity and provide nesting and feeding areas for various species.

Large-scale restoration opportunities:

A few large-scale restoration opportunities were mentioned, including:

- **Watershed restoration:** Initiatives to address environmental and hydrological issues across an entire watershed, integrating water quality management, habitat restoration and the sustainable management of farmland and forests.
- **Rehabilitation of large wetlands and marshlands:** The restoration of large wetlands, although not considered fish habitats, plays a crucial role in regulating water regimes, storing carbon, filtering pollutants and providing habitats for rich biodiversity.
- **Aquatic ecological corridors:** Creating or strengthening ecological corridors that connect fragmented aquatic habitats facilitates migration and movement of aquatic species and contributes to ecosystem resilience and biological diversity.
- **Integrated water resource management:** Projects that apply integrated water resource management approaches to balance human needs with aquatic ecosystems conservation, involving all watershed stakeholders in decision-making and action implementation.

Area 7: Provincial scope of action

Scope of participants' knowledge:

The participants interviewed in this region have knowledge that spans a wide geographic area across Quebec, highlighting a diversity of aquatic ecosystems from large rivers and lakes to wetlands. These conservation and restoration efforts focus in particular on the St. Lawrence River and its tributaries, Saint-Pierre Lake, as well as on specific regions such as the Côte-Nord region and areas impacted by hydroelectric and forestry activities. Participants are collaborating with various organizations to study reservoir impacts and loss of aquatic connectivity, while engaging in fish habitat compensation projects and invasive species control.

State of knowledge:

Participants rated their knowledge level in their respective areas related to the conservation and restoration of aquatic environments in Quebec as significant. Their qualifications reflect a high degree of specialization and a significant contribution to the science and practice of aquatic conservation in the province.

Important habitats and locations:

The aquatic habitats mentioned by participants include a variety of key ecosystems across Quebec, underlining their importance for biodiversity and conservation. Among these, the St. Lawrence River and its tributaries are frequently cited, in particular for their crucial role in supporting aquatic life and as areas requiring restoration efforts. Saint-Pierre Lake was also identified as an important aquatic habitat, particularly for its biodiversity-rich floodplain, which faces significant anthropogenic pressures. These habitats are recognized for their ecological value, their role in maintaining fish and other aquatic species populations and for the conservation challenges they present.

Other specific regions, such as areas impacted by hydroelectric and forestry activities as well as rivers and lakes affected by loss of aquatic connectivity due to roads, are also highlighted.

Degradation or pressure:

According to participants, aquatic habitats in Quebec are subject to a number of threats and pressures. Among these, habitat fragmentation due to dam and road construction, leading to a loss of aquatic connectivity, is frequently cited. Water eutrophication, resulting from excessive nutrient inputs from agricultural activities and wastewater, is also mentioned as a major problem affecting water quality and the health of aquatic ecosystems. Invasive species, such as Eurasian watermilfoil, pose a significant challenge by displacing native species and altering habitats. Climate change, with its impact on water temperature and hydrological regimes, is identified as a global threat affecting the distribution and survival of aquatic species. Finally, industrial exploitation and shoreline development pressure are also highlighted as factors contributing to the degradation of aquatic habitats. These threats underscore the importance of implementing appropriate conservation and restoration strategies to protect Quebec's aquatic environments.

Locations and habitats already receiving significant attention:

According to participants, several areas or sites are of significant interest for conservation and restoration. The St. Lawrence River, with a particular focus on the St. Lawrence floodplain and Saint-Pierre Lake, is frequently mentioned

due to its high biodiversity and precarious ecological status. These areas are considered critical for conservation due to their role in supporting fish populations and other aquatic species, despite significant anthropogenic pressures.

Other sites of interest include habitats impacted by hydroelectric activities, particularly in the context of fish habitat compensation projects in northern Quebec. Environments affected by forest roads, in particular the loss of aquatic connectivity caused by culverts, are also targeted for restoration initiatives.

Efforts to control invasive species, such as Eurasian watermilfoil in lakes, and to restore salmonid spawning habitats in various watercourses also highlight the importance of these areas for aquatic restoration in the province. These sites and areas reflect the diversity of Quebec's aquatic ecosystems and the multiple conservation challenges they face.

Priority locations and habitat types:

Participants identified several priority areas for aquatic habitat conservation and restoration in Quebec. Among these areas, the St. Lawrence River and its tributaries, including the St. Lawrence floodplain and Saint-Pierre Lake, are considered essential due to their significant biodiversity and the environmental pressures they face. These areas are vital for many aquatic species and are affected by activities such as agriculture and urbanization.

Wetlands, particularly around Saint-Pierre Lake, are also highlighted as critical habitats requiring urgent protection and restoration efforts. These ecosystems play a key role in regulating water cycles, maintaining biodiversity and as fish spawning grounds.

Areas impacted by hydroelectric activities and forest roads, resulting in loss of aquatic connectivity and changes in aquatic ecosystems, are also cited as priority targets for conservation actions. Restoration of connectivity in these areas, including by modifying or replacing culverts, is seen as an important measure for improving watercourse health.

Finally, controlling invasive species in lakes and rivers is another priority highlighted by participants, as these species can significantly alter aquatic ecosystems and reduce native biodiversity.

Most degraded areas:

According to participants, the most degraded aquatic environments in Quebec include the St. Lawrence floodplain and Saint-Pierre Lake, which are affected by intensive agriculture, urbanization and the construction of infrastructure that disrupts natural ecosystems. These areas are under considerable pressure due to eutrophication, sedimentation and the loss of vital habitats for aquatic wildlife. Wetlands around Saint-Pierre Lake are also cited as particularly vulnerable due to their ecological importance and the multiple threats they face, including the spread of invasive species such as Eurasian watermilfoil. In addition, habitats influenced by hydroelectric activities and forest roads are identified as areas that have suffered significant degradation, mainly due to habitat fragmentation and loss of aquatic connectivity, disrupting the natural ecological dynamics of watercourses and limiting the movement of aquatic wildlife. These environments reflect the conservation and restoration challenges that Quebec faces in maintaining the health and biodiversity of its aquatic ecosystems.

Restoration potential:

Participants cited several potential restoration sites and projects that reflect various approaches to improving the health of Quebec's aquatic ecosystems. Among these initiatives, habitat restoration in the St. Lawrence River, particularly through efforts to counter eutrophication and sedimentation, is being promoted. Saint-Pierre Lake is also identified as a key restoration site due to its ecological importance and the environmental pressures it faces.

Projects to restore aquatic connectivity and improve fish passage, such as modifying or replacing culverts under roads or forest roads, are also mentioned. These efforts seek to restore the natural movement of aquatic species through watercourses impacted by human infrastructure.

Invasive species control, such as Eurasian watermilfoil in lakes, is also cited as a priority for action, with projects that include management and control techniques to preserve native biodiversity and aquatic health.

Finally, the creation or restoration of spawning grounds for salmonids and other fish species in various watercourses in Quebec is mentioned as an important measure to support fish population reproduction and survival.

Aquatic species:

Participants highlighted a number of valued aquatic species in Quebec, emphasizing their ecological importance and sometimes their special concern status. Among these species, the copper redhorse is specifically mentioned as an endangered endemic species in Quebec, and therefore a priority for conservation. This fish symbolizes conservation efforts targeting species unique to Quebec's aquatic habitats.

Lake sturgeon, another valued species, is cited for its importance in the Greater Montréal area, with mentions of projects to restore and protect its habitats. This species illustrates the conservation challenges posed by urban and industrial development.

Northern pike is also discussed as a key species for aquatic ecosystems, in part because of its need for specific breeding habitats, such as floodplains, which are threatened by urbanization and changes in land use.

In addition to copper redhorse, lake sturgeon and northern pike, participants also mentioned brook trout and lake trout as important species in Quebec's aquatic ecosystems. These species are valued for sportfishing and play a crucial role in the biodiversity of their habitat. They face challenges such as warming waters, competition from introduced species and the destruction of their natural habitats. The mention of these species illustrates the richness of Quebec's aquatic biodiversity and highlights the importance of conservation efforts to protect these vulnerable populations.

Restoration work:

A number of restoration projects have been carried out in Quebec, including the following key initiatives:

- Aquatic connectivity restoration: Efforts have been made to modify or replace culverts under roads or forest roads to restore the natural movement of aquatic species through watercourses impacted by human infrastructure.

- Invasive species control: Projects have been launched to control and manage invasive species, such as Eurasian watermilfoil in lakes, using appropriate management techniques to preserve native biodiversity and aquatic health.
- Creation and restoration of spawning grounds: The creation or restoration of spawning grounds for salmonids and other fish species in various watercourses in Quebec is identified as an important measure to support fish population reproduction and survival.

Restoration work success or failure:

Success factors:

Participants mentioned several key factors contributing to the success of aquatic restoration projects. Among those repeatedly cited, the importance of scientifically sound planning and a thorough understanding of the target ecosystems stand out as essential. This includes the need for a precise assessment of environmental impacts and the specific needs of the species and habitats concerned.

Another frequently mentioned success factor is the involvement and collaboration of various stakeholders, including local communities, conservation organizations, researchers and government authorities. This collaborative approach promotes knowledge sharing, alignment of objectives and effective implementation of restoration actions.

Long-term monitoring and project adaptability are also considered crucial. The ability to adjust strategies based on results and environmental changes ensures dynamic and responsive management of restored ecosystems.

Finally, public awareness and education on the importance of aquatic habitat conservation and related issues are seen as fundamental to ensure community support and active participation in these projects.

The following comments from discussions with participants illustrate the above points:

- “It is also a success because we went and did a historical analysis of what was in that territory. Success mostly stems from being brave enough to conduct a full analysis.”
- “This is a success because we can take the necessary time, as the protected areas are on our lands. No one is pushing us with an agenda. We can set up the research projects, making sure that everything is done properly.”

Restoration project challenges:

Participants identified several failure factors in aquatic restoration projects, highlighting common obstacles to effective restoration. A critical failure factor cited is the lack of long-term monitoring and project evaluation, which prevents clear understanding of intervention effectiveness and the ability to adjust strategies accordingly.

The lack of in-depth scientific knowledge or inadequate application of this knowledge in project planning and delivery is another significant obstacle. This can lead to actions that are poorly adapted to the specific needs of the target habitats and species, reducing their effectiveness.

Inadequate coordination and collaboration between the various stakeholders involved (e.g., government authorities, conservation organizations, local communities) can also jeopardize projects, limiting their scope and impact.

Furthermore, restoration is sometimes undertaken without adequate consideration of broader environmental factors or ongoing anthropogenic pressures, such as pollution or urbanization, which can compromise restoration efforts.

The following comments from discussions with participants illustrate the above points:

- “There are technical challenges and a lack of understanding about how to implement a project. You have to obtain the necessary permits and procure fairly complex services, which may involve machinery. There are a lot of complex regulations to follow. It can be a real barrier, and organizations often don’t get past this stage.”
- “Most of the time, the increased cost of labour and materials is a limiting factor.”

Turnkey restoration opportunities:

Participants mentioned several turnkey restoration opportunities. Among these opportunities, restoration of watercourse connectivity through modification or replacement of undersized or poorly designed culverts is often cited. This measure aims to facilitate fish passage and restore natural water flow, contributing to the overall health of aquatic ecosystems.

Another turnkey project mentioned is the management and control of invasive species, such as Eurasian watermilfoil, which can be addressed through targeted physical, chemical or biological interventions to restore natural habitats and protect local biodiversity.

The creation or restoration of spawning grounds for specific fish species, using techniques and materials that mimic natural conditions, was also identified as a promising opportunity. These actions promote the reproductive success of target species and strengthen fish populations.

Large-scale restoration opportunities:

Large-scale restoration opportunities discussed by participants focus on ambitious initiatives with the potential to significantly transform aquatic ecosystems and contribute to biodiversity conservation on a regional or provincial scale. These opportunities include:

- Habitat restoration in the St. Lawrence River: This includes efforts to improve water quality, control invasive species and restore wetlands and spawning habitats along the river, which are essential for many aquatic and terrestrial species.
- Protection and restoration of the Saint-Pierre Lake floodplain: Saint-Pierre Lake and its floodplain represent a unique ecosystem requiring restoration measures to combat sedimentation, eutrophication and habitat loss due to agricultural and urban activities.
- Improving watercourse connectivity: Projects to remove obsolete dams or improve fish passage through existing infrastructure, such as culverts, to restore the natural movement of aquatic species through watersheds.
- Invasive species control: Large-scale management of invasive species, such as Eurasian watermilfoil, through targeted and coordinated interventions to restore and protect native aquatic habitats.

These initiatives reflect a comprehensive and integrated approach to aquatic restoration, recognizing the need for coordinated and large-scale actions to address the complex and interconnected environmental challenges that are facing Quebec’s aquatic ecosystems.

Appendices

A.1 Invitation e-mail

Hello (INSERT CONTACT NAME),

My name is ____ and I work for Léger. We have been mandated by Fisheries and Oceans Canada (DFO) to conduct a targeted consultation with people who have experience and knowledge related to the conservation and restoration of aquatic environments. The aim of our study is to draw a portrait of restoration priorities in Quebec.

Your name and contact information were provided to us by Fisheries and Oceans Canada following your positive response to a brief conversation in which you shared your perspective on the needs, threats and opportunities related to fish habitat and restoration possibilities.

First, I would like to thank you for agreeing to speak with us. Your participation is greatly appreciated and will be a great help to the Fisheries and Oceans Canada team.

Would you be available for a 45-minute call within the next few weeks? If yes, could you please provide me with three available time slots?

The interview will take place via video conference (MS Teams).

If these weeks do not work for you, please suggest other options that would suit you better.

To thank you for your participation, you will be offered \$150 in financial compensation at the end of the consultation.

The interview can be conducted in English or French, depending on your preference.

All information will remain anonymous and will be used for research purposes. A final report on results will be released to Library and Archives Canada, but this report will contain only aggregated findings, and you will not at any moment be directly identified.

We look forward to hearing from you.

PS: I have attached the topics and questions we will be covering during the interview so that you can review them in advance and consult with other members of your organization and network, if needed.

[Name], [Role] Léger

A.2 Discussion guide

PART 0	Introduction and Explanations
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Duration	2 MINUTES
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MODERATOR: CHECK THE PARTICIPANT'S PREFERRED LANGUAGE. Préférez-vous que cette entrevue se déroule en français ou en anglais?

Do you prefer that this interview is conducted in French or English?

WELCOME AND PRESENTATION

Hello, let me introduce myself. My name is _____ and I'm _____ at Léger. Léger is a public opinion and marketing research firm. You may already know Léger from our surveys and media presence in Québec and Canada. In addition to surveys, we organize focus groups and interviews, like this one, on a variety of subjects.

PRIMARY OBJECTIVE

Léger is conducting this interview on behalf of Fisheries and Oceans Canada (DFO) in order to gather diverse perspectives and information to give us a picture of Québec's aquatic habitats and identify restoration priorities for strategic planning.

DISCUSSION RULES

This interview is designed to encourage open and honest discussion. My role as moderator is to ask you questions and encourage you to share your opinions. I will also ensure that our discussion stays on topic and on schedule. Your role is to answer questions to the best of your knowledge and expertise, and to express your opinions. I would also like to stress that there are no wrong answers. This is not a test of your knowledge.

As much as possible, we would like your answers today to reflect the viewpoint and knowledge of your organization and your network.

The information collected is for the study's purposes only. All information will remain anonymous and will be used for research purposes. A final report on the results will be submitted to Library and Archives Canada, but this report will contain aggregated results only, and you will not be directly identified at any time.

Finally, this interview is audio and video recorded for analysis purposes. Only the Léger and DFO teams involved in this study will have access to the recordings. The recordings will not be distributed in any other way without your explicit consent, and your name will never be mentioned in the project report.

Do you have any questions before we get started?

PART 1	General Information
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Duration	5 MINUTES
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Note to moderator: The intention is to get to know the respondent and how representative he or she is of a given sector. The aim is also to shed light on which territories of action the respondent, and the organization he/she represents, is familiar with.

1.1 Can you tell me a little about yourself? What is:

- Your level of education (technical, bachelor's, master's, doctorate, other)?
- Name of organization/workplace?
- How long have you been working there?
- Did you work with colleagues to prepare for the interview?

1.2 In the following regions, at which location is the scope of current or ongoing knowledge, initiatives and actions taking place?

Note to moderator: SHOW TABLE

If the participant mentions several, please specify the main one.

<i>Separation</i>	<i>Administrative region</i>
<i>1</i>	<i>Bas-Saint-Laurent (01)</i>
	<i>Gaspésie et Îles-de-la- Madeleine (11)</i>
<i>2</i>	<i>Saguenay Lac-Saint-Jean (2)</i>
	<i>Côte-Nord (09)</i>
	<i>Nord du Québec (10)</i>
<i>3</i>	<i>Capitale nationale (03)</i>
	<i>Mauricie (04)</i>
<i>4</i>	<i>Outaouais (07)</i>
	<i>Abitibi-Témiscamingue (08)</i>
	<i>Lanaudière (14)</i>
	<i>Laurentides (15)</i>
<i>5</i>	<i>Estrie (05)</i>
	<i>Chaudière-Appalaches (12)</i>

	Centre-du-Québec (17)
6	Montréal (06)
7	Régional- all of Québec

1.3 Can you name regions, towns and villages, watersheds, names of watercourses and sectors, if possible. Specify whether freshwater and/or seawater.

PART 2

Starting the discussion – General Knowledge and Opinion

DURATION

15 MINUTES.

The intention here is to highlight the sectors/types of habitat/species impacted. Significant threats and opportunities for restoration work are also discussed.

2.1 Knowledge Status

- How would you rate your own and/or your organization's experience and knowledge of your territory and threats to this territory? Is it low, medium or high? Can you tell me why?
 - **If not mentioned by participant:** How many years of experience do you have?
 - **If not mentioned by participant:** Specifically, where did you, your organization or another entity get your knowledge of the threats, habitats and species? *(Open the discussion to learn more about what people have been working on, their experience, examples of collaboration, etc.).*

2.2 Habitats, Affected Locations and Interventions

- 2.2.1 **[PRIORITY]** Aside from environments that are already protected by regulation (e.g., by national legislation), what do you consider to be the most important aquatic environments or sectors on your territory? We're only targeting those that fall within the geographical area you specified at the start of our discussion.
- **If not mentioned by participant:** Can you identify the main ones? Can you name the sectors, watercourses, etc.?
 - Why are they important?
 - **Probe if necessary:** Is it because of their role in the ecosystem? Their link with the aquatic species? Area of cultural importance? Other reasons?
 - Are they under pressure or is there any environmental degradation?
 - If so, what are the associated issues and threats?
 - Probe if necessary:** Habitat loss? Pollution? Climate change? Overexploitation, invasive species?
- 2.2.2 Is/are there any sector(s) or site(s) of significant interest and/or for which there is an action plan/conservation potential/multi-stakeholder mobilization?
Please describe where (which ones), why?

2.2.3 Should additional measures (e.g., by government bodies) be taken for areas that have no protection/conservation status?

If so, where (which ones), please describe, indicate why?

2.2.4 **[PRIORITY]** According to your knowledge of your territory for action and the aquatic environments, what are the most degraded areas/sectors?

Are you able to provide more information for each? If so, could you name, identify, locate areas?

Specify if more than 3 sectors cited: Of these locations/sectors, which are the three most in need of restoration?

Note to moderator: Ask the following questions for each area/sector.

- What are the problems and threats in this area/sector?
- Specifically, can you identify the types of fish habitat affected (e.g., flood plains, grass beds, spawning grounds)?
- Could this area/sector be restored, and if so, how?

2.3 Valued Species

2.3.1 In your opinion, are there any valued species in your area of action? We are looking for all aquatic species (fish, aquatic plants, invertebrates, marine mammals). This can also include species at risk.

a. Why are they valued?

Prompt if necessary: Culturally? For the continued productivity of fisheries? Ecologically e.g., umbrella species?

b. Have you noticed any changes (population, status, etc.) over time? If so, which ones?

c. What are the main threats to these species?

Prompt if necessary: Habitat loss? Pollution? Climate change? Overexploitation, invasive species?

d. Have you done any knowledge gathering (inventory and/or research), restoration, or conservation work focused on specific species?

If so, can you describe the work and why it was done?

PART 3

RESTORATION WORK

DURATION

15 MINUTES.

Note to moderator: The intent here is to highlight examples of successful restoration projects, as well as barriers to implementation, in addition to compiling a list of restoration projects that the organization has undertaken (or participated in).

3.1 Do you have a good idea of the restoration projects that have taken place in your area of action, whether or not you were involved? (Yes/No/A little).

Note to moderator: Ask the following questions if yes or a little

- a. How many projects directly or indirectly affected aquatic environments?
- b. What was their scope in terms of time, surface area and budget?
- c. Can you name these sites and their geographical location?

- d. Among these projects, have you ever participated in restoration work related to the aquatic environment, whether it be studies prior to undertaking the work, related research work, monitoring or other?

If so, can you explain what they consisted of?

Note to moderator: Ask the following questions for all restoration work.

- What was the objective/purpose of the interventions?
- In what year and where did this take place?
- What was your role, and the role of the main partners?
- What is your overall assessment of the project? Was it a success, a failure, or did you get mixed results?

3.2 Can you tell us which of your projects were very beneficial or successful?

Note to moderator: If none of the projects they were involved in were successes, ask: Do you know of any projects that were very beneficial or successful?

- For these projects, what are the factors that contributed to these benefits?
 - **Prompt if necessary:** Clear identification of the problem? Effective partnerships? Technical expertise? Appropriate choice of interventions? Monitoring work? Funding? Good planning? Good knowledge of the site? Consideration of climatic variations?

3.3 If work was done on aquatic environments, do you feel that some of this work was a failure?

Note to moderator: If none of the projects they were involved in were failures, ask: Do you know of any projects that were failures?

- a. Can you describe the project and identify the factors that led to failure?
- b. **Prompt if necessary:** Coordination complexity? Lack of technical expertise? Costs too high? Inadequate design? Data gaps? Lack of knowledge? Inadequate monitoring? Poor planning? Extreme weather event.

3.4 Do you have a bank of information about these projects (database, reports, etc.) that you would be willing to share with DFO? Can you identify these documents / tell us where they are available?

3.5 Do you feel that your organization has a good capacity to accomplish restoration projects regarding the following aspects?

Is it poor, average, good or excellent? Why do you say that?

- i. Understanding the issues
- ii. Knowledge of techniques
- iii. Expertise (experienced HR)
- iv. Accessible human resources
- v. Funding
- vi. Collaboration/partnership.

3.6 Based on your experience and knowledge, what are the main barriers/ difficulties encountered/ when carrying out restoration projects?

- **Prompt if necessary:** *Private property? Contamination? Funding? Multi-party coordination?*

- 3.7 Are there any opportunities that can be seized quickly on your territory (projects that are easier to carry out, turn-key projects)?
- **Prompt if necessary:** *e.g., connections with the best avenues for restoration (work adapted to sectors according to feasibility, social parameters, costs, coordination and collaboration, etc.).*
- 3.8 To your knowledge, are there any opportunities or potential for large-scale restoration (e.g., by watershed), or over large areas (e.g., terrestrial and aquatic connectivity) in your territory?

PART 4	STRATEGIC PLANNING AND CONTINUITY
DURATION	5 MINUTES.

Note to moderator: The intent here is to bring up important aspects that may have been overlooked during the interview, to question the alignment of priorities in territorial strategic planning and to ensure follow-up or continuity between DFO and the respondent.

[DO NOT ASK THE QUESTION BELOW IF YOU RUN OUT OF TIME].

- 4.1 Do you participate in events/workshops/training or any other methods that allow for the development of new knowledge and networking related to restoration?
Can you give some examples?
- 4.2 Are you involved in strategic planning related to aquatic resources/environments in your territory (e.g., have you participated in or organized round tables on territory-related issues?)
- Have you participated in the development of management plans, integrated management plans or other tools providing strategic direction for your territory?
- 4.3 To what extent do you feel that your region's (or your organization's) needs (to mitigate threats) are aligned with broader strategic planning (*e.g., action plan stemming from the Stratégie québécoise sur l'eau du Gouv. Qc., recovery planning for species at risk*)?

BLOCK 5	CONCLUSION
DURATION	5 MINUTES.

- 5.1 Given your knowledge of existing strategic plans, do you have any other relevant information that you would like to share and/or pass on to DFO for their work on setting restoration priorities, which would help provide the most accurate picture of aquatic habitats and restoration in Québec?

5.2 Are you interested in continuing the discussion with DFO? Share relevant documentation? If so, please name the documents, if possible.

THANK THE PARTICIPANT