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# FISH HABITAT RESTORATION IN NOVA SCOTIA:

PRIORITIES, APPROACHES AND RESOURCES



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## **DISCLAIMER**

The “Fish Habitat Restoration Priorities for Nova Scotia” is not a substitute for the *Fisheries Act* or its Regulations. In the event of an inconsistency between the Regional Priorities Document and the *Fisheries Act* or its Regulations, the legislation will prevail.

The inclusion of Mi'kmaw principles and recognition of the Mi'kmaq of Nova Scotia as Rights Holders in no way fulfills the duty to consult on projects regarding fish habitat and restoration. Consultation under the *Terms of Reference for a Mi'kmaq-Nova Scotia-Canada Consultation Process (ToR)* as ratified on August 31, 2010 shall be carried out on a project by project basis and should be initiated as soon as possible to enable meaningful consultation.

## **NOTE TO READERS**

It is recommended that the [Fish and Fish Habitat Protection Policy Statement, August 2019](#) be read prior to the “Framework to Identify Fish Habitat Restoration Priorities” to understand how Fisheries and Oceans Canada interprets and applies the regulatory and non-regulatory tools available to support the conservation, protection and restoration of fish habitat.



# INTRODUCTION

**H**abitat loss and degradation, modification to fish passage and flow, and other threats have historically and continue to contribute to the decline of freshwater and marine ecosystems in Canada. Fish habitat restoration is one way to address these impacts to ecosystems and the damage and destruction to fish habitat. Fish habitat restoration occurs across Canada through a range of initiatives supported and carried out by federal, provincial, territorial and local governments, as well as Indigenous Peoples, non-profit organizations, community organizations, academia, and others. Fisheries and Oceans Canada (DFO) is establishing fish habitat restoration priorities to inform coordinated and strategic actions toward shared restoration goals. The Restoration Priorities for DFO-Maritimes Region is meant to inform restoration of freshwater and coastal habitats across the province of Nova Scotia.

The planning area for this work is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq people. The Mi'kmaq are the rightful stewards of their traditional lands and waters and have a direct responsibility in the management and protection of these areas. The Government of Canada recognizes existing Aboriginal and treaty rights in sections 25 and 35 of the *Constitution Act* and the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), which was endorsed by

the Government of Canada in 2016 and implemented in legislation in 2021. Canada aims to advance reconciliation with Indigenous Peoples by recognizing the relationships and ongoing management of their ancestral lands and waters. DFO is committed to working with Rights holders and incorporating Mi'kmaw knowledge and principles to identify areas for restoration and carry out work in Mi'kma'ki.

This Restoration Priorities plan was largely informed by a series of engagement sessions held from 2022 to 2023 with participation from Rights holders, provincial governments, non-governmental organizations, local watershed groups, academia, and consultants (for further information and a summary of what we heard see Appendix A).

As defined in the [Framework to Identify Fish Habitat Restoration Priorities](#) (hereafter, the 'National Framework'), fish habitat restoration “involves actions to modify degraded habitat to improve its capacity to produce and sustain fish and to improve ecosystem functions.” This may involve actions to return degraded habitat to its original condition, or as close to the original condition as is feasible, and/or enhancement of habitat.

## Role of the Fish and Fish Habitat Protection Program in Fish Habitat Restoration

The Fish and Fish Habitat Protection Program (FFHPP) at DFO has a mandate to protect and conserve fish and fish habitat, including roles related to habitat restoration such as:

- Identifying priorities and objectives for conservation, protection or restoration of habitat;
- Administering the fish and fish habitat protection provisions of the *Fisheries Act* (including decisions related to offsetting to counterbalance the death of fish and the harmful alteration, disruption or destruction of fish habitat) and relevant provisions of the *Species At Risk Act*;
- Assessing and reporting on the state of fish and fish habitat, including development of decision-support tools;
- Administering grants and contributions programs to provide funding for fish habitat restoration projects led by partners;
- Developing fish habitat restoration plans following the designation of Ecologically Significant Areas (ESAs) (DFO 2023), if required; and
- Participating in planning initiatives led by partners, such as watershed management planning.

In addition to the role of FFHPP, other sectors within DFO support the development of fish habitat restoration plans in areas designated under the *Fisheries Act* (Fish Stock Rebuilding Plans), *Species at Risk Act* (critical habitat), and *Oceans Act* (Marine Protected Areas), as required to meet their conservation, protection, and recovery objectives.

## Definitions of Fish and Fish Habitat

**Fish** includes

- (a) parts of fish,
- (b) shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals, and
- (c) the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals.

**Fish Habitat** means water frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas.

Fisheries Act: <https://laws-lois.justice.gc.ca/eng/acts/f-14/page-1.html#h-231172>

## Habitat Offsetting and Banking

DFO regulates works, undertakings or activities (referred to as “projects”) that could result in the death of fish or the harmful alteration, disruption or destruction of fish habitat (DFO 2025). Offsetting measures are the actions taken by a proponent to counterbalance the residual effects to fish and fish habitat that are caused by their project, after avoidance and mitigation measures have been applied. Proponents typically apply offsetting measures through habitat offsetting plans and/or fish habitat banks. Offsetting measures may include habitat restoration, enhancement, or construction. For more information on habitat offsetting, refer to the [Policy for Applying Measures to Offset Harmful Impacts to Fish and Fish Habitat](#).

## Funding Programs

DFO administers several grants and contributions programs that may support fish habitat restoration activities, including the Aquatic Ecosystem Restoration Fund, Habitat Stewardship Program for Aquatic Species at Risk, Canada Nature Fund for Aquatic Species at Risk, Aboriginal Fund for Species At Risk, and Aquatic Invasive Species Prevention Fund.

An overview of investments in Nova Scotia under various programs between 2013 and 2022 is available in the region’s [Habitat Highlights](#) report. Note that the funded activities are not limited to fish habitat restoration, but many of the projects include a restoration element.

For further information on funding that could support restoration planning and implementation including but not limited to DFO funding programs, refer to Section 5 in Appendix B.

## Role of the Mi’kmaq of Nova Scotia in Fish Habitat Restoration

Collaboration with the Mi’kmaq is important at all stages of restoration: planning, implementation, and monitoring. DFO strives to collaborate with the Mi’kmaq on fish habitat restoration initiatives. To foster collaboration, early engagement on the development of this document brought together Mi’kmaq and non-Indigenous participants in five workshops. These discussions informed the restoration priorities using *Etuaptmuk*, or a Two-Eyed Seeing approach, bringing Indigenous and Western knowledge systems together so that each way of knowing can inform the other. Through this engagement, DFO heard that there is a preference for wholistic, ecosystem-based approaches that recognize the importance and interconnectedness of all things in the natural world, in keeping with *Msit no’kmaq*. This approach was used to develop the restoration goals and priorities. DFO encourages partners to collaborate with the Mi’kmaq in planning and conducting restoration projects and to embrace the concept of *Etuaptmuk*.

In Nova Scotia, Mi'kmaw communities and organizations play key roles in fish habitat restoration. Some Mi'kmaw groups that provide leadership in fish habitat restoration include the Unama'ki Institute of Natural Resources (UINR), the Confederacy of Mainland Mi'kmaq (CMM), and the Maritime Aboriginal Peoples Council (MAPC). Mi'kmaw guiding principles are incorporated into their daily works, through projects, and within partnerships.

"Canoe Culture"

**Eva Nicholas**

We'koqmaq First Nation



## Mi'kmaw Guiding Principles

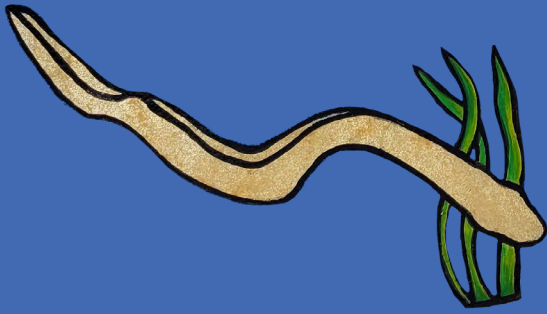
The Mi'kmaq have provided the following definitions of traditional Mi'kmaw teachings and principles to reflect the meaning, common usage, and application of the principles. The text below has been included at the request of the Mi'kmaq of Nova Scotia to enhance relationship building and co-learning between Nations.

### ***Etuaptmumk* (eh-doo-ahp-duh-mumk)**

*Etuaptmumk* or Two-Eyed Seeing is a balanced respect, appreciation, and consideration for Indigenous and Western knowledge. It is learning to see from one eye with the strengths of Indigenous knowledge and ways of knowing, and from the other eye with the strengths of Western knowledge and ways of knowing and learning to use both eyes together for the benefit of all. In practicality, Two-Eyed Seeing is about co-learning, co-production of knowledge, and implies collaboration between different knowledge systems. Two-Eyed Seeing is an Indigenous construct – the wisdom has roots in Indigenous teachings. Mi'kmaw Elder Albert Marshall of the Eskasoni First Nation developed the concept and was the first to formalize and apply it in a Western academic setting (Bartlett et al. 2012).

### ***Msit no'kmaq* (Mm-sih Noh-goh-mah)**

"All my relations" – all things are inter-related, and we must honour and respect all life as our kin.



## Restoration Through Two-Eyed Seeing Approaches

The Community Eelgrass Restoration Initiative (CERI) is a partnership between the Confederacy of Mainland Mi'kmaq and the Future of Marine Ecosystems Lab at Dalhousie University aimed at locating, studying and replanting eelgrass meadows around the province. Eelgrass is an ecologically significant species that has seen major declines in recent years. The restoration efforts incorporate Mi'kmaq ecological knowledge and the guiding principle of *Etuaptmumk* in the research design and community engagement pieces, to work toward achieving the common goal of healthy eelgrass systems.



Photo Credit: Future of Marine Ecosystems Lab, Dalhousie University

## Role of the Province of Nova Scotia in Fish Habitat Restoration

In Nova Scotia, the management of fisheries and the regulatory oversight of activities that have a potential to impact fish and fish habitat are shared responsibilities between the federal and provincial governments. As a result, the Canada-Nova Scotia Memorandum of Understanding (MOU) on Fish Habitat Management was signed in 2005. The agreement was developed to increase federal-provincial cooperation in protecting and enhancing fish habitat in Nova Scotia. The Province of Nova Scotia manages Crown lands, water and fisheries, including recreational fisheries, in non-tidal waters. This is accomplished through various provincial legislation including the *Species at Risk Act*, *Crown Lands Act*, *Water Resources Protection Act*, and *Environment Act*. The *Environment Act* provides the provincial authority to protect watercourses, and any activity that changes a watercourse, a water resource, or the flow of water therein requires an Approval or Notification in accordance with the *Activities Designation Regulations*. Projects that are undertaken in or around watercourses, wetlands, or along the coastline, including fish habitat restoration actions, often require specific permits, approvals, or notifications from the province. Habitat restoration work involving non-tidal instream structures and activities requires certification as a “Certified Watercourse Installer (Fish Habitat Restoration)”. This certification, which is recognized by Nova Scotia Environment and Climate Change, can be earned through training provided by the [Nova Scotia Salmon Association \(NSSA\) Adopt A Stream Program](#).

Information about provincial permitting requirements for watercourse alterations is available from the [Nova Scotia Department of Environment and Climate Change](#).

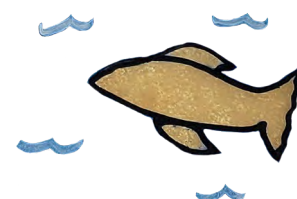
Information about permitting and approvals for activities in or near the coastline, is available from the [Nova Scotia Department of Natural Resources](#).

Prior to undertaking restoration actions, it is the responsibility of the recipient, proponent, or organization to verify with the various levels of government whether permits and/or authorizations are required and to acquire the necessary permits and/or authorizations.



### Sportfish Habitat Fund

The province of Nova Scotia also supports community-led projects focused on habitat restoration and improving access to sportfishing resources through the Nova Scotia Sportfish Habitat Fund. The Habitat Fund fee that is added to General and Salmon licenses supports this funding. The majority of the funding goes to the Nova Scotia Salmon Association Adopt A Stream Program, who distribute it to community groups for habitat restoration projects to support restoration of spawning, rearing, over-wintering and cool water refugia habitat for salmon and trout, and to support restoration of habitat connectivity. This provincial funding is often considered to be base or core funding that is used to leverage additional support for community-based restoration initiatives from other sources. Further information is available from the [Province of Nova Scotia](#) and the [NSSA](#) and in Section 5, Appendix B (Table 5.4).





# APPROACH TO SETTING RESTORATION PRIORITIES

## Framework to Identify Fish Habitat Restoration Priorities

**DFO** published the [Framework To Identify Fish Habitat Restoration Priorities](#) (DFO 2022) to guide DFO Regions in the development of regional Restoration Priorities.

### The National Framework:

- Describes the need for fish habitat restoration priorities and how they may be used;
- Describes principles which characterize integrated and effective restoration;
- Outlines a consistent yet flexible approach to identify restoration priorities for fish habitat across Canada; and
- Identifies considerations regarding how to identify and select restoration actions, opportunities, or objectives.

The National Framework allows for regional flexibility in the development of restoration goals and priorities for each DFO region, taking into consideration the unique ecological, social and cultural characteristics of the respective region.

## Approach for Nova Scotia

The Regional Restoration Priorities document (hereafter, the “Regional Priorities”) for the DFO Maritimes Region identifies restoration priorities for freshwater and coastal habitats in Nova Scotia and is intended to be used in conjunction with the National Framework<sup>1</sup>.

The purpose of the Regional Priorities is to encourage the strategic use of resources to target restoration activities that will yield maximum benefits for fish habitat in Nova Scotia by:

- Defining restoration goals and actions needed to improve fish habitat, to benefit species and areas that are of importance to DFO, Indigenous Peoples, and partners.
- Describing recommendations for the planning, development and implementation of priority fish habitat restoration projects.
- Providing a list of resource materials that should be used to inform fish habitat restoration planning and implementation (Appendix B).

The Regional Priorities document is not as broad as the over-arching National Framework, nor is it as detailed as a watershed management plan. The Regional Priorities are intended to establish priorities at the provincial scale, which may guide the development of management or restoration plans by partner organizations at a watershed or sub-watershed scale (Figure 1). Watershed planning is key to determining specific localized restoration priorities and objectives.

## Restoration Principles

The National Framework sets out a series of restoration principles to help achieve success in restoration planning and activities:

1. Address the root causes of degradation;
2. Result in self-sustaining habitat improvement;
3. Consider ecological, cultural and socioeconomic contexts;
4. Incorporate engagement and collaboration;
5. Include the best available information from all sources;
6. Integrate policies and activities across programs or jurisdictions; and
7. Assess effectiveness through monitoring and be subject to adaptive management.

As noted in the National Framework, “Causes of habitat degradation are complex and interconnected. Efforts to identify relevant threats and the desired condition for important species, areas, and ecosystem functions should include an assessment of the primary drivers of habitat degradation and loss. Current ecological conditions in the region (e.g. the hydrogeomorphology, biodiversity, habitat types, and limiting habitat conditions for fish life cycle processes) and causes of habitat degradation should be understood to meaningfully establish priorities for fish habitat restoration” (DFO 2022).



**Figure 1.** National, regional, and local planning documents for fish habitat restoration.

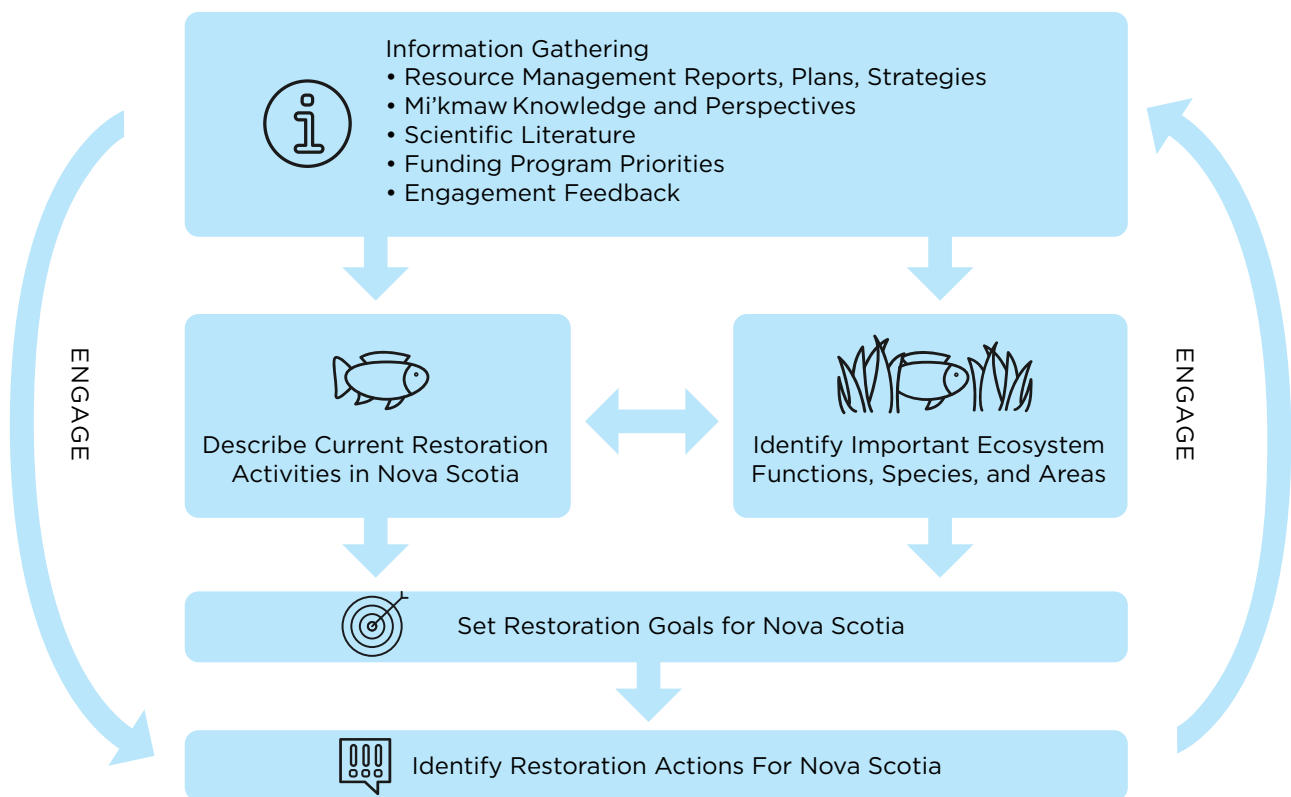
1. FFHPP is divided into administrative regions that, in eastern Canada, differ from the overall administrative regions of DFO (<https://www.dfo-mpo.gc.ca/about-notre-sujet/organisation-eng.htm>). The FFHPP-Maritimes Region corresponds to the provincial boundaries for Nova Scotia.

The Regional Priorities should be read in conjunction with relevant legislation, policy and guidance, including the Policy for Applying Measures to Offset Harmful Impacts to Fish and Fish Habitat (DFO 2025), and/or funding program guidance and priorities. This priorities document is intended to help partners better understand the factors that FFHPP considers when evaluating fish habitat restoration projects.

Across Canada, there are thousands of existing facilities and structures located in or near water frequented by fish, that vary greatly in scale and complexity (e.g., hydroelectric dams, tidal gates and aboiteaux, causeways, instream barriers) and that may cause impacts to fish and fish habitat. While the issues at existing structures and facilities, in some cases, have the potential to yield significant fish habitat gains if corrected/mitigated, these issues are not the focus of the Regional Priorities. Where there is major infrastructure, DFO will continue to work with proponents using regulatory tools informed by departmental policies and guidance, such as the [Position Statement on the Management of Existing Facilities and Structures under the Fisheries Act and the Species at Risk Act](#).

There are numerous conservation planning processes, both internal and external to DFO, that intersect with the Regional Priorities. When undertaking a restoration project it can be beneficial to consider other initiatives that are underway, as there may be opportunities to leverage other efforts, utilize existing information to inform new work, complement or expand upon other efforts, avoid duplication of efforts, and align with priorities of other partners and organizations.

In order to develop Regional Priorities for Nova Scotia, DFO Maritimes Region followed the general approach outlined in the National Framework, and incorporated some regional adaptations (Figure 2).



**Figure 2.** DFO Maritimes Region approach to setting Fish Habitat Restoration Priorities for Nova Scotia (adapted from the National Framework).

Overall an ecosystem approach was used to identify restoration priorities. An ecosystem approach considers the entire community of living and non-living things, rather than focusing on a single species in isolation. In Nova Scotia, there are various threats that exert pressure on fish habitat and have damaged and degraded the ecosystem functions that are necessary to support healthy fish populations. As per the guidance in the National Framework, this document identifies important ecosystem functions and important species and areas on which to focus restoration. Restoration goals are identified for each of the important ecosystem functions. For each goal, restoration actions are identified that will benefit the important species and areas. The restoration goals and actions identified can inform fish habitat restoration decisions both internal and external to DFO.

For more detailed discussion and definitions of important species and areas see the section on Fish Habitat Restoration Priorities for Nova Scotia.

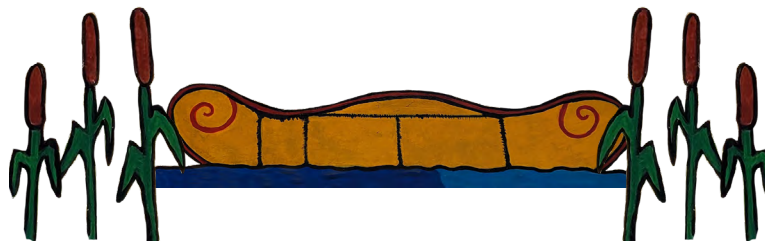
For the purpose of this document, the following terms and definitions apply:

- *Ecosystem Function*: Interactions and relationships between biotic and abiotic elements in an ecosystem, including ecosystem processes such as primary production, decomposition, nutrient cycling and transpiration and properties such as competition and (SER 2019).
- *Restoration Goal*: Desired future outcomes for species, areas, or ecosystem functions. The term 'future' permits for short-term and/or long-term restoration goals.
- *Restoration Actions*: Restoration opportunities to be implemented at strategic locations on the landscape to help improve degraded habitat and return ecosystem functions to a more desired state. This may include modifying habitat to enhance its capacity to produce and sustain fish populations and improve overall ecosystem functions.

A wide range of sources were reviewed to gather information on fish habitat threats and restoration activities in Nova Scotia. The information was compiled and collated to identify major recurring themes, which informed a preliminary identification of important species, areas and ecosystem functions; restoration goals; and restoration actions. Information sources included:

- DFO documents (e.g., species at risk recovery planning documents, fisheries management plans);
- Other government documents (e.g., provincial fisheries management plans, provincial species at risk recovery documents);
- External documents (e.g., watershed management plans, scientific documents, primary literature); and
- Funding program criteria (government and non-government programs).

This information was validated and further refined through engagement (see Appendix A).





# FISH

## AND FISH HABITAT IN NOVA SCOTIA

### Aquatic Environments and Fish Species in Nova Scotia

**N**ova Scotia is a coastal province that is almost completely surrounded by water, with 13,300 kilometres of coastline (Province of Nova Scotia 2010). Nova Scotia is located on the east coast of Canada and is part of Mi'kma'ki, the unceded and traditional territory of the Mi'kmaw peoples. Over thousands of years of living in this area, the Mi'kmaq have witnessed changes in the landscapes and shorelines of the region. Today it is the second smallest province in the country, with a land area of 52,840 square kilometres (Government of Canada 2017).

Nova Scotia is characterized by a variety of water features that support a wide range of fish species that inhabit and utilize more than 6,700 lakes and hundreds of rivers and wetlands (Province of Nova Scotia 2010). The waters of Nova Scotia, including freshwater, estuarine and coastal areas are home to approximately 44 freshwater fish species, with about 15 of those being diadromous (i.e. fish that are migratory between saltwater and freshwater) (Hebda 2019) and approximately 300 marine species (Davis and Browne 1996).

The various fish species have different requirements depending on their life history. Some, such as Atlantic Salmon (known as '*Plamu*' in the Mi'kmaw language), American Eel (*Katu*), Gaspereau (*Kaspalew*, *Kasapalaw*), Rainbow Smelt (*Kaqpesaw*), and Sea-run Brook Trout (*Atoqwa'su*), are diadromous. Atlantic Whitefish (*Alanj/Alanjik*) is also diadromous but the only known population is found in the freshwater portion of the Petite Rivière watershed. Other species such as landlocked Brook Trout (*Atoqwa'su*), Yellow Perch (*Ajoqlue'j*), and various freshwater mussels rely entirely on freshwater habitat. Still other species rely entirely on saltwater or brackish habitats. In order to survive and thrive, the structures, functions, and processes that make up the habitats on which fish depend, must be healthy.

## Threats to Fish and Fish Habitat in Nova Scotia

Fish habitat in Nova Scotia is vulnerable to a diverse range of threats, both from activities taking place in or near water, as well as from broader land use pressures. Threats impacting freshwater and coastal habitat include:

- Barriers to aquatic connectivity
- Land use and development
- Acidification
- Pollution and nutrification
- Degradation of riparian zones
- Aquatic habitat damage
- Aquatic invasive species
- Climate change

The main impact on watercourse habitat and on estuary health and function is changes in land use. Land use changes change the hydrology of watercourses. Activities that lead to increased runoff volume from storm events cause watercourses to widen and pool-riffle patterns to lengthen, degrading fish habitat (DFO 2006a).

Acidification (mainly caused by acid rain) is an issue across the province, although some watersheds are more heavily impacted than others. This has resulted in changes in water chemistry (low calcium, magnesium, potassium; increased metals) which can have significant impacts on fish and fish habitat.

Climate change is an over-arching threat impacting both freshwater and coastal environments. In freshwater, rising air temperature and changing precipitation patterns lead to modifications in both water temperature and flow regimes, two key habitat features for freshwater species (Barbarossa et al. 2021). Climate change is also having an effect with more intense rainfall and droughts. The more intensive rainfalls widen streams, whereas droughts result in shallower, warmer flows. Coastal ecosystems, such as salt marshes, seagrass beds, kelp forests, coral reefs and oyster reefs, are impacted by sea level rise, warming water temperatures, climate extremes (more frequent storm events, heat waves, etc.) and ocean acidification (He and Silliman 2019).

A relative assessment of multiple threats to freshwater fish and fish habitat in Nova Scotia shows that while issues such as land use, barriers to aquatic connectivity, acidification and aquatic invasive species occur throughout the province, the extent differs across different watersheds (MacDonald et al. 2023). Coastal ecosystems can be profoundly impacted by poor watershed management (DFO 2006a), and it is important to consider threats and impacts to both the freshwater environment and the adjacent coastline holistically. Land use maps compiled for parts of Nova Scotia demonstrate a gradient in land-use, showing high percentages of agriculture, or impervious cover from urban development in some watersheds, while many are mostly forested (Guijarro-Sabaniel and Kelly 2022).

“The current condition of fish habitat in the Maritimes is symptomatic of complex ecological problems driven by changes in riparian forests, river channelization, instream works, and local and watershed-scale erosion and sedimentation. Large-scale flood events, due to watershed land use changes and global climate change, are becoming more common, and these reshape channel morphology and fish habitat throughout the length of the watershed” (DFO 2006a).

### DFO Habitat Highlights

The [Habitat Highlights](#) series published by DFO, aims to explore and champion the ways that DFO collaborates with Indigenous Peoples, partners, and stakeholder communities to protect fish and fish habitat. For information about freshwater fish and fish habitat, threats and impacts across Nova Scotia, and examples of initiatives that DFO is leading or supporting with partners to help address threats, refer to:

- [Threats to fish and fish habitat in the watersheds of Nova Scotia](#)
- [Assessing aquatic connectivity in Nova Scotia](#)
- [Managing aquatic invasive species in Nova Scotia watersheds](#)
- [Addressing the acidification of watersheds in Nova Scotia](#)

## Current Restoration Activities in Nova Scotia

Fish habitat restoration projects are currently being undertaken in watersheds and coastal areas throughout Nova Scotia by Mi'kmaw communities and organizations, various levels of government, non-governmental organizations, community groups, academia, consultants and proponents. Organizations often work collaboratively, exchanging information, expertise, and technical support to inform the planning and implementation of restoration activities. Restoration work in Nova Scotia is implemented through a combination of well-established techniques and innovative approaches to address particular restoration challenges. The following section highlights some of the organizations that develop and provide guidance, training, or resources. This is not an exhaustive list of all the organizations that undertake fish habitat restoration in Nova Scotia. This section also provides an overview of the common restoration approaches currently used, with reference to guidance and training that is available for these approaches (for a complete list, refer to Appendix B, Sections 1-3).

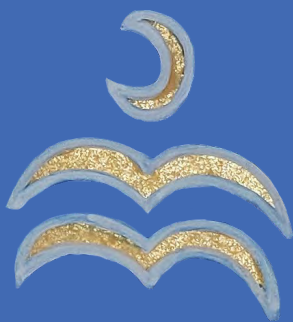
### Freshwater Restoration

#### *Watershed Planning*

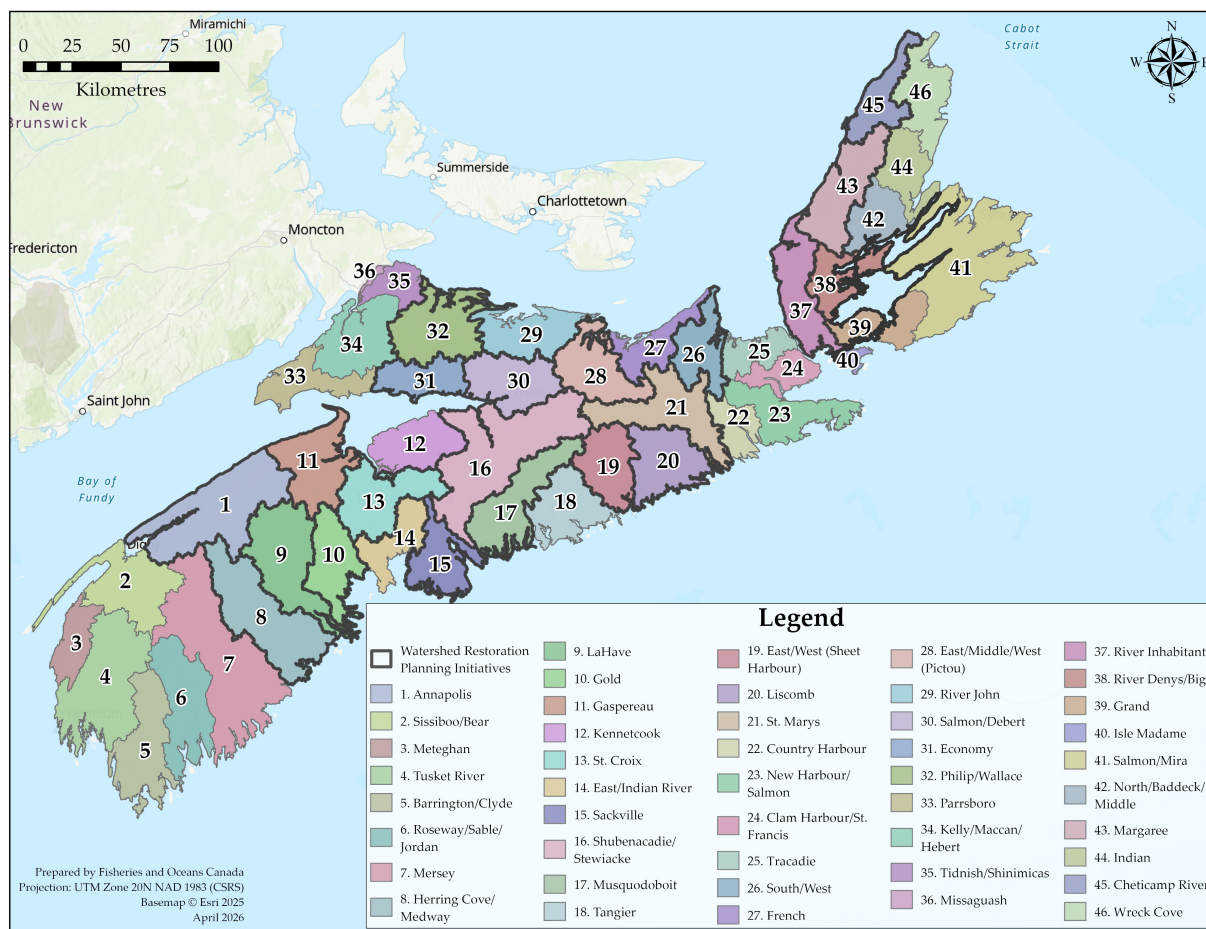
This Regional Priorities document identifies province-wide goals, which are intended to guide localized restoration actions at a watershed or sub-watershed scale. Watershed planning is key to determining specific localized restoration actions and to prioritizing specific habitat restoration projects at the watershed or sub-watershed scale. A watershed management plan examines the threats and limiting factors impacting a watershed to identify mitigation measures. Watershed planning is important to ensure that the implications of restoration actions are carefully considered. In order to develop a detailed watershed management plan, it may be necessary to collect baseline data about different components of the watershed.

The Nova Scotia Salmon Association (NSSA), through the Adopt A Stream Program (AAS), provides restoration organizations with technical support to develop watershed management plans as well as guidance on the collection of various baseline information, such as habitat suitability assessments and watercourse crossing assessments. For watershed planning resources, refer to Appendix B (Section 1, Table 1.1).

Watershed management and other restoration plans have been developed for many areas of the province by a number of different organizations (Figure 3).



In addition to providing guidance to help organizations develop watershed management plans, the NSSA is leading the development of detailed watershed management plans to help improve aquatic habitat quality to benefit key aquatic species at risk through the implementation of the Watershed Assessment Towards Ecosystem Recovery (W.A.T.E.R.) project. This project is being carried out in collaboration with multiple partner organizations throughout Nova Scotia.



**Figure 3.** The primary watersheds within which watershed management plans and other restoration planning initiatives such as barrier inventories have been prepared in Nova Scotia (2007 to 2024).

### Implementation

Informed by a watershed management or restoration plan, restoration groups across Nova Scotia are addressing habitat damage and degradation using various well-established techniques such as:

- installation of physical instream structures (e.g., digger logs, deflectors),
- stabilization of banks,
- remediation of riparian zone vegetation,
- reconnection of the channel and the floodplain,
- creation and/or restoration of connectivity in the system, and
- addition of lime to watersheds.

Watersheds are comprised of various interconnected components (streambed, bank, riparian zone, flow regime, land uses), that, together, influence the structure, function, and processes of the system. The strategic placement of appropriately sized instream structures can alter water flow, scour substrate for pool formation, and transport and deposit the scoured streambed materials elsewhere downstream to form other features (e.g. spawning gravels, gravel bars). These processes, in turn influence the thalweg, pool, riffle and run sequences. This permits the enhancement of fish habitat in various ways, including promoting connectivity through the creation of pools for resting. Freshwater restoration may also involve the removal or modification of barriers (e.g. undersized or perched culverts), to restore fish passage, natural flows, and transport of nutrients through the system.



The addition of lime to a watershed ('liming') is one method to address the impacts of acidification. It is important to note that liming requires ongoing efforts and restoration practitioners should ensure they have the ability to maintain long-term commitments of liming prior to beginning.

The NSSA's AAS program provides funding and technical support to organizations to undertake projects to protect, repair and improve aquatic and riparian habitats. Numerous guidance documents are available, including a series of *Fish Habitat Restoration Methods Concept Specification Fact Sheets* (Note: these are applicable to small to medium size and low gradient watercourses with predominantly cobble and gravel bottoms; different approaches would be needed for large rivers and/or steeper gradients). In addition, through the AAS program, groups can participate in training programs, including the training required for installers of aquatic habitat restoration structures, which is required to undertake instream work under the provincial *Activities Designation Regulations* and is recognized by the provincial regulator, Nova Scotia Environment and Climate Change (NSECC). For resources related to freshwater restoration implementation techniques, refer to Appendix B (Sections 1 and 2).

Oversight from an experienced restoration practitioner is important because localized modifications can influence the flows and hydrology within a watershed, contributing to physical habitat changes in other locations, as the system adjusts. Careful consideration of aquatic invasive species and potential unintentional spread when restoring connectivity are also important.

In addition to the well-established techniques discussed above, new techniques and approaches are being developed to address emerging issues. For example, in watersheds having elevated water temperatures, there may be opportunities to create thermal refuges or enhance cold-water pockets in locations having ground-fed, cool water. Work is currently underway in Nova Scotia using thermal infrared cameras to identify, prioritize, and restore and/or enhance cold-water refugia.

Numerous organizations across the province conduct restoration activities. Information on the location and details of projects carried out by these various organizations that are supported through the AAS program are available from [AAS](#). This is not a comprehensive list of all restoration projects, but provides an overview of the types of initiatives taking place in the province.



## **Coastal Restoration**

### *Planning*

As in freshwater areas, planning for coastal restoration projects is an important step. Coastal areas are linked to the adjacent watershed and subject to the threats, pressures and stressors originating from that watershed, in addition to direct coastal impacts. The impacts of poor watershed management on coastal ecosystems can be profound (DFO 2006a). Consideration of the whole watershed, including the freshwater and adjacent coastal area is encouraged when undertaking restoration initiatives.

Organizations such as TransCoastal Adaptations (TCA), based at St. Mary's University, the Clean Foundation, and the Future of Marine Ecosystems (FOME) lab, based at Dalhousie University have significant expertise in coastal restoration and provide training and guidance in the planning and design of coastal restoration projects, such as tidal barrier remediation, tidal wetland restoration and eelgrass restoration. For coastal restoration planning resources, refer to Appendix B (Section 3).

## Implementation

Some restoration actions currently being undertaken in coastal habitats in Nova Scotia are described briefly below including:

- stabilization of shorelines;
- improvement of benthic habitat (e.g., artificial reefs);
- restoration of seagrasses;
- restoration of tidal wetlands (this includes all saltwater and freshwater tidal wetlands); and
- removal or decrease of tidal restriction (reestablishing a more natural hydrological regime).

For a list of resources related to coastal habitat restoration implementation, refer to Appendix B (Section 3).



### Shoreline Stabilization

Nova Scotia is a coastal province characterized by a lengthy coastline that is being increasingly subjected to erosive forces and flooding. These continue to increase in severity in association with climate change and development. There are various approaches to mitigating erosion and flood risk including attenuation of wave action (e.g. artificial reefs, see below), coastal buffers (e.g. salt marshes, see below) or shoreline stabilization. Shoreline or bank stabilization involves a range of techniques from more natural, vegetated approaches (i.e., soft approaches), to the use of rock structures (i.e. hardened structures), or some combination of both (Murphy et al. 2024).

Natural, vegetated approaches are often referred to as living shorelines or green infrastructure. While there are many approaches to shoreline stabilization and these various approaches are important for climate change adaptation, from a fish habitat restoration perspective, key areas for shoreline restoration would be those where fish habitat would benefit and where fish-friendly habitat features are incorporated into the design.

### Benthic Habitat

Habitat improvement methods, such as artificial reefs, can successfully enhance benthic habitat by fostering growth of an ecosystem that supports fish populations. The reefs support the establishment and growth of marine plants, including algae and seagrasses, which represent a fundamental component of the marine ecosystem and further provide habitat to support life processes of various species for spawning, rearing, feeding, or cover. There are varying artificial reef types and designs, with differing applications. For example, structures with a lower profile are not as effective in promoting or supporting the establishment of marine algae, but rather, aid in wave attenuation along shorelines. The selection of sites should consider whether there is appropriate depth, substrate (i.e. ability to support weight of reefs and prevent subsidence) and support from users and stakeholders, ensuring no impact on navigation and limiting conflicts with resource users.

### Seagrasses

Eelgrass (*qata'kul*) is the dominant seagrass in coastal Nova Scotia. It is a foundational, habitat-forming marine species. Restoration of eelgrass is challenging, with several techniques and methods employed on a relatively small scale to date. Recent studies have shown that temporal changes in coverage and structure may not be related to any one stressor and coverage can be naturally quite variable (Wong et al. 2013). Water quality, health of adjacent eelgrass beds, genetic diversity and selection of an appropriate restoration method (e.g.,



Photo: Nick Hawkins



transplants, seed harvest and distribution) will increase the likelihood of success of an eelgrass restoration project.

#### *Kelp*

Kelp is a group of marine algae (i.e. seaweeds) that forms extensive beds, or forests, which are commonly found in subtidal waters along rocky headlands and other wave-exposed areas that have nutrient-rich waters and strong currents. Kelp provides habitat and structural support for a range of marine organisms, and plays a role in filtration of excess nutrients from the water. There have been large-scale periods of degradation of the kelp ecosystem in Nova Scotia over the past 4-6 decades (Filbee-Dexter et al. 2016) with declines linked to impacts associated with

climate change, over-grazing by sea urchins, and exposure to invasive species. Despite the losses, kelp species have shown resilience and persistence in response to environmental changes, and a shift from cold to warm-water species has been observed (Krumhansl et al. 2024). Kelp restoration is early in its development in Nova Scotia, involving testing of approaches to grow kelp in nurseries, and use of green gravel and other substrates to promote settlement, growth and establishment.

#### *Tidal wetlands*

Tidal wetlands provide habitat that supports the life processes of important fish species and many other marine and estuarine species, while also providing other benefits such as shoreline protection. Much of the salt marsh loss in the province is due to historical land use involving the conversion of salt marsh to farmland (Bowron et al. 2012). Coastal wetland habitats are being restored through different methods intended to reestablish the physical and chemical processes, such as the exchange of tidal waters in places where it has been blocked or restricted. This may involve the removal of tidal barriers such as aboiteaux (tide gates), the decommissioning or realignment of dykes or flood control structures, and/or the removal or remediation of tidal crossings (i.e., culverts, bridges). Once natural processes are restored, salt marsh and/or estuarine vegetation and associated functions tend to reestablish naturally, with little need for further human intervention, provided the environmental conditions are suitable.

In response to changes in water levels due to sea level rise, tidal wetlands grow both vertically and horizontally. With sufficient sediment supply, tidal wetlands are able to maintain their elevation and keep pace with sea level rise (Ollerhead 2011). In addition, they can also migrate landward if sufficient accommodation space is available (Singh et al. 2007). If space for horizontal migration is not available, a tidal wetland can continue to grow vertically in place, sustained by the supply of sediment and the growth of the vegetation community. Many of the salt marshes in the Bay of Fundy lack space to migrate, yet are healthy.

The removal of barriers to marsh migration (such as hardened structures) and the protection/restoration of accommodation space are important considerations for coastal wetland restoration to allow for landward migration (van Proosdij 2021), however those marshes that are bordered by hard structures also have the potential to be restored.



Photo: Clean Foundation



# FISH HABITAT

## RESTORATION PRIORITIES FOR NOVA SCOTIA

### Important Ecosystem Functions, Species, and Areas

The important ecosystem functions, fish species, and areas for Nova Scotia that are subject to threats, and have the potential to benefit from fish habitat restoration actions are identified in the table below. These were developed to align with a broad range of perspectives, and to reflect the *‘Considerations for Selecting Fish Habitat Restoration Priorities’* outlined in the National Framework.

Rather than naming specific species or geographic areas, the approach outlines categories. These were identified:

- based on a review of various information sources (e.g. species at risk recovery documents, integrated fisheries management plans, funding program priorities) and engagement input;
- with the intent that they reflect priorities of DFO and its partners; and
- to recognize the importance of the ecosystem as a whole rather than placing preference on one particular species or geographic area.

## IMPORTANT ECOSYSTEM FUNCTIONS

Aquatic habitat connectivity and flow that enables movement of fish, nutrients and other material: This includes connectivity within freshwater environments or between the freshwater and coastal/estuarine systems.

Riparian and shoreline features that maintain aquatic habitat: These areas and features prevent bank and coastline degradation and flooding, and in turn prevent erosion and sedimentation, provide shelter and food to aquatic life, and support the natural flow regime.

Water quality that supports fish productivity: This includes acidity, temperature, oxygen, and turbidity, within suitable ranges to support the life processes of important fish species.

Physical habitat features that support fish productivity: These features and structures support the life processes of important fish and could include benthic habitat and instream morphology (e.g., riffle, pool, run sequences).

## IMPORTANT SPECIES

Species of importance to the Mi'kmaq of Nova Scotia: Species that are identified as being culturally significant for Food, Social, and Ceremonial purposes. Restoration priorities will respect and promote the rights and interests of the Mi'kmaq of Nova Scotia, incorporate Mi'kmaw knowledge and cultural values, and support treaty fishing rights.

Commercially and recreationally fished species: Species that DFO is mandated to manage and/or species that are of importance and under the management of the province of Nova Scotia (Note: this does not include recreationally-fished species that are aquatic invasive species (e.g., Smallmouth Bass, Chain Pickerel)).

Species at risk: Species listed under the Species at Risk Act (SARA) and/or assessed as at-risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

Ecologically significant species (ESS) and community properties: A species or community property that has particularly high ecological significance. DFO uses this tool to draw attention to a species or community, considered to be of particular significance for maintaining ecosystem structure and function (e.g., seagrass) (DFO 2006b).

## IMPORTANT AREAS

Areas of importance to the Mi'kmaq of Nova Scotia: Areas of importance are those identified by the Mi'kmaq of Nova Scotia to be of significance.

Areas established or being considered for DFO regulatory management: Areas where DFO has legislative responsibilities including: critical habitat for species at risk, Marine Protected Areas (MPAs) and Areas of Interest (AOIs), and Ecologically Significant Areas (ESAs) and candidate areas.

Areas defined as DFO departmental priorities: Areas including index rivers, grants and contributions priority areas, and those identified as priorities for various programs.



## Restoration Goals and Actions

In Nova Scotia, DFO will prioritize restoration initiatives that improve important ecosystem functions to benefit important fish species and/or important areas across the province as defined in the table above.

Four overall restoration goals are identified for Nova Scotia that correspond with each of the important ecosystem functions. The restoration goals are relatively broad, allowing for flexibility in their interpretation, and are applicable at both the provincial and sub-regional scales, and to a range of fish habitat types (i.e. freshwater and coastal).

Fish habitat restoration actions are then identified for each restoration goal shown in the table below. The restoration actions for Nova Scotia are not ranked, but rather, represent opportunities for actions that are deemed to be of importance to promote fish habitat improvements in the province. While the restoration actions are not ranked, in freshwater systems it may be preferable to first protect and conserve intact habitats, then undertake restoration actions in the following order: remove barriers to intact habitats; restore watershed processes (e.g., instream flows, sediment reduction, riparian areas), and finally, enhance instream habitat (Beechie et al. 2008). However, as specific watersheds have different needs, this step-by-step approach may not be appropriate in all situations (DFO 2006a).

Identification of an activity as a restoration action does not negate or supersede the need for regulatory approval(s). Prior to undertaking restoration actions, it is the responsibility of the recipient, proponent, or organization to verify with the various levels of government whether permits and/or authorizations are required and to acquire the necessary permits and/or authorizations.



## RESTORATION GOAL 1: IMPROVE AQUATIC HABITAT CONNECTIVITY TO AND BETWEEN IMPORTANT AREAS

### Freshwater Restoration Actions

- Improve connectivity where it will facilitate access to the greatest amount of high quality habitat for important species and in important areas (where natural connectivity historically existed).
  - Connectivity improvements should aim to restore natural flows (including with floodplains and wetlands), nutrient exchange, and facilitate access to high quality habitat.
- To restore connectivity, the order of preference for the approach to be implemented is:
  - i. Remove structure to restore free flow of the watercourse.
  - ii. Replace with an improved structure (such as an open bottom structure or clear span bridge), which maintains the natural stream bottom.
  - iii. Replace with a closed bottom structure that is properly sized for the 1:100 year storm levels, embedded, and filled with material to simulate the natural watercourse. This can be an alternative if open bottom structures are not possible and site conditions and design requirements for the embedded structure are met.
  - iv. Remediate the existing structure (such as addition of low flow barrier, chute and/or baffles) to improve flow and/or fish passage as a short-term, interim measure until a longer-term solution is feasible to implement.
- To restore connectivity across floodplains, regrade streambanks of incised channels to maintain connection between a watercourse and the floodplain and allow for channel migration and connection of wetlands.

#### Note:

- Specific conditions that are outlined in the [‘Guidelines for the design of fish passage for culverts in Nova Scotia’](#) must be met.
- The presence of aquatic invasive species may influence sites selected for restoring connectivity. The benefits of restoring connectivity must outweigh the risk of unintentionally spreading aquatic invasive species or any other unintended risks. Considerations for Nova Scotia are outlined in the [‘Aquatic Connectivity and Aquatic Invasive Species: A Decision Making Framework for Fish Passage in Nova Scotia’](#).

### Coastal Restoration Actions

- Improve connectivity where exchange of tidal waters is restricted and where it will facilitate access to the greatest amount of high quality habitat for important species.
  - Connectivity improvements should aim to restore natural flows, promote natural estuarine processes including sediment and nutrient exchange, and promote the restoration of tidal wetlands in areas that are not blocked by hardened structures (such as roads).
- To restore connectivity, the order of preference for the restoration approach to be implemented is:
  - i. Remove structure to reestablish a more natural hydrological regime and allow fish passage.
  - ii. Replace with an improved structure (such as clear span bridge or open bottom structure) to reestablish a more natural hydrological regime and allow fish passage.

#### Note:

- Project designs need to consider potential impacts to existing infrastructure and adjacent lands to avoid unintentional negative impacts.

## RESTORATION GOAL 2: RESTORE RIPARIAN AND SHORELINE FISH HABITAT IN IMPORTANT AREAS

### Freshwater Restoration Actions

- Plant native vegetation where streambanks are vulnerable to increased erosion particularly in areas adjacent to habitat necessary to support life history processes for important species.
  - Riparian zone improvements should aim to help reduce erosion, stabilize banks, and improve habitat conditions (e.g., shade, food, cover, water quality) for important species.
- For riparian zone restoration, the order of preference for the restoration approach to be implemented is:
  - i. Use living shoreline techniques where feasible.
  - ii. Blend living shorelines or riparian plantings with hardened approaches for bank stabilization.
  - iii. Use more robust, hardened structures if needed to address issues in high flow, highly dynamic systems that cannot be corrected through softer techniques.

### Coastal Restoration Actions

- Stabilize shorelines where habitat is vulnerable to erosion impacts, and where the actions can improve habitat that supports key life processes of fish.
  - Actions should aim to reduce wave energy, reduce shoreline erosion potential, improve water quality, and increase shoreline resiliency and diversity of coastal habitat for important species.

#### Note:

- Bank stabilization is an important action, in general, for climate change adaptation. In the context of restoration priorities, projects must benefit fish habitat and approaches would need to have fish-friendly habitat features incorporated into the design.
- The roles of tidal wetlands, seagrass meadows, and artificial reefs as buffers are captured in other restoration goals.

## RESTORATION GOAL 3: IMPROVE WATER QUALITY TO INCREASE PRODUCTIVITY OF IMPORTANT FISH

### Freshwater Restoration Actions

- Address acidification issues by applying lime (either directly to water or to adjacent forested lands) in watersheds that are limited by pH and that are relatively undisturbed and where there are existing populations of important species.
  - Improving water quality should aim to help address acidic conditions and reestablish water chemistry levels within ranges suitable to support the life processes of important species.

#### Note:

- Water quality involves a variety of other parameters (e.g., temperature, dissolved oxygen, turbidity). These are captured in other restoration goals.
- Liming requires ongoing efforts and restoration practitioners should ensure they have the ability to maintain long-term commitments of liming prior to beginning.

### Coastal Restoration Actions

#### Note:

- Water quality involves a variety of parameters (such as temperature, dissolved oxygen, turbidity). Water quality can be improved by reestablishing more natural hydrological regimes. Actions to address these in coastal areas are captured in other restoration goals.

## RESTORATION GOAL 4: IMPROVE QUALITY OF PHYSICAL FISH HABITAT TO INCREASE PRODUCTIVITY OF IMPORTANT SPECIES

### Freshwater Restoration Actions

- Install instream habitat restoration structures where watercourses have become over-widened, over-heated and/or shallow and where there are existing populations of important species.
  - Instream habitat improvement should aim to support the reestablishment of meander (curving) and river flow patterns, thalwegs and pool-riffle-run sequences, help reduce water temperatures, and facilitate movement of important species throughout the watershed.

### Coastal Restoration Actions

- Install artificial reef structures where the bottom of the body of water, including the seafloor and the sediment, lacks conditions to support productivity of important species.
  - Artificial reef structure installation should aim to increase benthic habitat complexity and productivity, provide refuge, improve feeding habitat, and help reduce wave action.
- Revegetate native seagrasses (e.g., eelgrass) where nearshore conditions such as shallow sheltered bays with good water quality and appropriate substrates exist.
  - Revegetation of native seagrasses should aim to promote restoration and/or enhancement of existing habitat to provide spawning, rearing, feeding and refuge habitat for important fish species, help reduce wave action and resulting coastal erosion, and improve water quality.

#### Note:

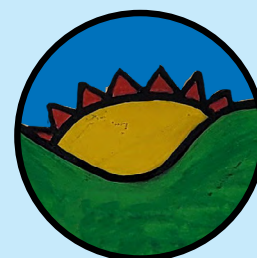
- Excessively soft or depositional areas should be avoided for artificial reefs as they may become buried with sediment over time, thereby reducing or eliminating their effectiveness.
- Kelp restoration in Nova Scotia is an emerging field, and current efforts involve exploring approaches to grow kelp in nurseries and testing various substrates for kelp settlement.
- Restoration of tidal wetlands is captured in the connectivity restoration goal.

Refer to Appendix B for lists of restoration guidance, protocols, open source data platforms, and resources to be followed, as relevant and applicable, depending on the nature of the restoration initiative(s) being considered.

### Promoting Climate Change Adaptation and Resiliency

#### *An Over-Arching Consideration for Fish Habitat Restoration in Nova Scotia*

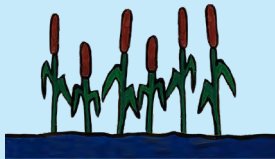
Although restoration cannot stop the threat of climate change, measures can be taken to promote adaptation, through increasing habitat resiliency, and mitigating impacts. Predicted future climate change scenarios should be used to evaluate climate change resilience and considered in the design of restoration projects (e.g., designing instream structures in consideration of future flow scenarios). Certain fish habitat improvements have the co-benefits of supporting the mitigation of climate change impacts (e.g., restoring coastal buffer features and living shorelines provide shoreline protection against increasingly frequent and extreme storm events; salt marsh and eelgrass restoration promote carbon sequestration; and the development of cold-water refugia benefits multiple cold-water species). Where possible, opportunities to increase climate change resiliency and adaptation should be implemented through fish habitat restoration initiatives.





### **Inter-Relatedness Amongst Restoration Goals and Actions**

Like the ecosystem functions they were derived from, the restoration goals are closely inter-related, and must not be considered in isolation when evaluating restoration needs. The restoration actions can contribute to achieving more than one restoration goal, either directly, or by complementing other priority actions.



### **Example - Riparian Restoration:**

Attributes in the riparian zone maintain aquatic features through various biophysical processes. By planting native vegetation on streambanks to reinstate the riparian vegetation in degraded areas, bank stability is improved, which reduces or eliminates active erosion and associated sediment discharge into the watercourse. This, in turn, can reduce instream sedimentation, thus improving physical stream habitat. Once the plantings become established, grow and mature, the shade offered helps lower the water temperatures and provides habitat for insects which contribute nutrients to the water and the species it supports. In addition, the newly stabilized streambanks will affect the hydrology, helping nature to reestablish appropriate habitat features including pool, riffle, run sequences.

For further information about the importance of riparian zone management for freshwater fish and fish habitat protection in Nova Scotia, including a description of the seven biophysical processes occurring in the riparian zone that support aquatic features and their description, refer to Collison and Gromack (2022).

## Additional Considerations for Fish Habitat Restoration Projects

In addition to the restoration goals and actions that align with the important ecosystem functions, there are a number of additional considerations that should be applied in designing fish habitat restoration projects. While projects must consider all relevant DFO policies and guidance, including grant and contribution program funding criteria or requirements under a *Fisheries Act* Authorization (e.g., habitat offsetting, monitoring), the information in the table below is intended to guide the development of strategic restoration projects so they align with DFO's priorities. The considerations below are informed by over-arching principles of restoration in the literature, feedback from engagement, and best practices for restoration. It is acknowledged that in identifying and planning specific restoration projects, the Mi'kmaq may also have project specific priorities.

### INDIGENOUS PERSPECTIVES

- Preference will be given to restoration projects that prioritize Mi'kmaq knowledge and perspectives, or that integrate Mi'kmaq knowledge with Western scientific approaches through *Etuaptmumk* (Two-Eyed Seeing), to inform localized restoration actions.

### LOCAL LEADERSHIP AND/OR PARTNERSHIP

- Restoration projects are more likely to succeed with the leadership and support of local communities (e.g. Mi'kmaq communities and organizations, watershed organizations, and/or other community user groups);
- Preference will be given to projects that have the support and active involvement of the community.

### HIGH QUALITY RESTORATION OR WATERSHED MANAGEMENT PLANS

- High quality restoration or watershed management plans inform the prioritization of habitat restoration projects and the development of localized objectives;
- Preference will be given to restoration projects that are informed by high quality restoration or watershed management plans.

### EXPERTISE AND EXPERIENCE

- Due to the complexity of natural systems, the prioritization and implementation of restoration actions should be informed by individuals who have the applicable knowledge and experience to enable them to apply techniques appropriately. This could include knowledge and experience about the watershed, target species, and restoration techniques;
- Preference will be given to projects that involve the oversight of restoration practitioner(s) who have relevant training, expertise and experience.

### CLIMATE CHANGE ADAPTATION, MITIGATION AND RESILIENCE

- Restoration actions can address climate change impacts by promoting adaptation and increasing resiliency to help mitigate impacts (e.g. cold-water refugia, coastal buffer features, blue carbon capture);
- Preference will be given to projects that are designed in consideration of predicted future climate change scenarios (e.g. increased flows, sea level rise), and that incorporate fish habitat features, and optimize opportunities to yield climate change related co-benefits (e.g. shoreline stabilization and carbon capture).

## LARGE-SCALE INFRASTRUCTURE

- In areas impacted by existing large-scale infrastructure (e.g., that impede overall connectivity to upstream habitat), DFO will continue to work with proponents to address the issue(s) through enforcing the existing facilities policy;
- Preference, in most cases, will be given to restoration projects in watersheds that do not have large-scale infrastructure.

## LIMITING FACTORS

- If key variables (e.g., oxygen, pH, wave energy, aquatic invasive species) are not within a suitable range to support the life processes of important species, and are limiting, then physical habitat restoration is not likely beneficial to fish. There are some exceptions - physical habitat restoration actions often help improve certain parameters such as flows, water temperature, and connectivity (e.g. by reestablishing resting pools for upstream migrations);
- Preference, in most cases, will be given to physical habitat restoration projects in areas where key parameters such as water quality (e.g. pH, metal levels, temperature) fall within ranges suitable to support important species, but where physical habitat is limiting.

## AQUATIC INVASIVE SPECIES

- In some circumstances, restoration can cause unwanted effects such as the unintentional spread of aquatic invasive species (e.g. through restoration of connectivity);
- Preference will be given to projects that have minimal risk of incidental introduction and spread of aquatic invasive species.

## STANDARD PROTOCOLS FOR DATA COLLECTION, MANAGEMENT, AND SHARING

- A number of standardized data collection protocols for pre and post-restoration assessments and monitoring (e.g. habitat and barrier assessments, eDNA sampling) have been developed (see Appendix B);
- There are also a number of open source data platforms, that allow for data to be shared and used to inform other projects (see Appendix B);
- Preference will be given to projects that demonstrate the use of standardized data protocols for the collection, management, storage and sharing of data (where available).

### Monitoring

The general intent of fish habitat restoration monitoring is to determine whether or not some level of improvement has been achieved through restoration work. Fish habitat restoration monitoring typically aims to assess changes observed in conditions before restoration and after its implementation. The complexity of habitat restoration monitoring spans a spectrum from relatively simple observations, to more elaborate and comprehensive multi-year plans involving the measurement and analyses of multiple indicators or metrics.

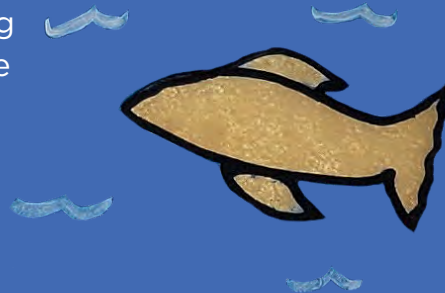
Smaller scale monitoring approaches can help verify that projects have been completed as planned and that structures remain intact and function as intended. If structures are not functioning as intended, repair and maintenance opportunities are identified and implemented, with further monitoring to confirm repairs were effective (e.g., digger logs are leading to pool formation as anticipated; riparian vegetation is growing). Such monitoring approaches may be appropriate for assessing small-scale projects undertaken through well-established restoration techniques.

By comparison, more rigorous monitoring may be required in some cases, particularly if novel or experimental techniques are used or to meet requirements under a *Fisheries Act* Authorization (e.g., habitat offsetting). This more rigorous monitoring could involve assessing various factors (e.g. structural, biological, ecological) to compare pre- and post-restoration conditions, and/or to compare the restored site against control and/or reference sites. The collection and analysis of a suite of key metrics over multiple years can help assess the effectiveness of restoration in addressing broader ecosystem goals (e.g. increases in fish populations).

In practice, the implementation of rigorous monitoring programs may not always be feasible. The feasibility of undertaking an extensive restoration monitoring program can depend on the capacity of the organization or restoration team (e.g., long-established, high capacity organizations may be able to undertake more comprehensive monitoring programs). There may be opportunities to leverage resources across organizations to achieve more comprehensive, rigorous, or longer term monitoring if merited. In any case, it is important to be familiar with legislative or program monitoring requirements well in advance of undertaking a project, to inform the planning and development of the monitoring component.

### **The Need for Fish Habitat Restoration Guidance**

There is a gap in the availability of technical guidance to inform the design of fish habitat restoration approaches in varying environments. More guidance is available for freshwater habitats, but often these documents have limitations and are only applicable for specified applications, which should be well understood by the users prior to implementation of techniques. In particular, there is a need for technical guidance targeting fish habitat restoration approaches in the coastal and marine environments, documenting existing expertise and approaches and/or development of training opportunities to foster further knowledge exchange. This can help inform restoration for various purposes such as grants and contributions initiatives, and habitat offsetting and banking requirements.





# CONCLUSION

**F**ish habitat restoration efforts are underway in Nova Scotia in a variety of environments to reverse habitat damages. The goals, actions and guidance in this Regional Priorities document are intended to contribute to a more strategic approach to implementing restoration projects to improve ecosystem functions and benefit important species and areas while upholding the values and priorities of the Mi'kmaq. A more strategic approach has the potential to optimize fish habitat restoration gains and help ensure alignment of restoration efforts amongst the various organizations in the province. It will help inform restoration efforts associated with existing grants and contributions programs, guide the development of priorities for potential future grants and contributions programs, inform habitat offsetting and banking projects, and strengthen the Nation to Nation relationship.

For more information, please contact [DFO.MARIP-PIMAR.MPO@dfo-mpo.gc.ca](mailto:DFO.MARIP-PIMAR.MPO@dfo-mpo.gc.ca)

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# APPENDIX A

## ENGAGEMENT SUMMARY

Engagement with partners was carried out throughout the development of the Regional Priorities. Given that fish habitat restoration in Nova Scotia is primarily planned and implemented by organizations external to DFO, it was important to engage with these partners, to ensure that various perspectives and experiences were considered in the plan, and to ensure alignment with other program and partner priorities, where possible.

### **Phase 1: Early Engagement: Helping to Shape the Regional Priorities**

Early engagement took place in 2022 to 2023. It involved a series of in-person meetings held at four locations throughout Nova Scotia, in order to optimize opportunities for participation. One virtual session was held at the end of the series to accommodate those unable to attend in-person.

In order to gather a wide variety of perspectives, a number of organizations were invited to participate in early engagement, including Mi'kmaw communities and organizations, provincial government, non-governmental organizations, local watershed groups, academia, and consultants. These organizations often work in close collaboration to deliver restoration projects in Nova Scotia. In total, over 50 participants representing 27 organizations took part in the engagement.

The engagement sessions were designed to gather information for Nova Scotia following the approach and concepts in the Framework To Identify Fish Habitat Restoration Priorities ('National Framework'). The National Framework outlines a consistent yet flexible approach that the DFO regions are to follow for the identification of fish habitat restoration priorities for their respective regions. In order to inform the development of the regional priorities, these early engagement sessions were intended to:

- gather information about fish and fish habitat threats and their impacts in Nova Scotia;
- discuss important ecosystem functions, species, and areas; and
- explore the scope, scale, and potential approaches to identifying regional fish habitat restoration priorities.

Throughout the sessions, there was discussion about the major threats and impacts to fish and fish habitat in Nova Scotia. There were also discussions about important ecosystem functions, species, and areas; and the proposed approach to develop restoration goals to align with the ecosystem functions. Participants generally supported the proposed ecosystem approach to developing the restoration goals and actions. In addition, a number of restoration priorities emerged throughout the engagement discussions, extending beyond ecological priorities. Some of the main themes that were heard across the sessions included:

- climate change is an over-arching threat and mitigation and adaptation to increase resiliency should be considered for restoration priorities;
- Mi'kmaw Ways of Knowing should be reflected in restoration goals and actions and Indigenous Mi'kmaw communities and organizations should be involved in site prioritization and monitoring;
- place-based knowledge is needed for the identification of localized restoration priorities;
- further resources are needed to support fish habitat restoration including funding, guidance, training, and opportunities to foster collaboration;
- work is required to make progress toward addressing the root causes of habitat degradation;
- priorities should consider the risk of unintentional spread of aquatic invasive species;
- challenges relating to the remediation of structures that obstruct watercourse connectivity impacting fish passage, flows, and exchange between freshwater, estuaries, and the adjacent coastline need to be addressed;
- priorities should promote healthy riparian and intertidal zones to restore stability, shade, and water quality; and
- there should be clear, transparent and measurable indicators to track success or failure of restoration through monitoring.

The draft regional restoration document was developed based on the information and perspectives gathered through the early engagement sessions. The sections of the draft document reflect the “process steps” that are outlined in the National Framework. Additional information was gathered, upon the suggestion of engagement participants, through the review of existing guidance documents, reports, and watershed plans, and through some targeted discussions with subject matter experts. The intent of this additional information gathering was to complement and expand upon what was heard through early engagement to provide some additional context within the draft Regional Priorities document.

Mi'kmaw communities and organizations were invited to, and participated in the early engagement workshops. Updates about progress on the development of the draft document were provided to Indigenous Habitat Participation Program (IHPP) coordinators at various times throughout the development of the document. A simple summary of the highlights of ‘What We Heard’ was shared at IHPP meetings, and feedback and comments were welcomed.

### **Phase 2: Engaging on the Draft Regional Priorities**

The draft regional restoration priorities document was distributed in 2025 to Mi'kmaw communities and organizations, the provincial government, non-governmental organizations, local watershed groups, academia, and consultants. The input gathered through this engagement informed the finalized document.

# APPENDIX B

## RESTORATION GUIDANCE

The following resources contain guidance that can help inform various fish habitat restoration-related activities and components. The guidance list contains resources that can inform the development of fish habitat restoration projects including the planning, assessments, restoration approaches, open source data platforms, monitoring approaches and funding sources. It is important to understand the limitations, constraints and applicability of the various guidelines, tools, and restoration approaches presented below, and the need for oversight by a properly trained and experienced restoration practitioner. The resource list is not comprehensive. It is evergreen and will be updated periodically to reflect new developments and information. Links to the websites for the various resources are provided in the tables below.

### Section 1: Freshwater Restoration Planning and Implementation Resources

**Table 1.1 Watershed and Restoration Planning and Freshwater Restoration Methods**

RESOURCE	PURPOSE AND LINKAGE(S) TO RESTORATION	SOURCE OF DOCUMENT	DATE PUBLISHED
<a href="#">Ecological Restoration to Degraded Aquatic Habitats: A Watershed Approach</a>	This manual was developed to help educate citizens on various aspects related to watershed management and fish habitat conservation, protection and enhancement. The manual contains information to help educate citizens about various aspects related to watershed management including fundamental information on: watershed processes, human impacts, stream function, fish habitat, limiting factors and habitat needs for various fish species, watershed and stream assessments, and fact sheets on various fish habitat restoration techniques. The restoration techniques included in this manual are suitable for small to medium size and low gradient watercourses with predominantly cobble and gravel bottoms. Different approaches would be needed for large rivers with steeper gradients.	Fisheries and Oceans Canada	2006

RESOURCE	PURPOSE AND LINKAGE(S) TO RESTORATION	SOURCE OF DOCUMENT	DATE PUBLISHED
<a href="#">Fish Habitat Restoration Methods</a>	<p>Information on various well established restoration techniques for application freshwater environments. Instream structures must be sized and placed properly, with appropriate consideration of the natural processes that form and maintain stream structure. In order to be effective, aquatic habitat restoration plans should involve trained specialists who have the knowledge, training, and experience to size and lay-out the structures. Decisions about restoration methods and approaches applicable to a site are informed by the information collected through the habitat suitability assessments.</p>	<p>Nova Scotia Salmon Association - Adopt A Stream Program</p>	<p>2014</p>
<a href="#">Habitat Suitability Assessments</a>	<p>The Nova Scotia Fish Habitat Suitability Index Assessment (NSHSI) was developed by the Nova Scotia Salmon Association and is being used widely across the province. This webpage contains important information and guidance on the protocol for habitat suitability assessments -it was created to standardize freshwater fish habitat assessments while making use of habitat suitability variables and values specific to Nova Scotian rivers. The approach was originally developed to assess habitat for salmonids, but the data collected can be examined in various ways depending on the target species of interest and their habitat requirements.</p>	<p>Nova Scotia Salmon Association - Adopt A Stream Program</p>	<p>2018</p>
<a href="#">The Nova Scotia Adopt A Stream Program: A Watershed Approach to Community-Based Stewardship</a> (Nova Scotia Adopt A Stream Manual)	<p>This manual is intended to be used by various types of groups to help improve conditions for fish in Nova Scotia through the implementation of actions to improve the quality of fish and wildlife habitat in and around the waterways of Nova Scotia. The AAS manual has been developed for ordinary Nova Scotians who may not have special knowledge about fish or waterways. It provides the basic tools and guidelines for 'adopting' a stream or other waterway including information about watersheds, historical uses and impacts, habitat types, understanding habitat requirements, enhancement methods, and other information to help an organization or individual get started.</p>	<p>Nova Scotia Salmon Association - Adopt A Stream Program</p>	<p>2005</p>

**Table 1.2 Habitat Connectivity**

RESOURCE	PURPOSE AND LINKAGE(S) TO RESTORATION	SOURCE OF DOCUMENT	DATE PUBLISHED
<a href="#">Guidelines for the design of fish passage for culverts in Nova Scotia</a>	This document provides procedural and technical information to ensure that engineers and other design professionals properly incorporate fish passage into watercourse crossings. Ensuring successful fish passage can be complicated and requires careful design, installation and ongoing maintenance. The guidelines pertain to permanent single culverts where the watershed size is no more than 20 km <sup>2</sup> and the watercourse support fish that require fish passage. The user should be familiarized with other considerations and constraints on the use of the guidelines, in advance of applying them to the design of culverts.	Fisheries and Oceans Canada	2015
<a href="#">Watercourse Crossing Assessment Training Information, Field Form and Batch Entry Sheet</a>	The Aquatic Connectivity Assessment Training focuses on culvert surveys and evaluating whether or not a structure is a barrier (e.g. full, partial) to fish passage. The data collected can be used with modelling software to model fish passage through culverts for a variety of species. This website contains information on how to take the aquatic connectivity training and field and batch entry sheets.	Nova Scotia Salmon Association – Adopt A Stream Program	Website updated as needed

**Table 1.3 Water Quality**

RESOURCE	PURPOSE AND LINKAGE(S) TO RESTORATION	SOURCE OF DOCUMENT	DATE PUBLISHED
<a href="#">CABIN Field Manual for Wadable Streams</a>	This webpage contains information on the Canadian Aquatic Biomonitoring Network (CABIN) and has many resources such as a field techniques video, manuals, field sheets and checklists. In the context of restoration, this resource could be beneficial to obtain training in standardized CABIN protocols for the collection of information about benthic macroinvertebrates. This information can help inform habitat quality assessments that feeds into fish habitat restoration planning, prioritization, and implementation.	Environment and Climate Change Canada	2012
<a href="#">“Walking the River”—A Citizen’s Guide to Interpreting Water Quality Data</a>	This guide is intended to be used as a tool to give users a better understanding of the importance of water quality and how to properly interpret water quality data. This information can help inform restoration planning, prioritization and implementation.	Nova Scotia Salmon Association – Adopt A Stream Program	2014

**Table 1.4 Electrofishing**

RESOURCE	PURPOSE AND LINKAGE(S) TO RESTORATION	SOURCE OF DOCUMENT	DATE PUBLISHED
<a href="#">Electrofishing Field Training Information</a>	This webpage gives information on how to obtain training for electrofishing, which is a commonly used fish collection method in streams, rivers, and lakes. Although not legislated in most provinces in Canada (except for BC), electrofishing training provides trainees with adequate knowledge of the risks and safety features of these machines.	Canadian Rivers Institute	Website updated as needed

## Section 2: Aquatic Invasive Species

**Table 2.1 Aquatic Invasive Species Resources**

RESOURCE	PURPOSE AND LINKAGE(S) TO RESTORATION	SOURCE OF DOCUMENT	DATE PUBLISHED
<a href="#">Aquatic Connectivity and Aquatic Invasive Species: A Decision-Making Framework for Fish Passage Projects in Nova Scotia</a>	This decision-making framework was developed to guide managers in the planning and prioritization of aquatic connectivity improvement projects in the Nova Scotia context, in consideration of the potential risk for aquatic invasive species (AIS) to move into a previously isolated area should the barrier be remediated or removed.	Clean Annapolis River Project in partnership with Nova Scotia Salmon Association	2020
<a href="#">Invasive Species in Nova Scotia—Second Addition</a>	The presence of invasive species in Nova Scotia is a growing concern for native species across the province. In the context of restoration, this guide could be an informative resource for restoration practitioners to be able to identify not only common aquatic invasive species, terrestrial and botanic invasives. In order to eliminate or slow down the spread of invasive species, reporting sightings is a crucial step in further understanding the distribution of invasive species and this guide could help restoration practitioners be able to identify a wide range of invasive species and if spotted, be able to report the sightings.	Nova Scotia Invasive Species Council	2022

## Section 3: Coastal Restoration Planning and Implementation Resources

**Table 3.1 Seagrass**

RESOURCE	PURPOSE AND LINKAGE(S) TO RESTORATION	SOURCE OF DOCUMENT	DATE PUBLISHED
<a href="#">National Eelgrass Task Force</a>	The National Eelgrass Task (NET) Force is an innovative, diverse and inclusive partnership of scientists, managers, and partners working towards a national map of eelgrass distribution in Canada that is publicly accessible. This may serve as a starting point when considering undertaking eelgrass restoration.	Fisheries and Oceans Canada	2021
<a href="#">Seagrass Restoration Handbook</a>	The Seagrass Restoration Handbook provides foundational guidance on the restoration and conservation of seagrasses and seagrass beds in the UK and Ireland with a focus on the <i>Zostera</i> species ( <i>Z. marina</i> and <i>Z. noltei</i> ). The guidance outlined is also relevant to restoration projects across the biogeographic range of these seagrass species.	Community Eelgrass Restoration Initiative	2021

**Table 3.2 Reef Structures**

RESOURCE	PURPOSE AND LINKAGE(S) TO RESTORATION	SOURCE OF DOCUMENT	DATE PUBLISHED
<a href="#">A Step-by-step Guide for Grassroots Efforts to Reef Rehabilitation</a>	This guide was developed for user groups that are interested in 'reef rehabilitation. Although it devotes many chapters to coral reefs, it offers a step-by-step framework suitable for rehabilitation efforts on any type of reef including temperate reefs, kelp reefs, and others, and it can inform benthic restoration work in Nova Scotia. It includes guidance for common design goals such as fish enhancement.	Reef Ball Foundation	2008
<a href="#">Methods to Determine the Efficacy of Utilizing Artificial Scallop and Rock Reefs as Fish Habitat Compensation in Inshore Newfoundland</a>	This document is a published paper that provides guidance on methods to determine the efficacy of utilizing artificial scallop and rock reefs as fish habitat compensation in inshore Newfoundland. The approaches can inform considerations for coastal restoration approaches in Nova Scotia.	Fisheries and Oceans Canada	2017

**Table 3.3 Tidal Wetlands**

RESOURCE	PURPOSE AND LINKAGE(S) TO RESTORATION	SOURCE OF DOCUMENT	DATE PUBLISHED
<a href="#">Northumberland Strait Salt Marsh Atlas</a>	The Northumberland Strait Salt Marsh Atlas contains information on the state of tidal flow for road crossings and salt marshes in Nova Scotia.	Clean Foundation	2020
<a href="#">Restore America's Estuaries (RAE)</a>	Restore America's Estuaries is an umbrella organization in the U.S.A. of groups that work on salt marshes, eelgrass, etc. The organization has many different resources that could help inform restoration planning and implementation.	Restore America's Estuaries	Website updated as needed
<a href="#">TransCoastal Adaptations</a>	TransCoastal Adaptations is a Centre for Nature-Based Solutions at Saint Mary's University that engages in research and partnerships that promote and undertake projects related to climate change adaptation. The organization provides many different resources and information that could help inform restoration planning and implementation in coastal areas.	TransCoastal Adaptations: Centre for Nature-Based Solutions	Website updated as needed

**Table 3.4 Kelp**

RESOURCE	PURPOSE AND LINKAGE(S) TO RESTORATION	SOURCE OF DOCUMENT	DATE PUBLISHED
<a href="#">Monitoring Kelp Forest Ecosystems: A Guidebook to Quantifying Biodiversity, Ecosystem Health, and Ecosystem Benefits</a>	This guidebook is intended to provide practical knowledge to contribute to the protection and restoration of kelp forests around the world. The guidebook provides an overview of different approaches to monitoring and reporting.  Work on kelp restoration is an emerging area in Nova Scotia, and this guidebook provides a good starting point.	Kelp Forest Alliance (Australia)	2024

**Table 3.5 Other**

RESOURCE	PURPOSE AND LINKAGE(S) TO RESTORATION	SOURCE OF DOCUMENT	DATE PUBLISHED
<a href="#">Green Shores</a>	<p>Information and guidance on the “Green Shores” Program, intended to encourage the use of natural approaches to address such issues as shoreline erosion, flooding, sea level rise, and climate change adaptation. The website includes information about green shore principles, programs, training, and other resources such as webinars, toolkits and newsletters. Green shore approaches can help inform restoration planning and implementation of feasible alternatives to grey (hardened) shorelines, and such techniques can sometimes be applied in the context of fish habitat restoration, where feasible.</p>	<p>TransCoastal Adaptations Centre for Nature-Based Solutions</p>	<p>Website updated as needed</p>
<a href="#">Nature-based Infrastructure for Coastal Flood and Erosion Risk Management: A Canadian Design Guide</a>	<p>This document provides guidance for practitioners on techniques for selecting, designing, deploying, preserving, and adaptively managing nature-based infrastructure in Canada’s diverse coastal settings. The guidance may help inform the exploration of approaches to implement fish habitat restoration, and stabilize coastlines which can sometimes include nature-based solutions, where feasible.</p>	<p>National Research Council Canada</p>	<p>2024</p>
<a href="#">Nature-based Solutions to Address Flood Risks in Coastal Communities: Monitoring Efficacy: Proposed Methodology and Indicators</a>	<p>This document provides information and guidance related to monitoring nature-based solutions. It includes best practices for monitoring program design and considerations for the selection of performance metrics, performance indicators, and monitoring methodologies. There are case studies relating to implementation of monitoring programs in Canada, Mexico, and the United States, including monitoring considerations for restoration involving fish habitat.</p>	<p>Commission for Environmental Cooperation</p>	<p>2025</p>

## Section 4: Open Source Data Platforms and Resources

**Table 4.1 Open Source Data Platforms and Resources**

RESOURCE	PURPOSE AND LINKAGE(S) TO RESTORATION
<a href="#">Aquatic Connectivity Analytical Database (ACAD)</a>	<p>This database is a central archive of aquatic connectivity data in Nova Scotia to be used to address issues of aquatic habitat fragmentation. It was developed as part of the Nova Scotia Salmon Association Adopt-A-Stream <a href="#">Aquatic Connectivity Initiative</a>. This database was developed in partnership with the Clean Annapolis River Project, with the intent to help address the need for a central archive of aquatic connectivity in Nova Scotia. For fish habitat restoration, it can be used to seek information about connectivity and it can serve to store information about the status of barriers.</p>
<a href="#">Aquatic species at risk map</a>	<p>A compilation of critical habitat and distribution data for aquatic species listed under the <i>Species at Risk Act</i> (SARA). This map is intended to provide an overview of the distribution of aquatic species at risk and the presence of their critical habitat within Canadian waters.</p>
<a href="#">Atlantic Canada Conservation Data Centre (ACDC)</a>	<p>The Atlantic Canada Conservation Data Centre (ACDC) compiles and provides data about biological diversity in Atlantic Canada. Species at risk observations can be submitted to the ACDC. A data search can be requested around a point or small area of interest.</p>
<a href="#">Atlantic DataStream</a>	<p>Atlantic DataStream is an open access platform for sharing information on freshwater health. It currently allows users to access, visualize, and download full water quality datasets collected by monitoring groups from Newfoundland and Labrador, New Brunswick, Prince Edward Island and Nova Scotia. Atlantic DataStream is coordinated locally by <a href="#">Atlantic Water Network</a>. The network provides technical support for the collection of high quality water data and the lending of sampling equipment, which can support baseline and other assessments as part of fish habitat restoration projects.</p>
<a href="#">Canadian Aquatic Barriers Database (CABD)</a>	<p>The Canadian Aquatic Barrier Database is a collaborative initiative being led by the Canadian Wildlife Federation (CWF) to consolidate all of Canada's aquatic barrier and freshwater connectivity information in one place that is openly accessible.</p>
<a href="#">Coastal &amp; Ocean Information Network (COINAtlantic)</a>	<p>COINAtlantic actively uses and promotes open data portals, open data tools, and web atlases in its work to meet partners' objectives, such as resource management, geospatial data analysis, sustainable development, or citizen science initiatives. It can serve as a starting point for organizations exploring data to support restoration, and for the collection, management and handling of data.</p>
<a href="#">GeoNOVA</a>	<p>This database, managed by the Province of Nova Scotia, provides a directory on various geographic data for Nova Scotia that could help with restoration planning.</p>
<a href="#">iMap Invasives</a>	<p>An online, GIS-based data management system used to track invasive species. In the context of fish habitat restoration, it can be used to view AIS distribution or to report occurrences that may be encountered while conducting assessments relating to restoration tasks.</p>
<a href="#">iNaturalist</a>	<p>iNaturalist is an online social network of people sharing biodiversity information to help each other learn about nature. It is also a crowd-sourced species identification system and an organism occurrence recording tool.</p>
<a href="#">RivTemp (salmon)</a>	<p>RivTemp aims to bring together organizations concerned with water temperature issues in Atlantic salmon rivers; to centralize temperature data collected by different organizations on a variety of rivers in Eastern Canada (RivTemp database) and to develop thermal metrics relevant to the development of salmon protection tools and protocols.</p>
<a href="#">The Province of Nova Scotia's open data on Nature and Environment</a>	<p>This database provides a directory of datasets related to Nova Scotia's primary, secondary and sub-tertiary watersheds that could help with restoration planning and mapping work in regard to restoration projects.</p>

## Section 5: Funding programs that support fish habitat restoration-related activities in Nova Scotia

**Table 5.1 Federal Funding Targeting Indigenous Applicants**

PROGRAM	ADMINISTERING ORGANIZATION	PROGRAM OVERVIEW	PROGRAM SCHEDULE
<a href="#">Aboriginal Fund for Species at Risk (Aquatic Stream)</a>	Fisheries and Oceans Canada (Aquatic Programming)	The objective of the Aboriginal Fund for Species at Risk (AFSAR), established in 2004, is to support the development of Indigenous capacity to participate actively in the implementation of the <i>Species at Risk Act</i> (SARA).	Annual proposal call
<a href="#">Indigenous Habitat Participation Program (IHPP)</a>	Fisheries and Oceans Canada	The Indigenous Habitat Participation Program (IHPP) contribution component provides funding in three areas, including funding for collaborative activities to ensure Indigenous peoples can partner with DFO on fish and fish habitat conservation and protection activities.	Pending funding availability

**Table 5.2 Federal Funding Open to a Broad Range of Recipients**

PROGRAM	ADMINISTERING ORGANIZATION	PROGRAM OVERVIEW	PROGRAM SCHEDULE
<a href="#">Aquatic Ecosystems Restoration Fund (AERF)</a>	Fisheries and Oceans Canada	The Aquatic Ecosystems Restoration Fund (AERF) (2022-2027) support aquatic restoration projects that will help to address the root causes of impacts to coastal and marine environments.	Pending funding availability
<a href="#">Aquatic Invasive Species Prevention Fund (AISPF)</a>	Fisheries and Oceans Canada	The Aquatic Invasive Species Prevention Fund supports projects and partnerships that help prevent the introduction and spread of aquatic invasive species. Habitat improvement is eligible for AISPF funding.	Pending funding availability
<a href="#">Canada Nature fund for Aquatic Species at Risk (CNFASAR)</a>	Fisheries and Oceans Canada	The Canada Nature Fund for Aquatic Species at Risk (CNFASAR), supports the recovery and protection of aquatic species at risk through the delivery of multi-species, place-based and threat-based stewardship actions.	Pending funding availability
<a href="#">Coastal Restoration Fund (CRF)</a>	Fisheries and Oceans Canada	The Coastal Restoration Fund (2017-2022) supported projects that helped to restore coastal aquatic habitats.	Program Ended
<a href="#">EcoAction</a>	Environment and Climate Change Canada	The goal of this fund is to enable freshwater sustainability and actions across Canada. There are 2 funding streams: <ul style="list-style-type: none"> <li>• Stream 1 - Community-led Freshwater Action Across Canada. <ul style="list-style-type: none"> <li>o The goal of the Program is to improve the environment and increase environmental awareness and capacity in the community.</li> </ul> </li> <li>• Stream 2 - Freshwater Sustainability and Innovation Across Canada. This is a pilot program that launched in 2025. The aims are to: <ul style="list-style-type: none"> <li>o Achieve tangible environmental results</li> <li>o Engage communities and organizations to improve freshwater management</li> <li>o Enable sustainable outcomes and engagement following project completion</li> </ul> </li> </ul>	Annual proposal call(s)

**Table 5.2 (continued) Federal Funding Open to a Broad Range of Recipients**

PROGRAM	ADMINISTERING ORGANIZATION	PROGRAM OVERVIEW	PROGRAM SCHEDULE
<a href="#">Environmental Damages Fund (EDF)</a>	Environment and Climate Change Canada	The main goal of the Environmental Damages Fund (EDF) projects is to restore the environment and conserve wildlife and habitats in a scientifically sound, cost-effective, and technically feasible way. Monies directed to the EDF are used to fund projects that focus on the following four funding categories: <ul style="list-style-type: none"> <li>• Restoration</li> <li>• Environmental Quality Improvement</li> <li>• Research and Development</li> <li>• Education and Awareness</li> </ul>	Pending funding availability
<a href="#">Habitat Stewardship Program for Aquatic Species at Risk (HSP)</a>	Fisheries and Oceans Canada	The goal of the Habitat Stewardship Program (HSP) is to contribute to the recovery of endangered, threatened, and other species at risk by engaging Canadians from all walks of life in conservation actions to benefit wildlife. The HSP provides funding for projects that contribute directly to the recovery of aquatic species at risk. DFO routinely reviews the Program to best address emerging priorities related to aquatic species at risk across Canada. Habitat improvement is eligible for HSP funding.	Annual proposal call
<a href="#">Oceans Management Contribution Program</a>	Fisheries and Oceans Canada	The program supports outreach, monitoring and stewardship, and capacity building initiatives with partners to achieve Canada's commitment to marine conservation targets. It provides funding to eligible recipients through a regional funding model for activities under Marine Spatial Planning, Marine Environmental Quality and Marine Conservation Targets.	Pending funding availability

**Table 5.3 Provincial Funding**

PROGRAM	ADMINISTERING ORGANIZATION	PROGRAM OVERVIEW	PROGRAM SCHEDULE
<a href="#">Nova Scotia Species at Risk Conservation Fund</a>	Nova Scotia Department of Natural Resources and Renewables	Priorities for this fund include: <ol style="list-style-type: none"> <li>1) Priority Activities Outlined in the NS Endangered Species Act;</li> <li>2) Priority Species (Listed &amp; Non-Listed); and</li> <li>3) Priority Conservation and Recovery Need.</li> </ol> <p>Applications for the species at risk (SAR) fund can address a wide range of activities related to conservation, recovery and prevention.</p>	Pending funding availability

**Table 5.4 Non-Government Programs**

PROGRAM	ADMINISTERING ORGANIZATION	PROGRAM OVERVIEW	PROGRAM SCHEDULE
<a href="#">Adopt A Stream Program</a> (AAS)	Nova Scotia Salmon Association	The AAS program provides financial and technical support to non-profit, community groups in Nova Scotia undertaking fish habitat restoration and improvement projects. Eligible projects improve fish habitat for migration, spawning, nursery, rearing or adult fish by improving water quality and physical features of the aquatic habitats.	Annual proposal call
<a href="#">The Foundation for the Conservation of Atlantic Salmon</a> (FCAS)	The Foundation for Conservation of Atlantic Salmon	The Foundation for Conservation of Atlantic Salmon (FCAS) supports activities related to the conservation of the wild Atlantic salmon and its habitat. Funding supports various Atlantic salmon conservation projects in Atlantic Canada and Quebec including conservation planning, restoration, and public education.	Annual proposal call

