



CNL(23)98

# Informing a Strategic Approach to Address the Impacts of Climate Change on Wild Atlantic Salmon

CANADA

NASCO Theme Based Special Session, 2023

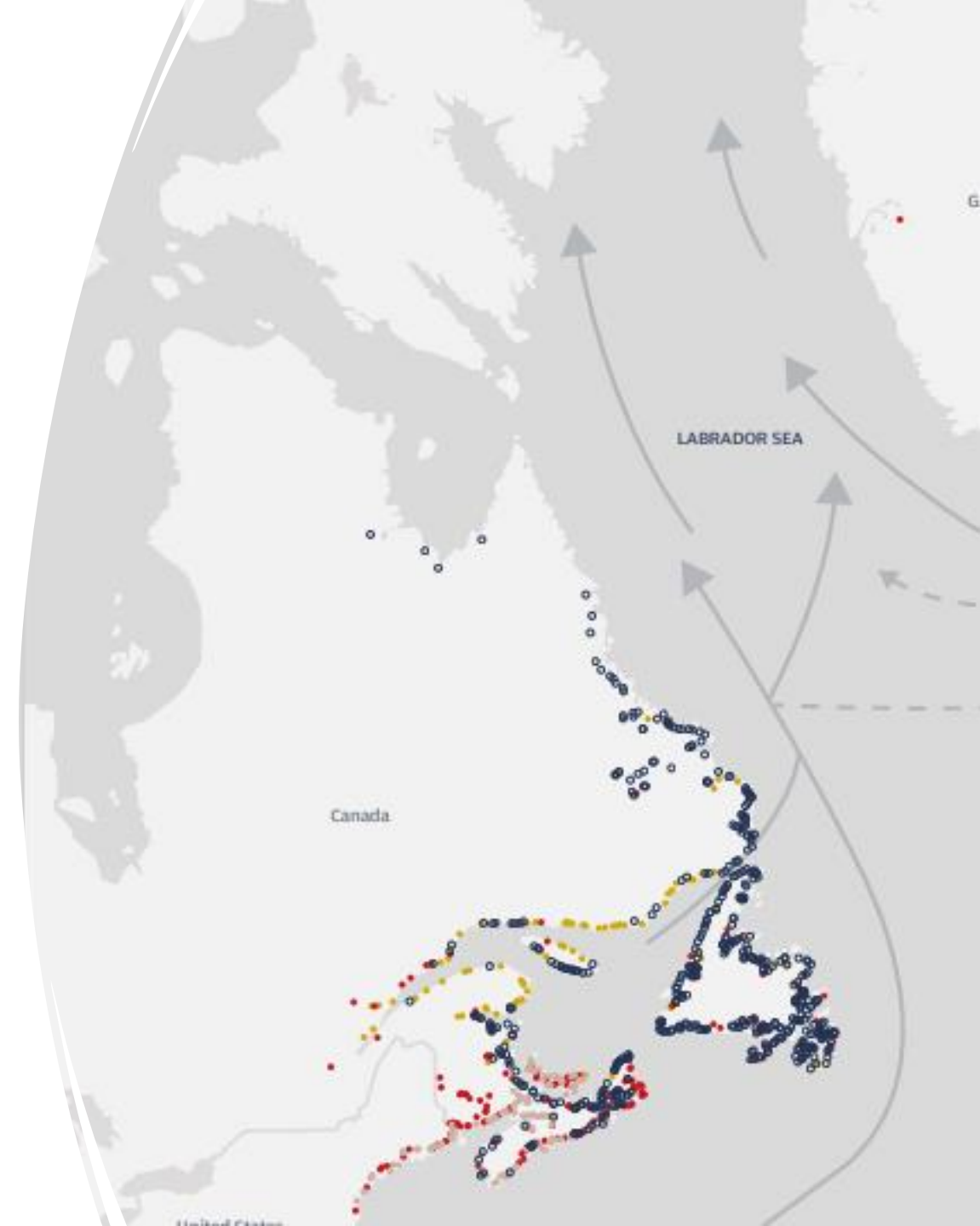
# Hello, Bonjour, Kwe! Welcome to Canada



Wild Atlantic salmon is an important icon for the people of Atlantic Canada and Québec.

- Fished for food, social, and ceremonial purposes by more than forty First Nations and many Indigenous communities in eastern Canada.
- Relied on for local community food fisheries in central and coastal Labrador.
- Valued as a recreational activity by both residents and non-residents.

Salmon are found in 850+ Canadian rivers and are considered an indicator of environmental quality, an animal of respect, an attraction for eco-tourism and have an importance beyond economic returns.



# Climate change impacts on Canada's Atlantic salmon

(from C-A Gillis et al., 2023, Canadian Water Resource Journal)

Understanding how climate change has affected Atlantic salmon and their habitats requires large scale collaboration.

- **The Atlantic Salmon Research Joint Venture (ASRJV)** was established to forge the partnerships and collaboration sufficient to address urgent and unresolved scientific questions, including climate change impacts, that might otherwise not be undertake.

The ASRJV's work indicates that the main climate change impacts on Atlantic salmon that need to be addressed in Canada include:

- **Effects of climate change on in-river habitat conditions:** with temperature and water discharge being recognized as the most important factors for Atlantic salmon to complete their freshwater life cycle;
- **Physiological and behavioral responses of salmon to temperature:** recognizing that Atlantic salmon are cold water, obligate ectotherms with a narrow range of thermal preference, from 16° to 18° C
- **Population-level responses of salmon to climate change:** considering the potential for Atlantic salmon to adapt to changing climate in light of the genetic diversity, life history characteristics, physiological and behavioral plasticity at the individual-level required for adaptation.



ATLANTIC  
SALMON RESEARCH  
JOINT VENTURE

PLAN CONJOINT  
DE RECHERCHE SUR LE  
SAUMON ATLANTIQUE



## Case study: How climate change is impacting Atlantic salmon Chéticamp River, Cape Breton, Nova Scotia



Atypical spring weather caused a severe landslide in 2018. Over 4,000 tonnes of debris fell into the Chéticamp River, blocking fish passage, including Atlantic salmon.

A large-scale restoration project undertaken by Parks Canada was necessary, to restore Atlantic salmon run:

- Debris removed to restore flow; rock, logs, root balls strategically placed to reinforce slope and stabilize banks ahead of expected future storms; planting of native Black Ash trees- a species of significance to the Mi'kmaq of Nova Scotia and provincially listed species at risk- to support stabilization.

## What are the climate adaptive management measures that are being enacted, or plan to be enacted, within Canada for Atlantic salmon?

Most measures fall into one of these categories:

- i. Atlantic salmon fisheries management activities
- ii. Atlantic salmon habitat protection & management activities
- iii. Research, monitoring & modelling of Atlantic salmon to support climate adaptive management

## i. Atlantic salmon fisheries management activities

- **Adaptive environmental (a.k.a. 'warm water')** protocols: result in recreational fishery closures when water exceeds a warm water threshold. The threshold varies within and between provinces, but falls between 18°C and 20°C.
  - E.g., In Newfoundland, protocols vary by river class and can be triggered when water temp exceeds threshold after 2-3 days. Secondary parameters such as water levels and weather forecast may also be considered.
- **Seasonal variation orders:** can be used to restrict a season to specific times of year
  - E.g., Salmon angling in parts of Nova Scotia is limited to a fall season: Sept-Oct
- Paired with **gear restrictions** to further reduce stress: barbless hook, artificial fly



## Our Pathway Towards Decarbonization and Climate Resilience

NEW BRUNSWICK'S CLIMATE CHANGE ACTION PLAN  
2022-2027



New Brunswick

## Our Climate, OUR FUTURE

Nova Scotia's Climate Change Plan for Clean Growth



GAGNANT  
POUR LE QUÉBEC.  
GAGNANT  
POUR LA PLANÈTE.

Plan pour une  
économie  
verte 2030

POLITIQUE-CADRE D'ÉLECTRIFICATION  
ET DE LUTTE CONTRE LES CHANGEMENTS  
CLIMATIQUES

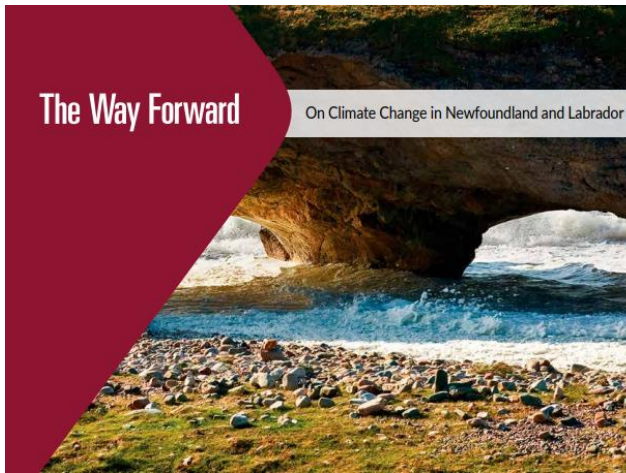


### Building Resilience: Climate Adaptation Plan



### The Way Forward

On Climate Change in Newfoundland and Labrador



## ii. Atlantic salmon habitat protection & management activities

**Nationally:** Canada's National Adaptation Strategy sets specific goals & objectives; e.g., to conserve 30% of Canada's land and water by 2030.

**Provincially:** provincial climate change action plans outline how each province will help meet national targets related to climate change (e.g., land protection, carbon emissions, etc.);

**Locally:** habitat restoration activities that support resiliency

- Identification and protection cold water refuges
- Restoring connectivity
- Riparian planning and regulation of development
- River and pool restoration activities

### iii. Research, monitoring & modelling of Atlantic salmon to support adaptive management

Canada has a robust and diverse science and research sector that includes scientists working for government, non-government, academic, and Indigenous organizations. This research supports adaptive management actions. Examples of recent areas of focus include:

- **Thermal refuges:** studying the importance of, inventorying and protecting, these areas in key salmon rivers;
- **Temperature effects on catch and release fishing** (stress, survival, reproductive success);
- **Linking environmental changes to Atlantic salmon:** abundance, physiology, growth, stress, etc.;
- **Modelling** climate vulnerability & risk assessment: both quantitatively and qualitatively;
- **Tracking salmon migration patterns** in relation to environmental conditions at-sea.



## Best practice from the most effective management actions in Canada

- ✓ Support Indigenous knowledge, data, and leadership
- ✓ Apply innovation and emerging technologies
- ✓ Dedicate funds to Atlantic salmon
- ✓ Facilitate partnership and collaboration

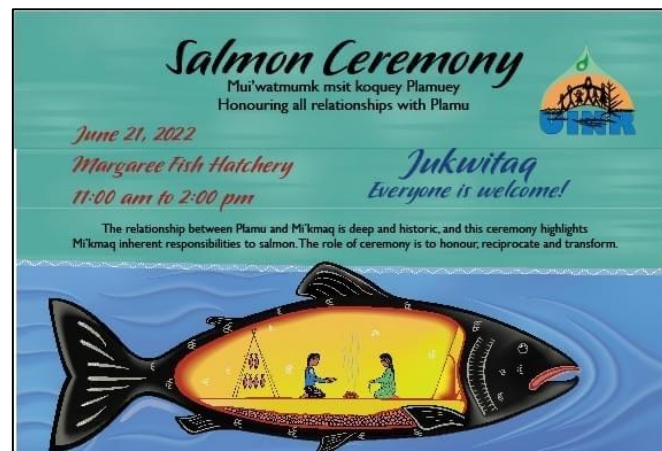
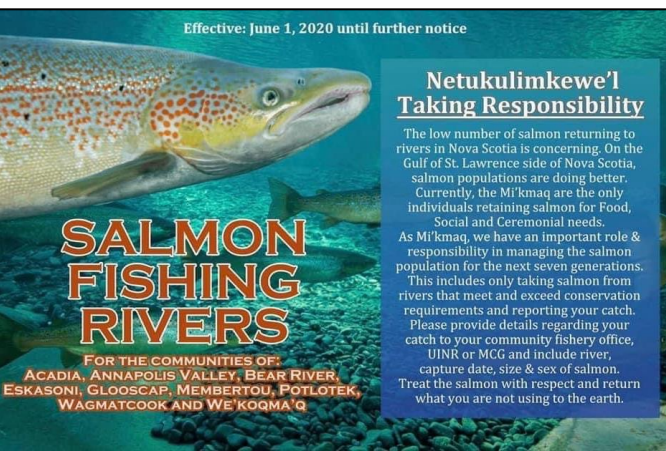


# Case Study: Support Indigenous data, knowledge, and leadership

## Unama'ki Institute of Natural Resources (UINR)

- The Supreme Court of Canada affirms the right of Indigenous people to fish for food, social and ceremonial (FSC) purposes.
- The Mi'kmaq assert their responsibility to contribute to sustainable harvest of salmon, build relations and understanding with non-Indigenous peoples, and respectfully honor Atlantic salmon through ceremony.
- UINR works to integrate Netukulimk (traditional Mi'kmaq management) with traditional and conventional ways of understanding, known as Etuaptmumk (Two-Eyed Seeing).
- UINR takes the lead on best-management practices in Unama'ki, including Atlantic salmon management in the context of climate change.

Images: UINR



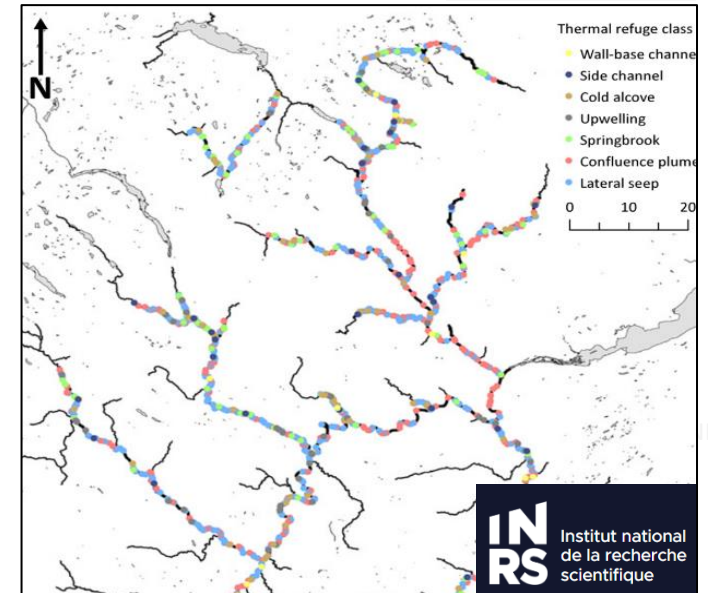
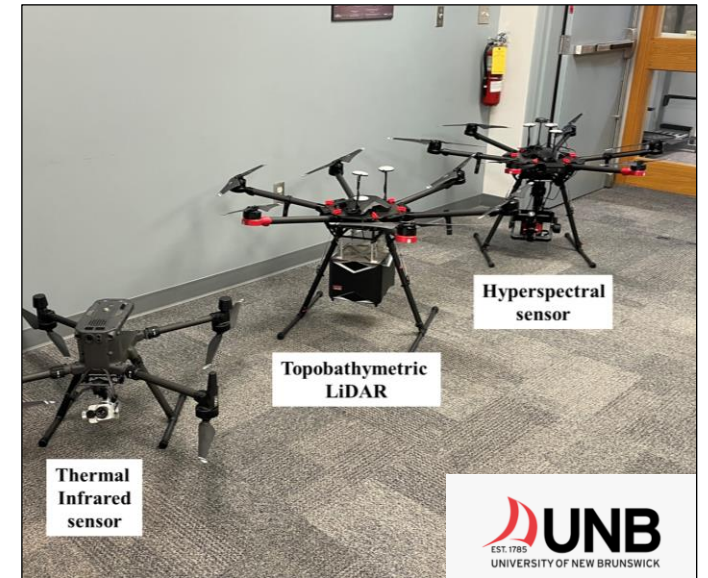


# Case study: Apply innovation and emerging technologies

## University of New Brunswick

Remote sensing at large scales to map and protect a 'thermal mosaic' of cold water refuges

- Drones + thermal infrared, topo-bathy LiDAR and hyperspectral sensors to understand role of refugia mosaic at small & riverscape scale
- Free public satellite imagery (i.e., Google Earth) to map thermal refugia at catchment scale (O'Sullivan et al. 2019).
- Application of this technology to restore, protect, and adopt refuges on (e.g.) Restigouche and Miramichi watersheds by local Indigenous communities, Indigenous organizations and others.





# Case study: Dedicate funds to Atlantic salmon conservation

## Foundation for the Conservation of Atlantic Salmon

### Effective and permanent support of Wild Atlantic Salmon Conservation.

Our funded projects have resulted in major conservation improvements. From 2008 to 2020, these have included:



Salmon in a changing environment:  
Developing community-driven  
water temperature monitoring and  
salmon observatory...

Newfoundland & Labrador  
2017

How physiography and climate  
change influences the effects of  
forest harvesting on Atlantic...

Scientific Advisory Committee  
2020

Temperature-dependent effects  
sea lice on Atlantic salmon

Scientific Advisory Committee  
2020

Challenges, concerns and solutions  
concerning the adaptation of  
Quebec salmon fishing industry to...

Quebec  
2020

Mitigating climate change impacts  
on Atlantic salmon on the  
Cheticamp River; Farm Brook...

Nova Scotia  
2021

Assessing the impact of instream  
barriers and climate change on  
wild Atlantic salmon...

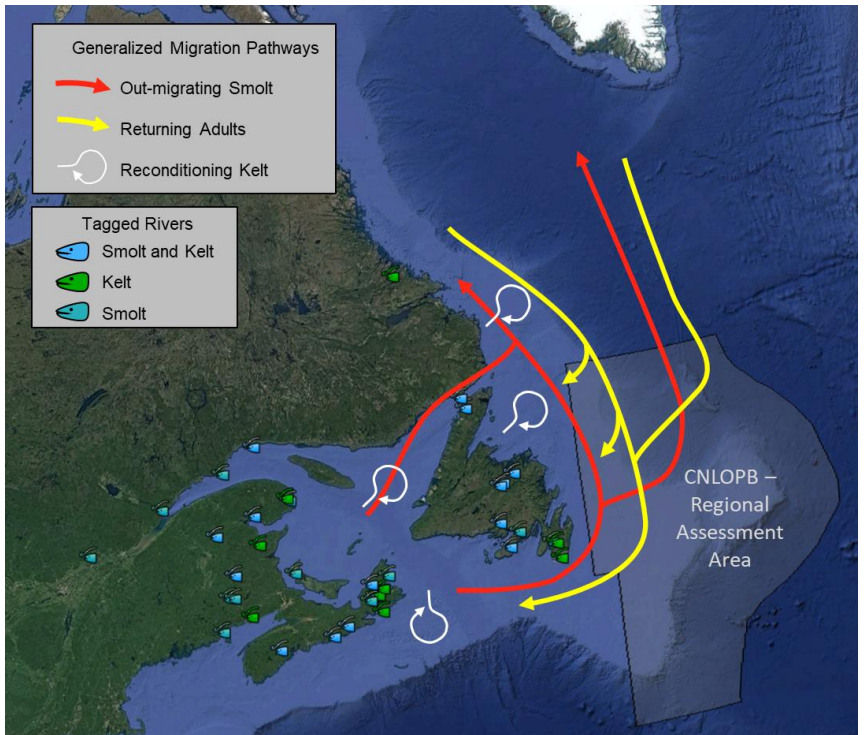
Scientific Advisory Committee  
2019

Inuit Observations of Land and Sea:  
'Kavisilik' (Atlantic salmon) (A  
Traditional knowledge and...

Newfoundland & Labrador  
2009

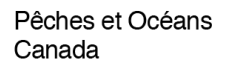
# Case study: Facilitate partnership and collaboration

## Atlantic salmon migration at-sea, Environmental Studies Research Fund



### Current and Future Migration Routes

Project outputs will include an individual-based model to predict Atlantic salmon migration pathways based on annual and future physical and biological oceanographic conditions



# Lessons learned from Canada's climate change management activities to improve our effectiveness

Indigenous peoples need to be included in decisions that impact their Rights

- How can we better align Atlantic salmon management with Canada's *Constitutions Act*, and *Fisheries Act*, and UNDRIP?

Low populations & continued declines will limit climate resiliency

- We need to ensure Atlantic salmon exist now, to populate into the future

Competing interests are apparent as coastal and riparian zones are developed

- How do we balance Atlantic salmon conservation with other interests?

Translating climate change science into management action

- How do we apply what we are learning through science to actions on the ground

Coordination, tracking & reporting

- In a large country with shared jurisdictions for climate change, how do we track, monitor, and measure our successes and challenges



# Conclusions from Canada

- Climate action requires a whole-of-government approach and buy-in from all Canadians, including Indigenous peoples, partners and stakeholders within the Atlantic salmon community;
- Given their iconic status and reliance on clean, cool, healthy freshwater and oceans, Atlantic salmon are a useful lens through which we can motivate climate action;
- Hope and action are symbiotic elements of seeing salmon persists for many human generations to come.

