



Department of Fisheries and Oceans Canada

Cumulative Effects Initiatives



Outline

- National policy work related to cumulative effects (Eric Chernoff)
- Cumulative effects assessment and cumulative impact mapping (Kristian Curran)
- Marxan with zones spatial analysis in Maritimes Region (Kyle Gordon)
- Overview and progress on cumulative impact analysis in NL Region (Cassandra Konecny)



National Policy Work

LEGISLATIVE CONTEXT FOR FEDERAL POLICIES

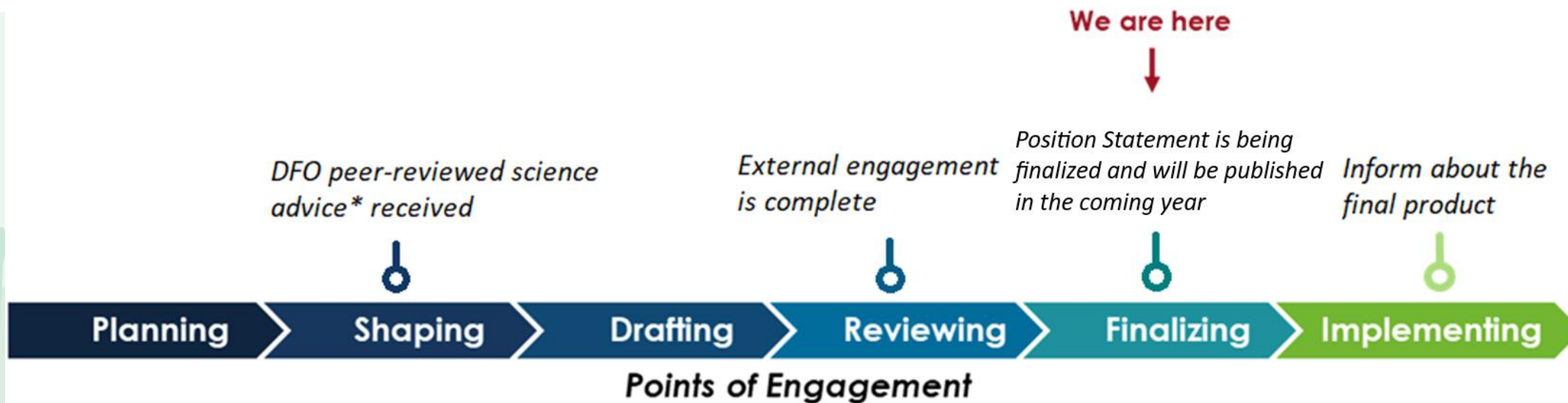
The Department of Fisheries and Oceans administers the fish and fish habitat protection provisions of the *Fisheries Act*, in combination with relevant provisions of the *Species at Risk Act* and the *Aquatic Invasive Species Regulations*, in order **to conserve and protect fish and fish habitat.**

- To inform decision-making, subsection 34.1(1) of the *Fisheries Act* sets out factors the Minister must consider when exercising their authority under some of the fish and fish habitat protection provisions of the *Fisheries Act*.
- One factor set out in paragraph 34.1(1)(d) is the requirement to consider cumulative effects on fish and fish habitat. More specifically, the Minister is required to consider the cumulative effects of a proposed project*, in combination with past or ongoing projects, prior to making a decision under the fish and fish habitat protection provisions of the *Act* (for example, prior to a *Fisheries Act* authorization decision).

*projects include works, undertakings, and activities in or near water

ENGAGEMENT DETAILS

- The Fish and Fish Habitat Protection Program (FFHPP) is drafting a *Position Statement for the Consideration of Cumulative Effects on Fish and Fish Habitat in Support of Decision-Making Under the Fisheries Act*.
- This document will provide an overview on how FFHPP considers cumulative effects on fish and fish habitat prior to making a decision to issue or refuse an authorization related to the death of fish and harmful alteration, disruption or destruction of fish habitat.



* DFO. 2022. [Science advice for assessing cumulative effects in support of policy development and regulatory decision-making](#). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2022/055.”



Cumulative Effects Assessment & Cumulative Impact Mapping



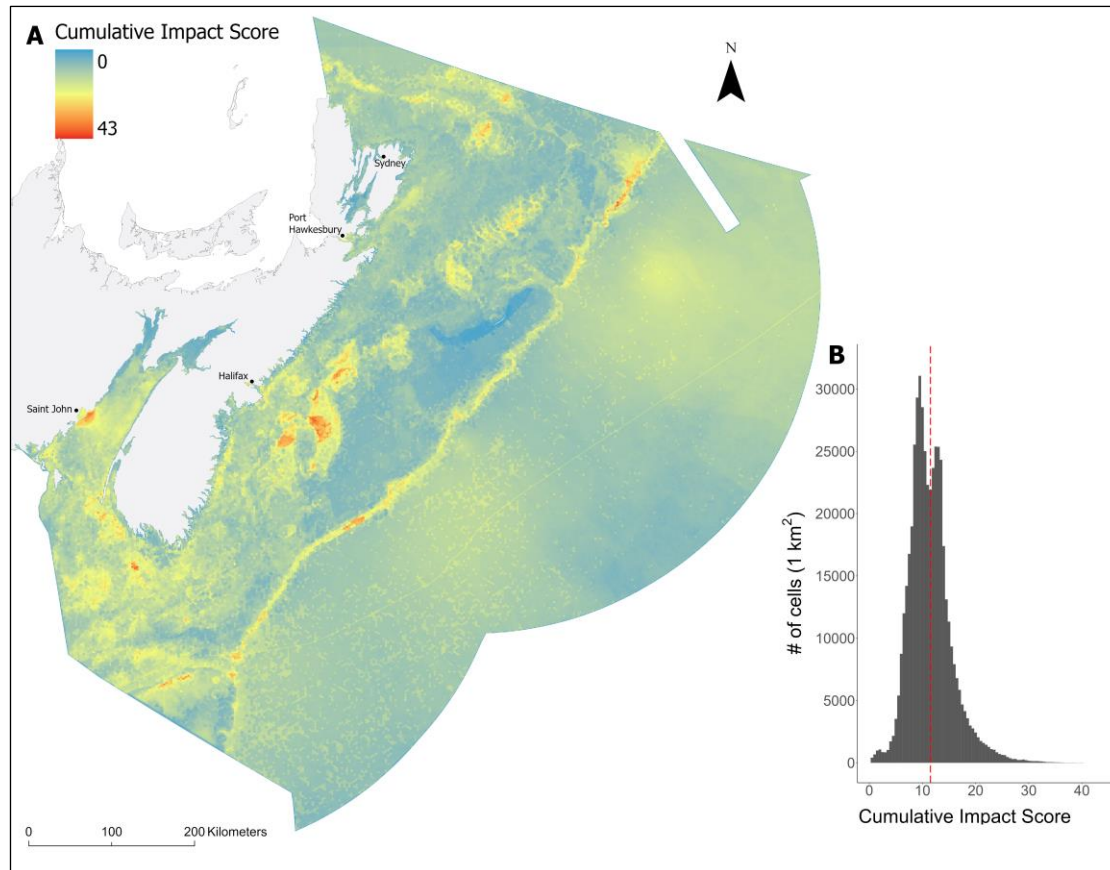
DFO CSAS Peer-review Processes on Cumulative Effects Assessment/Cumulative Impact Mapping

Date, subject and location of meeting	Scope and region(s)	Contact(s)	Details & Publications
March 8-12, 2021 Science advice for assessing cumulative effects in support of policy development and regulatory decision-making Virtual meeting	National Advisory Meeting NATIONAL CAPITAL REGION	Clarke, Keith Chair 709-772-2907 White, Hilary Contact 613-371-5891	Terms of Reference Proceedings 2023/025 Science Advisory Report 2022/055 Research Document 2022/078 Research Document 2022/079

Date, subject and location of meeting	Scope and region(s)	Contact(s)	Details & Publications
November 29-30 and December 2, 2021 Cumulative impact mapping and vulnerability of marine ecosystems to multiple anthropogenic stressors Virtual Meeting	National Advisory Meeting NATIONAL CAPITAL REGION	Worcester, Tana Chair 902-426-3246 Kristmanson, James CSAS Contact 613-790-6462	Terms of Reference Science Advisory Report 2024/040 Research Document 2024/024 Proceedings 2024/024



DFO Maritimes Region Cumulative Impact Map



Based on Halpern et al. (2008) method that calculates a spatially-explicit relative measure of cumulative impacts

21 habitats

- benthic and pelagic from intertidal to deep sea

45 human activities in 5 sectors

- land-based, coastal, marine, commercial fishing, climate change

***does not include impacts from OSW*



Cumulative Impact Mapping Knowledge Products



CSAS Review (2021),
Science Advisory
Report, Research
Document,
Proceedings
(available July 4, 2024)



Cumulative impact
maps and habitat
classes dataset on
Open Data



Web mapping services



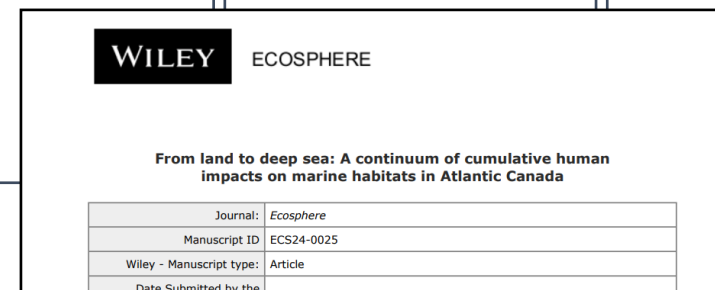
Toolbox code
(published on GitHub)
(DFO PAC)



Toolbox User Guide
(published on GitHub)
(DFO PAC)



Journal publication
Ecosphere
(accepted June 3, 2024)





Cumulative Habitat Risk Mapping for Atlantic Canada

Ongoing project to estimate the cumulative risk of degradation of marine habitats from human activities

- Atlantic-wide spatial data layers of human activities (stressors) and marine habitat classes
- Cumulative risk maps (spatial distribution of risk) to inform causes of degradation
- Scenario analyses to inform risk-reduction strategies
- Completion date of Fall 2025

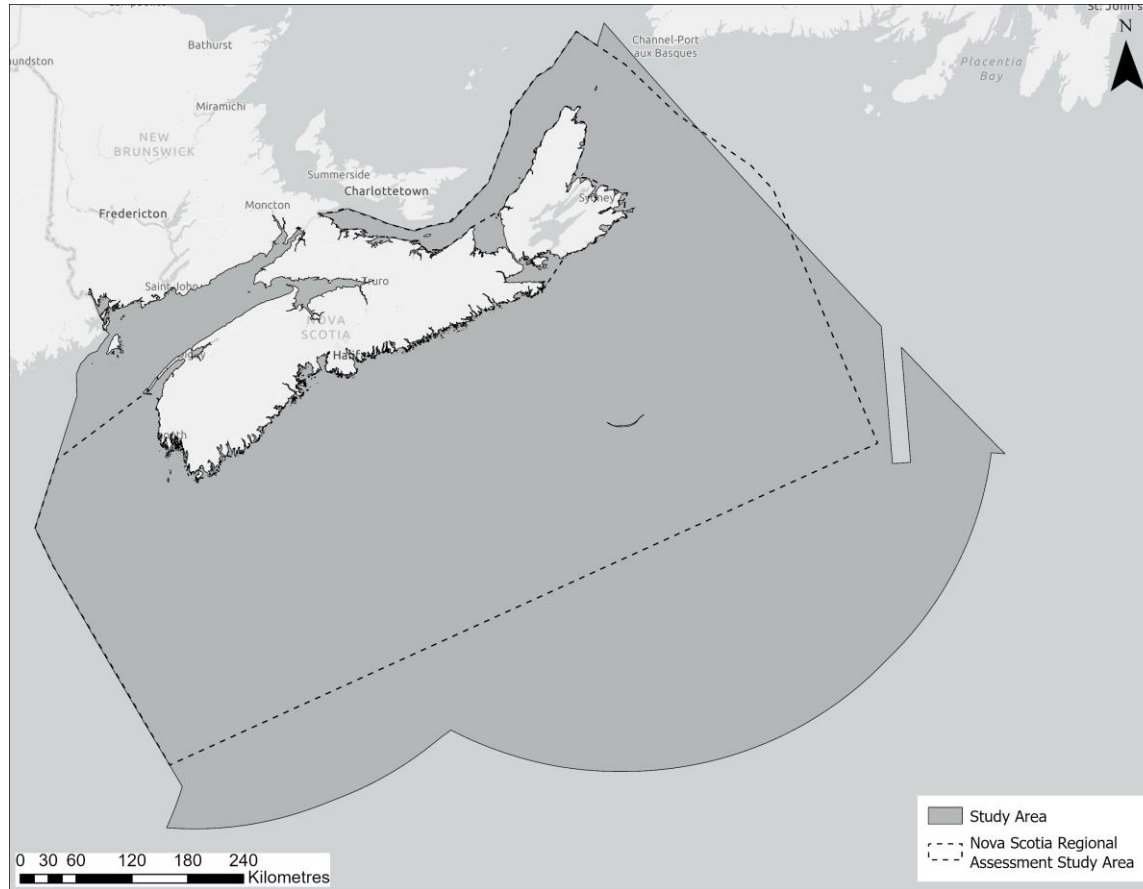


Marxan with Zones Spatial Analysis

Maritimes Region



Objective and Methodology



Study area designed to include the Nova Scotia RA study area (includes a portion of Gulf Region).

What it is: A decision-support tool developed by DFO Marine Planning and Conservation

Objective: Find areas that meet targets for OSW while minimizing spatial overlap with human uses and ecological features

- Planning objective based on initial Provincial 5 GW target

Methodology: Used Marxan with Zones decision-support software to achieve specific targets (economic, social, ecological)

- Multi-sector analysis included commercial fishing, transportation, conservation, oil & gas, and aquaculture
- Project includes 100+ individual data layers

Results will be published in a DFO *Technical Report of Fisheries and Aquatic Sciences* in 2024



Results and Future Directions

18 scenarios were developed based on different targets and combinations of sector data

Not an identification of wind energy areas; results show gradients of potential overlap to *inform* planning processes

- Results were provided to the NS RA Committee in February 2024

Tool is data-driven, adaptable, repeatable, scalable for future applications (e.g., smaller areas)

Tool can identify and quantify potential overlap between OSW energy, other ocean activities, and ecological features

- Results could be compared to existing cumulative effects maps to examine cumulative impacts in the areas identified as potentially suitable for future OSW



Overview and Progress on Cumulative Impact Analysis in the Newfoundland and Labrador Region



Approach

- Nationally developed cumulative impacts analysis relies on the existence of spatial layers for marine habitats.
- Due to the limited coverage and availability of habitat layers for the NL region, the decision was made to take a species-based approach (see Maxwell et al. 2013).
- This approach attempts to quantify the impacts of anthropogenic stressors on individual taxonomic or functional groups.



Work Completed

- Development of new methodology and modified models/scripts.
- Limited the scope of the work to look at the impacts of 3 anthropogenic activities on 8 fish functional groups. The spatial extent of the analysis encompassed offshore areas in the region.
 - Anthropogenic stressors: commercial fishing using fixed and mobile gear, substrate disturbance from oil and gas wells, and shipping of large commercial vessels
 - Fish functional group: small benthivores, medium benthivores, large benthivores, planktivores, piscivores, plank-piscivores, shrimp, and snow crab
- A vulnerability matrix was created by surveying species experts within the region.
- Initial analyses were then run by combining these components (e.g., functional group layers, stressor intensities, vulnerability matrix).



Future Directions and Opportunities

At present, due to changes in priorities, there are no immediate plans to continue this work. However, these areas have been identified for future exploration in the event that this work becomes a priority again:

- Refine resolution of analysis from functional groups to the species level. This is important when considering species distributions as well as their individual vulnerability to drivers of change.
- Improve spatial coverage to include near-shore areas.
- Look at impacts across different time periods vs. aggregating data over multiple decades.
- Incorporate climate change into analyses to inform proactive planning.



Questions





Reference Literature

Clarke Murray, C., Agbayani, S., Alidina, H.M., and Ban, N.C. 2015. [Advancing Marine Cumulative Effects Mapping: An Update in Canada's Pacific Waters](#). Mar. Policy 58: 71-77.

Halpern, B.S., Walbridge, S., Selkoe, K.A., Kappel, C.V., Micheli, F., D'Agrosa, C., Bruno, J.F., Casey, K.S., Ebert, C., Fox, H.E., and Fujita, R. 2008. [A global map of human impact on marine ecosystems](#). Science, 319: 948-952.

Murphy, G., Stock, A., and Kelly, N.E. 2023 (**Accepted**: June 3, 2024). From land to deep-sea: A continuum of cumulative human impacts on marine habitats in Atlantic Canada. *Ecosphere*.

Murray, C.C., Kelly, N.E., Nelson, J.C., Murphy, G.E.P., and Agbayani, S. Cumulative impact mapping and vulnerability of Canadian marine ecosystems to anthropogenic activities and stressors. 2024. DFO Can. Sci. Advis. Sec. Res. Doc. 2021/XXX. vi. + 52 p. **To be posted 4 July 2024.**

[Cumulative human impact maps for the Bay of Fundy and Scotian Shelf - Open Government Portal \(canada.ca\)](#)

DFO. 2022. [Science advice for assessing cumulative effects in support of policy development and regulatory decision-making](#). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2022/055

Halpern et al. (2008) Science 319(5865): 948-952.