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# Assessing fish habitat and projects along the Toronto and Region Area of Concern's waterfront

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Canada



This work would not be possible without our many colleagues and active collaborators:



**AQUATIC HABITAT**  
TORONTO

Credit: S. Doka

## Fish Habitat Lab, DFO



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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"*



Credit: TRCA, Essroc Quay, Toronto Harbour

Fisheries Act (R.S.C., 1985, c. F-14)

Like many Canadian waterbodies, and especially in AOCs, Toronto and Region's waterfront faces significant challenges:

-  Impaired water quality
-  Impaired sediment quality
-  Largescale changes to physical features
-  Loss or changes to coastal complexity

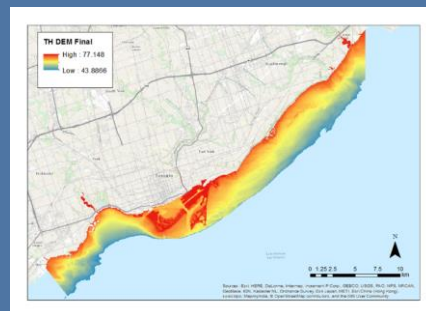
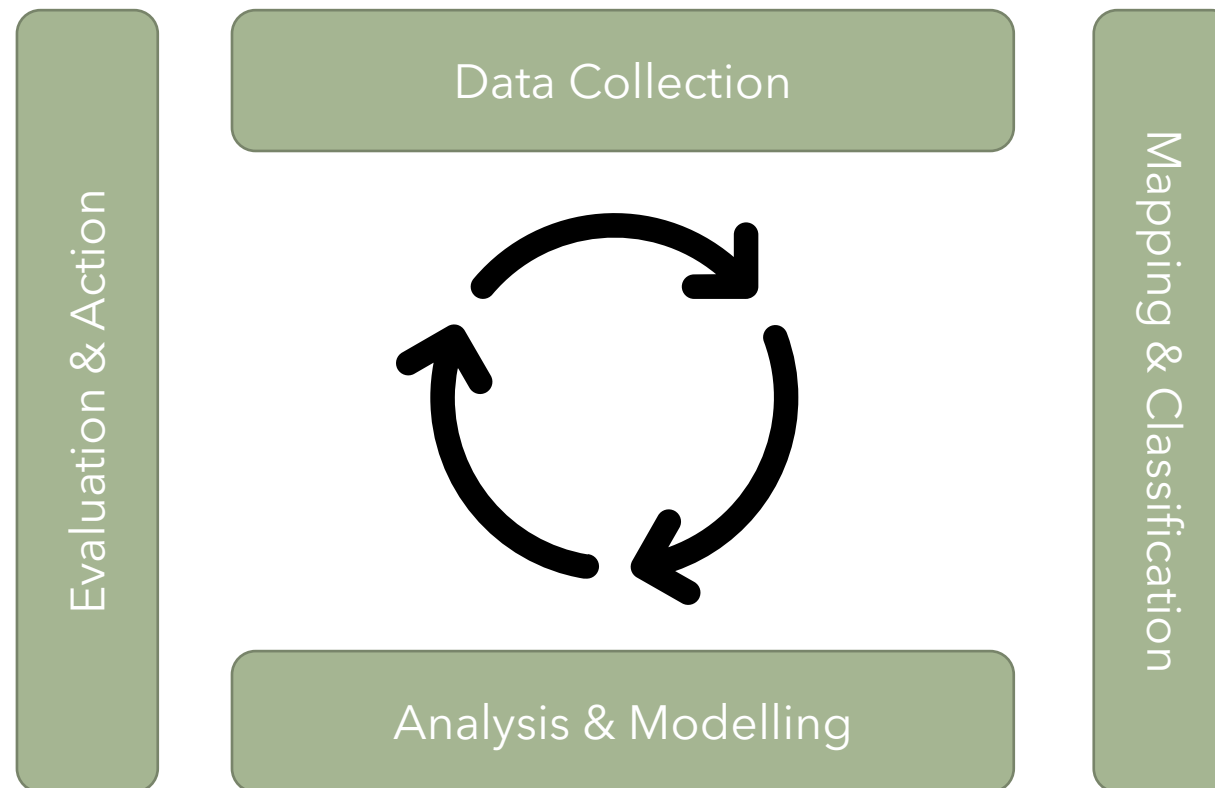


Credit: S. Smadis

Credit: stock internet images



Addressing the impairments facing the AOC requires a standardized approach to assessing fish habitat:



# Toronto and Region Area of Concern habitat team set criteria for evaluation and assessment:

## Criteria

FH 1: Habitat Restoration Goals

- **Open coast** habitat is rehabilitated (for coldwater fishes in particular)
- **Sheltered bays** are rehabilitated (for warmwater and coolwater species)
- **Rivermouths** are rehabilitated for resident and migratory fishes (e.g., Walleye, Northern Pike etc.)

## Contribution

FH 1: Science & Planning

- **Nearshore** habitat quality and quantity
  - Establish baseline conditions
  - Scenarios to identify best actions

+

- Evaluation of completed and proposed **habitat projects**
  - Quantify losses and gains over time from development and restoration

- Guidance for future habitat actions
- Track progress in landscape habitat goals

# Toronto and Region Area of Concern habitat team set criteria for evaluation and assessment:

## Criteria

### FH 2,3: Corridors, Specific Targets

- Remaining and created **[coastal] wetlands** are protected [and improved] Preliminary target of +75 ha.
- Specific wetland targets in **watershed** plans should be used. Where no plans exist, they should be developed.



Photo credit:

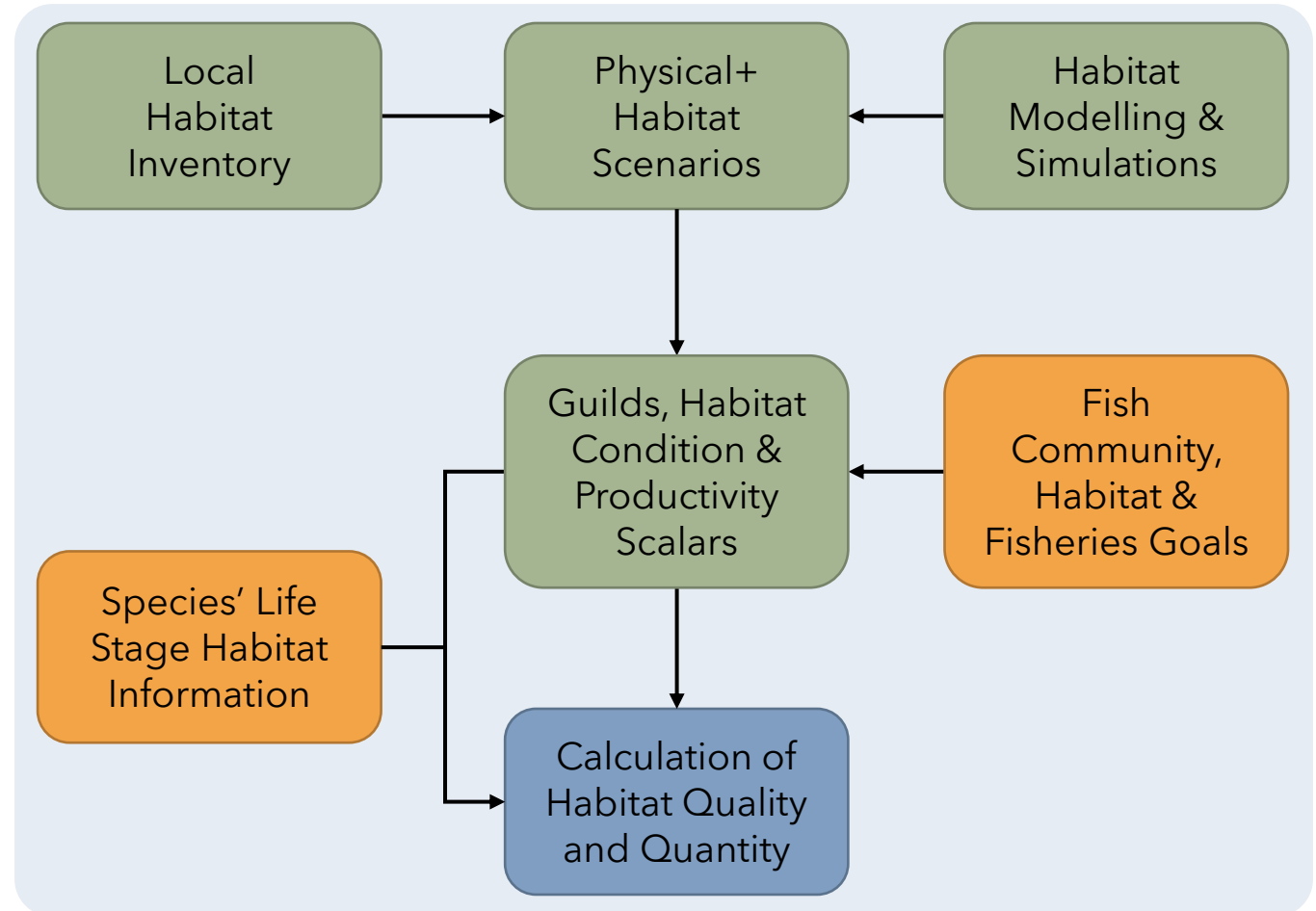
## Contribution

### FH 2,3: Science, Planning Implementation

- **Inventory** existing wetlands, other habitat features & use **telemetry**
- **Vegetation & fish predictions** under different conditions
  - Water levels, climate change, water clarity
- Advise on **status** of existing wetlands, fish use of habitat types (including wetlands), and **wetland + construction projects**
- Contribute to **planning and guidance docs** (e.g., Toronto Waterfront Aquatic Habitat Restoration Strategy, Species at Risk needs, Waterfront Integrated Restoration Planning tool, habitat accounting framework)

# Our assessments of fish habitat are based on species' suitability calculations

Habitat suitability indices provide a measure of the **quality** of habitat for fish species based on needs throughout their life cycle (e.g., associations, tolerances)







73 fish species are grouped into 5 "guilds" by life stage

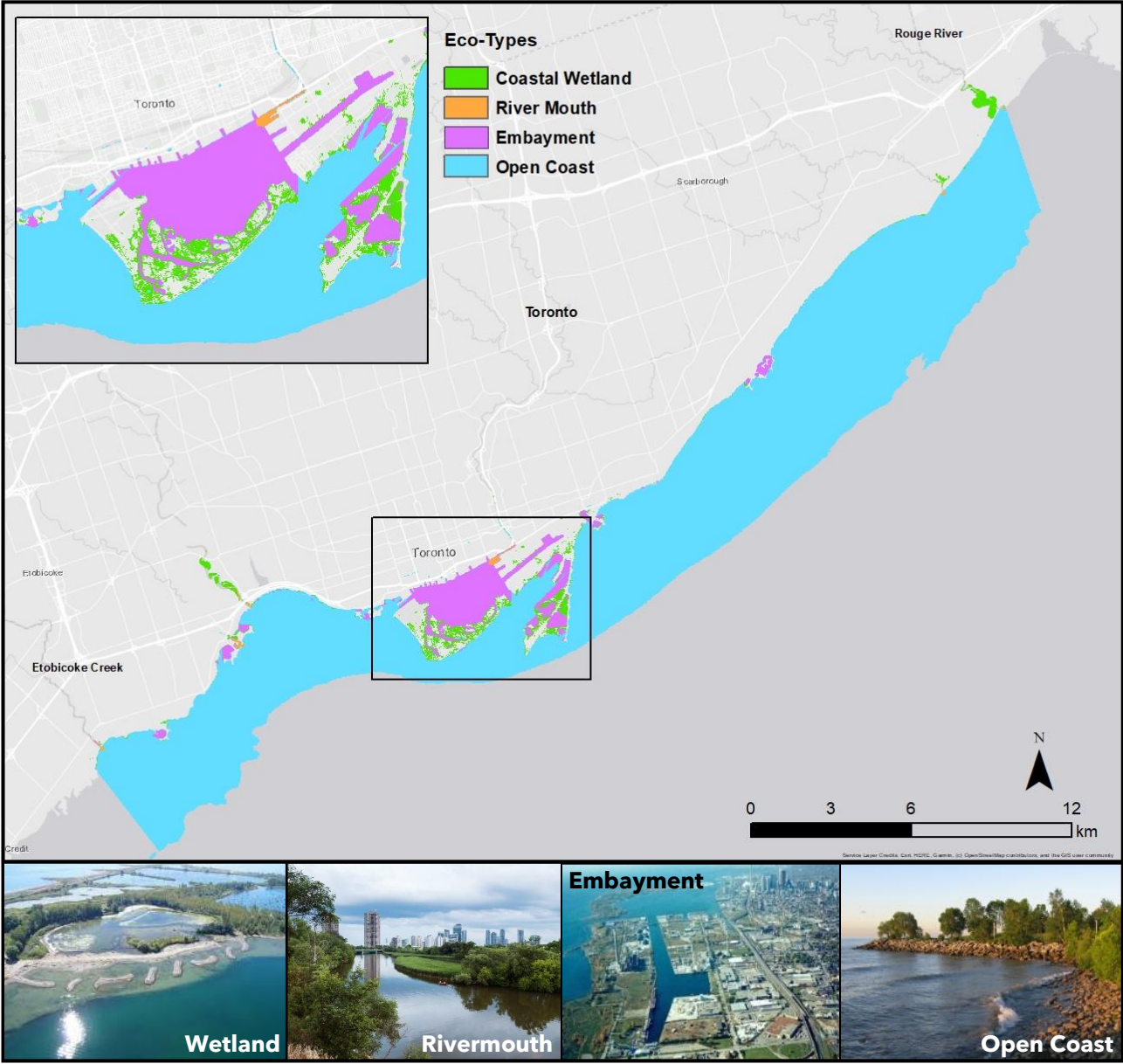
- Groups based on **temperature preference** and affinity for **vegetation** (low or high)
- **3 life stages**: spawning, nursery, adult stages
- Guild membership can change by life stage (completely riverine stages are not considered in our waterfront evaluation)



# Not all fish habitat can be considered equal

Broader habitats differ in productivity, affecting how we account for the effects of habitat loss and modification on fish communities.

Ecotype	Percentage of AOC	Total Area (ha)
Wetland	0.9*%	<u>136*</u>
Rivermouth	0.2%	31
Embayment	5%	832
Open Coast	94%	14,447



\* Wetlands are areas with emergent vegetation, buffered up to 2m water depth at datum; wetlands are typically found in rivermouths or embayments, and therefore areas of the latter are a larger proportion of the waterfront. Photo credits may be: TRCA, Urban Toronto, GoogleEarth, Waterfront Toronto, City of Toronto Portlands.

# Assessing baseline habitat supply

The first stage of our assessment involves understanding fish habitat quality and supply within the entire nearshore of the AOC

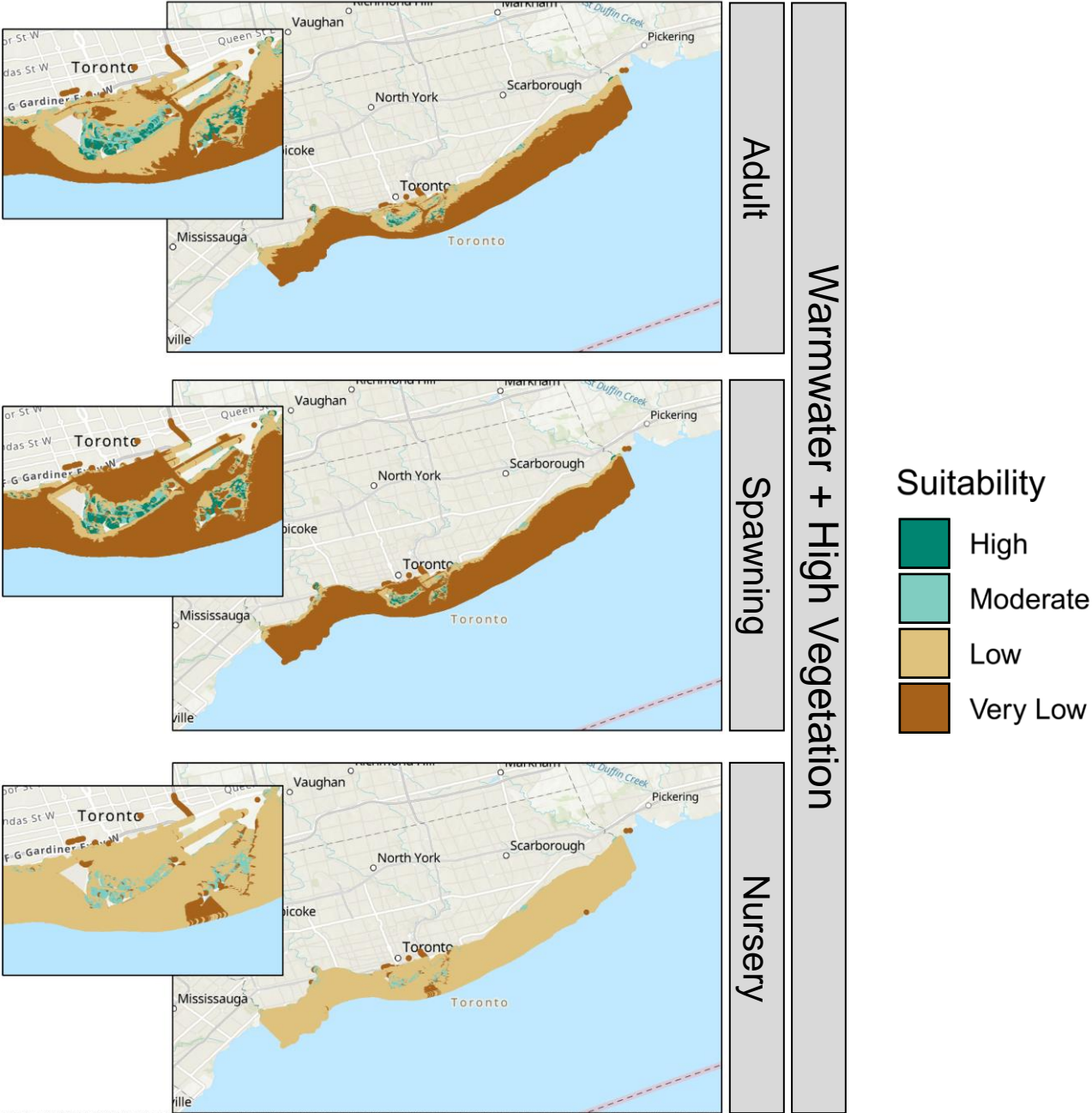


Moderate to high suitability habitat is limited within the AOC

Earlier work identified the central waterfront as a hot spot for higher quality fish habitat

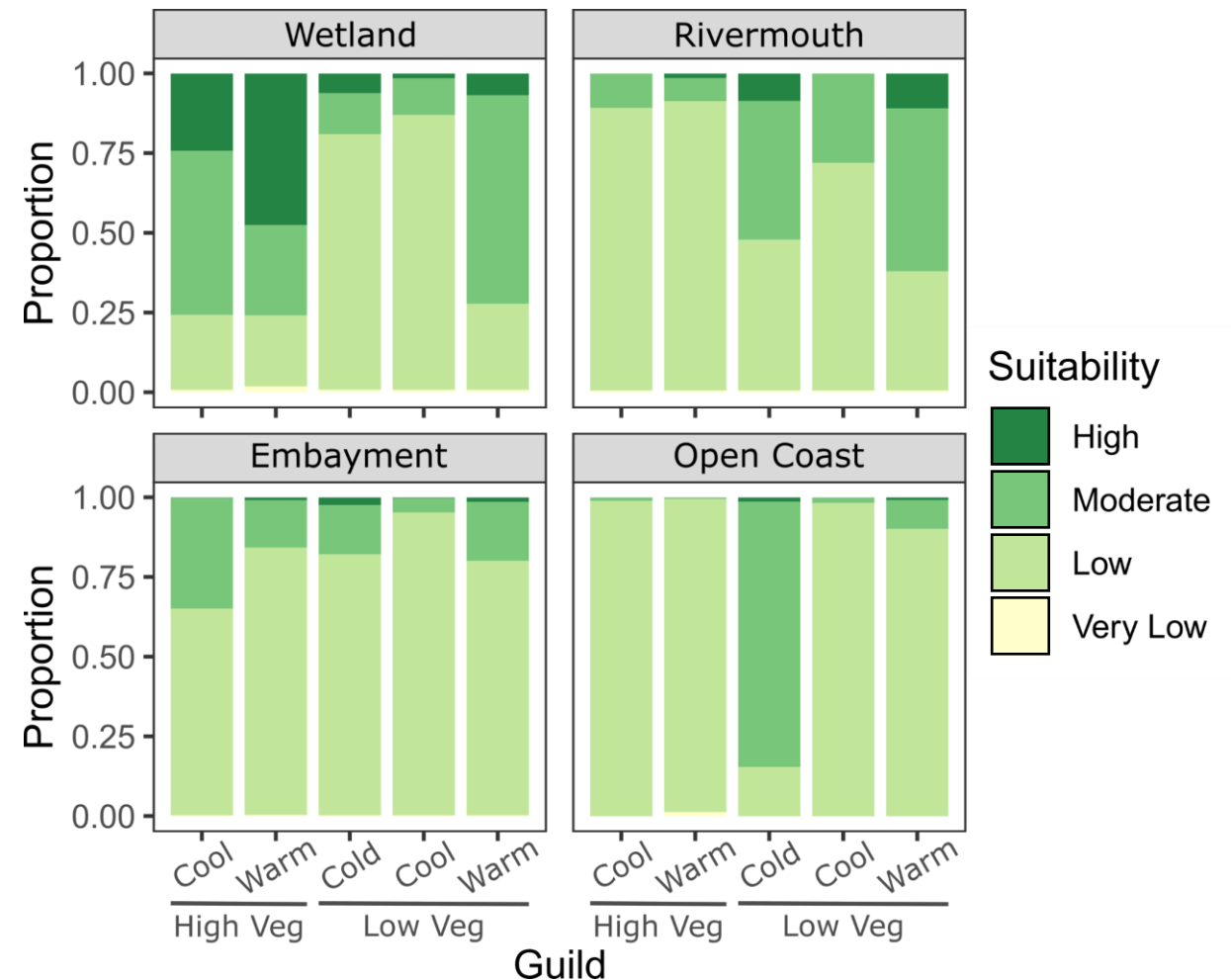
This map shows the suitable habitat for warmwater species that are associated with vegetation at 3 life stages.

**Note:** water temperatures have not been assessed yet, but depth preferences are included



Wetlands and rivermouths play an important role in supporting the fish community but are less available in the landscape

Ecotype	Percentage of AOC	Total Area (ha)
Wetland	0.9*%	136*
Rivermouth	0.2*%	31*
Embayment	5%	832
Open Coast	94%	14,447





Species and guilds have diverse habitat preferences, so ensuring a wide variety of habitats is important

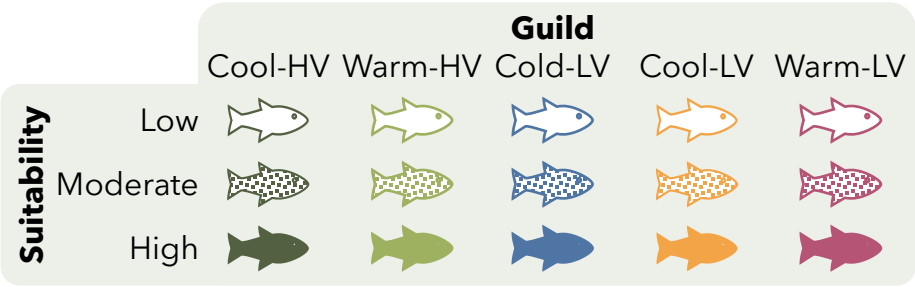
Most abundant habitat combinations:

Ecotype	Depth	Substrate	Vegetation	Coverage
Wetland	0-5 m	Sand/Silt	Emergent	43 %
Rivermouth	0-2 m	Sand/Silt	No cover	23 %
	5-10 m	Silt	No cover	20 %
Embayment	>5 m	Silt	No cover	26 %
	5-10 m	Silt	Submerged	17 %
Open coast	>5 m	Sand	No cover	62 %

Habitat preferred by:

Adult	Nursery	Spawning

Reconcile supply with demand in different ‘markets’



In summary,



Quality fish habitat is limited within the AOC, and moderate to high suitability habitat is primarily found in areas most likely affected by many human activities.



Open coast habitat is most abundant, and likely the least productive, making it a good candidate for habitat conversion while also making improvements for cold and coolwater species.

# Effect of restoration and development on fish habitat

The second stage of our assessment involves exploring how in-water projects affects fish habitat supply within the nearshore of the AOC and determining whether the AOC is meeting their net-gain goal.



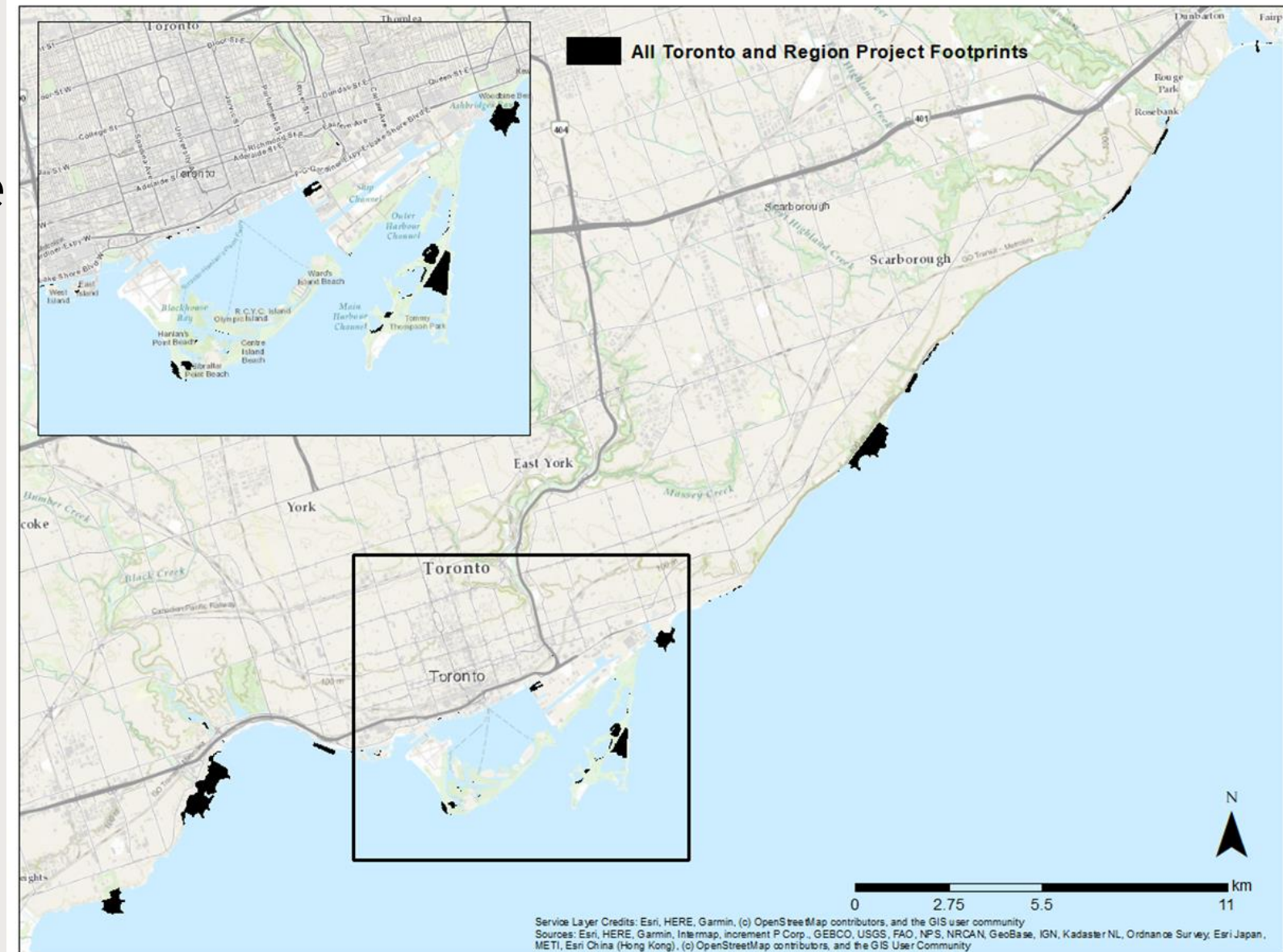
There are 57 in-water projects between Etobicoke Creek and Rouge River within the AOC boundary

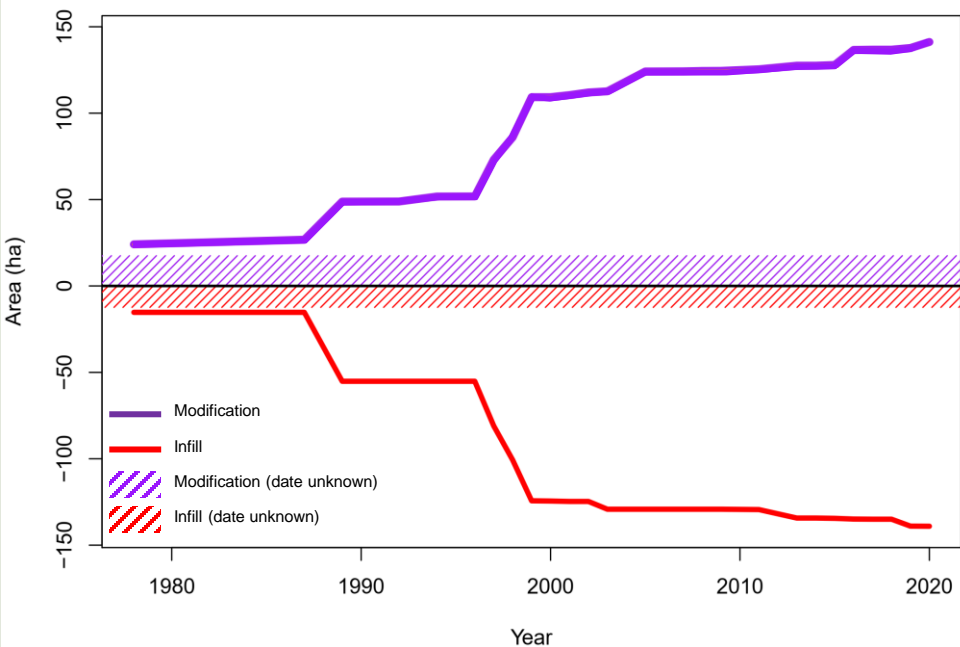


Credit: TRCA

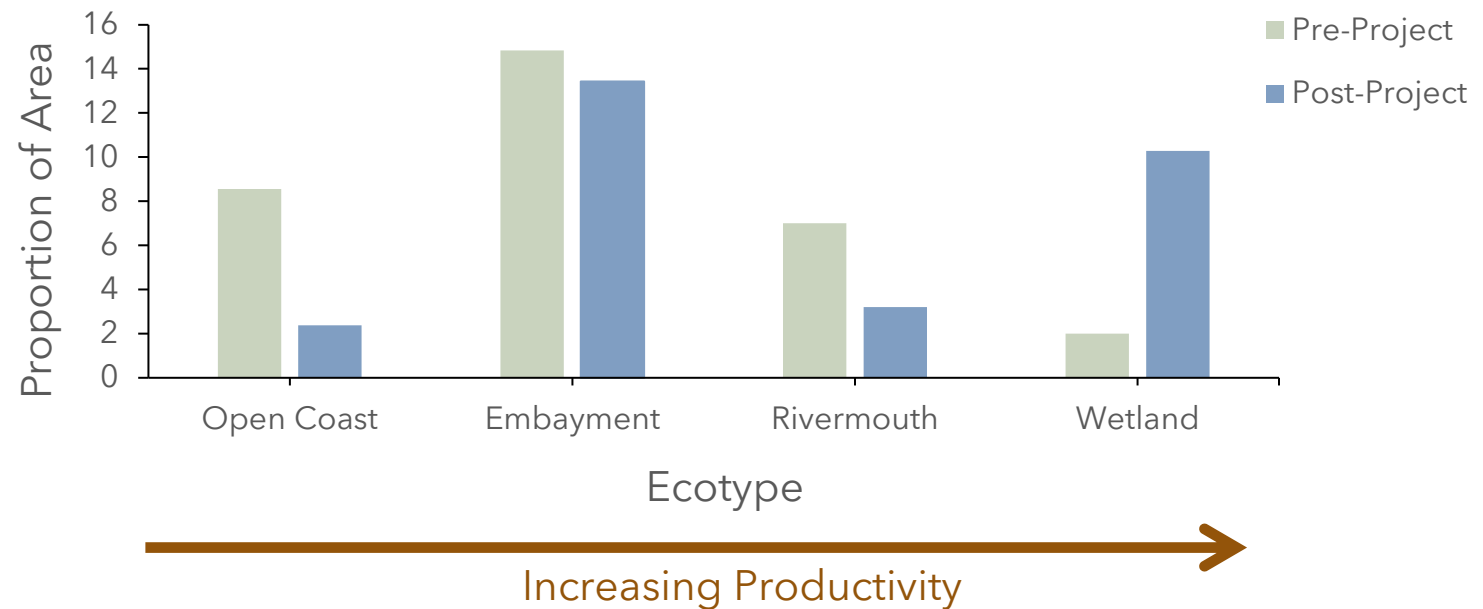


Credit: TRCA





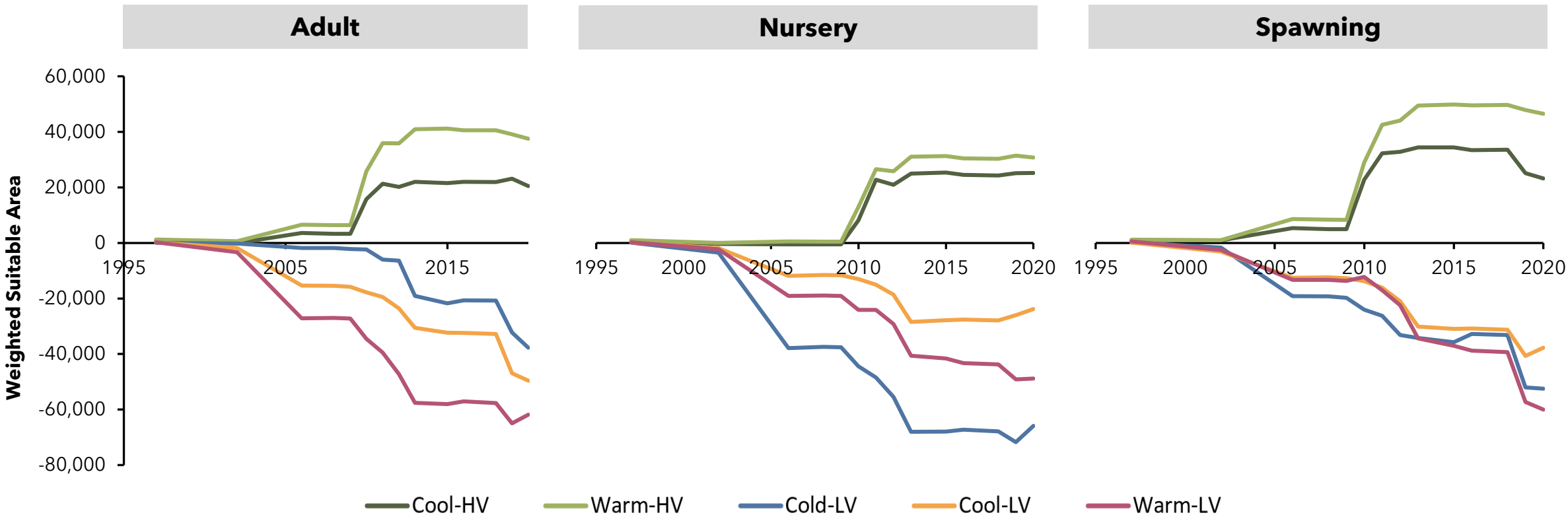
The nearshore has been greatly altered due to these projects, however,



the alterations are expected to increase productivity among 33 of the projects examined. Monitoring informs outcomes.



# Suitable habitat for fishes highly associated with vegetation has increased since 1995



In summary,



Ecological trade-offs almost always occur when modifying aquatic habitat



Overall, fish habitat has improved for high vegetation-association fishes since 1995

# Current status of fish habitat

Though considerable progress has been made, overall fish habitat within the AOC's nearshore **remains impaired**

To help the RAP reach its goal of delisting fish habitat within the AOC, we found:

Criteria

FH 1

- Open coast habitat is rehabilitated (for coldwater fishes, in particular).
- Sheltered bays are rehabilitated (for warmwater and coolwater species, in particular).
- Rivermouths are rehabilitated for resident and migratory fishes (e.g., Walleye, Northern Pike, Basses etc.)



Photo Credit: S. Smodis

Key Messages

FH 1

- Diverse habitat associations underscore importance of habitat diversity/complexity
- Majority of moderately to highly suitable habitat is found within the central waterfront and rivermouths
- Most abundant habitat type is open coast; least abundant habitat type is non-wetland rivermouth
- Restoration projects mostly occur within sheltered bays and rivermouths in the 0-2m depth zone
  - Often involve enhancement or creation of embayment or wetland habitat (even the slips)
- Addition of large substrate alone (particularly boulder) does not necessarily increase overall habitat suitability, but does for some specialist spawners

To help the RAP reach its goal of delisting fish habitat within the AOC, we found:

Criteria

FH 3

- Remaining and created [coastal] wetlands are protected.
- Specific coastal wetland targets contained in watershed plans should be used. Where no plans exist, they should be developed.



Key Messages

FH 3

- Wetlands provide valuable habitat suitable for many targeted species but remain limited in quantity may have met a preliminary target
- Several projects have involved the creation or enhancement of coastal wetlands greatly benefiting all species, especially those that have a high affinity for vegetation, prey fish for others
- Further conversion of land or open coast to wetlands / sheltered areas would be valuable; however, should be done in locations the features can be sustained
- Ongoing monitoring and fish tracking is an important crosscheck



# Our work to assess fish habitat within the AOC is still ongoing

## Second round of landscape habitat assessment

- Continued baseline testing to capture effect of water level fluctuations on supply
- Updated guild assignments to align landscape and project evaluations esp. incorporating temperature as key driver



## Continued project evaluations

- Complete analysis of remaining projects since last assessment (+24)
- Continued analysis of new and proposed projects to achieve net gain of fish habitat



## Future work

- Improvements to habitat suitability models to address temperature-based spawning times and pelagic species that do not interact with lake bottom
- Eco-accounting updates that set and track all ecotype targets for the habitat assessment



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## **Toronto Port Authority**

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# Questions?

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