Evaluating the effectiveness of fish habitat restoration across the Toronto waterfront

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Regional Watershed Alliance
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[1] Toronto and Region Conservation Authority
[2] Fisheries and Oceans Canada
[3] PREreview.org

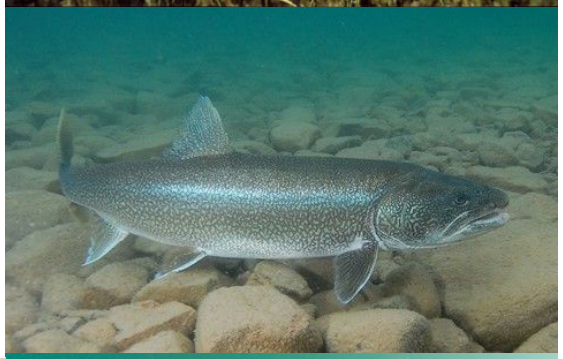
Toronto and Region Conservation Authority

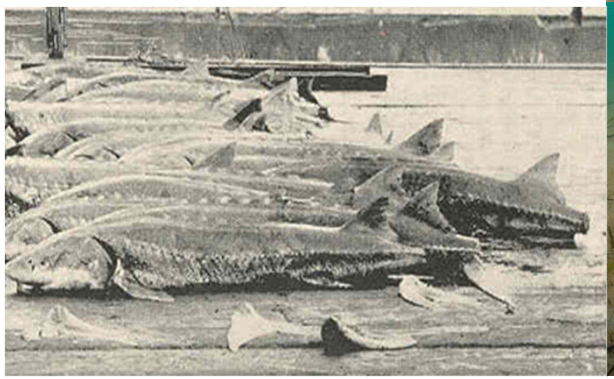
Toronto Port Lands 1899. Looking north west to Toronto skyline in left background.

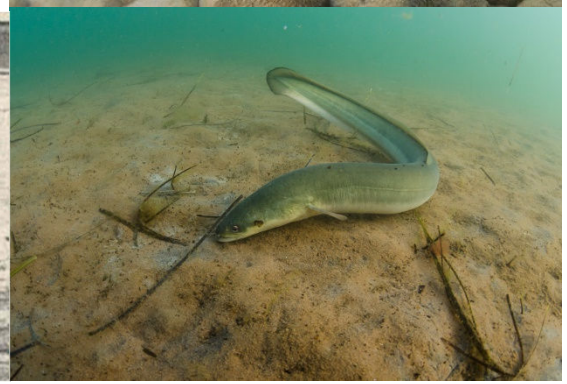
Toronto Public Library

Historical Fish Abundance

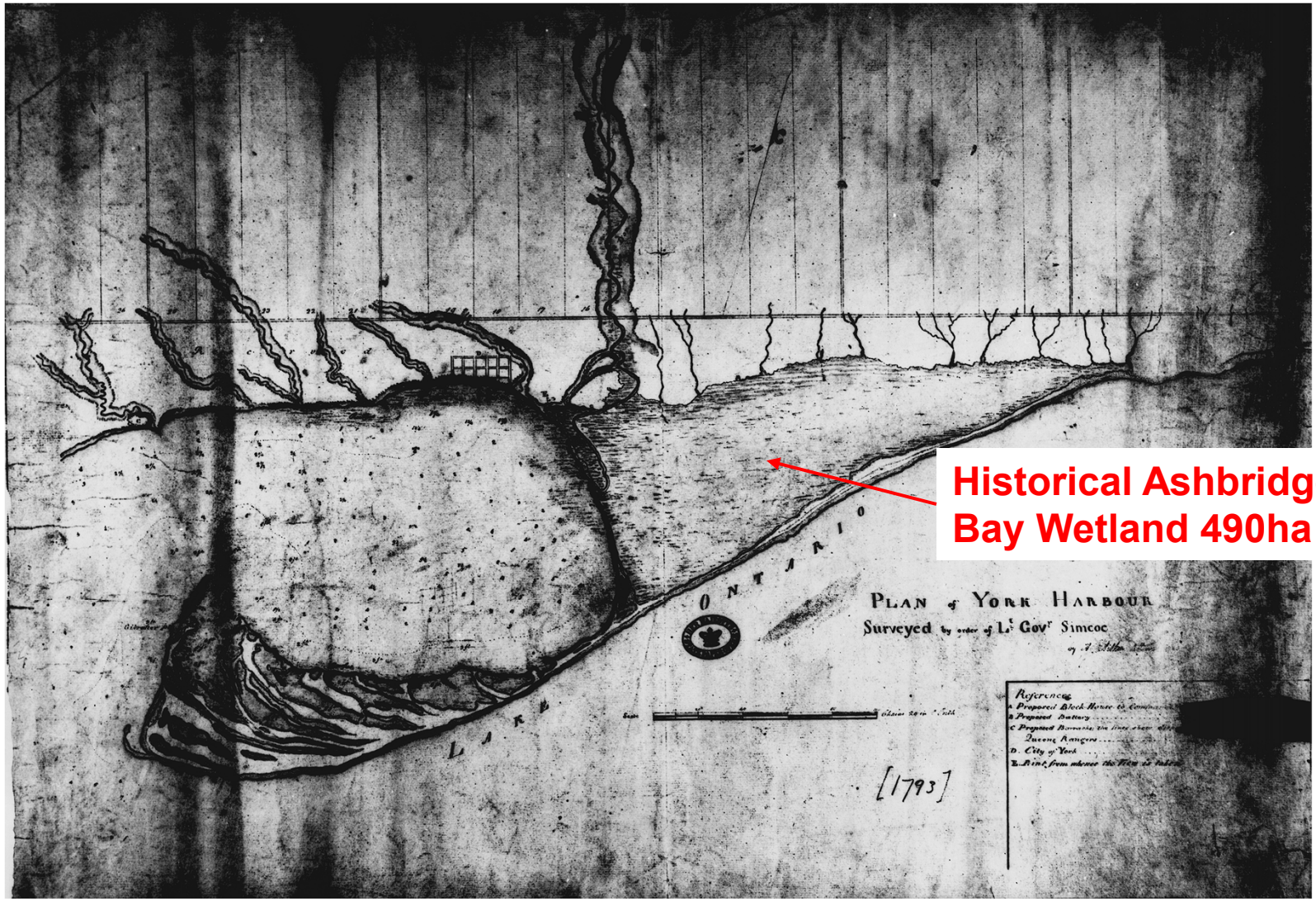
- 200 years ago Lake Ontario was pristine and teeming with Lake Trout and Atlantic Salmon
- The Toronto Islands were a large sandy spit protecting a huge wetland where Muskellunge, Northern Pike, and Walleye thrived
- The now rare Lake Sturgeon and American Eel were common





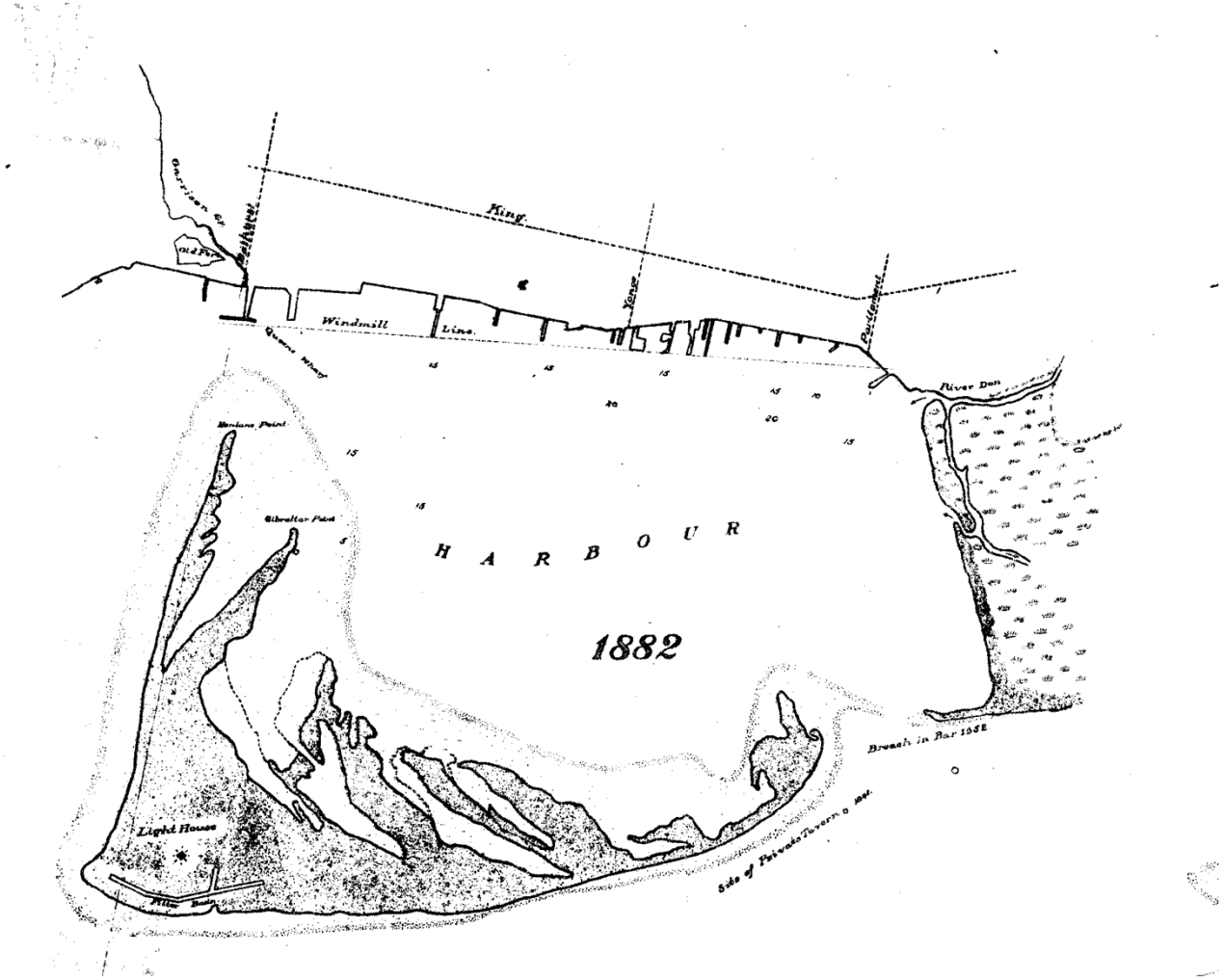


Toronto Harbour 1793



University of Toronto Libraries - Map & Data Library

Toronto Harbour 1882



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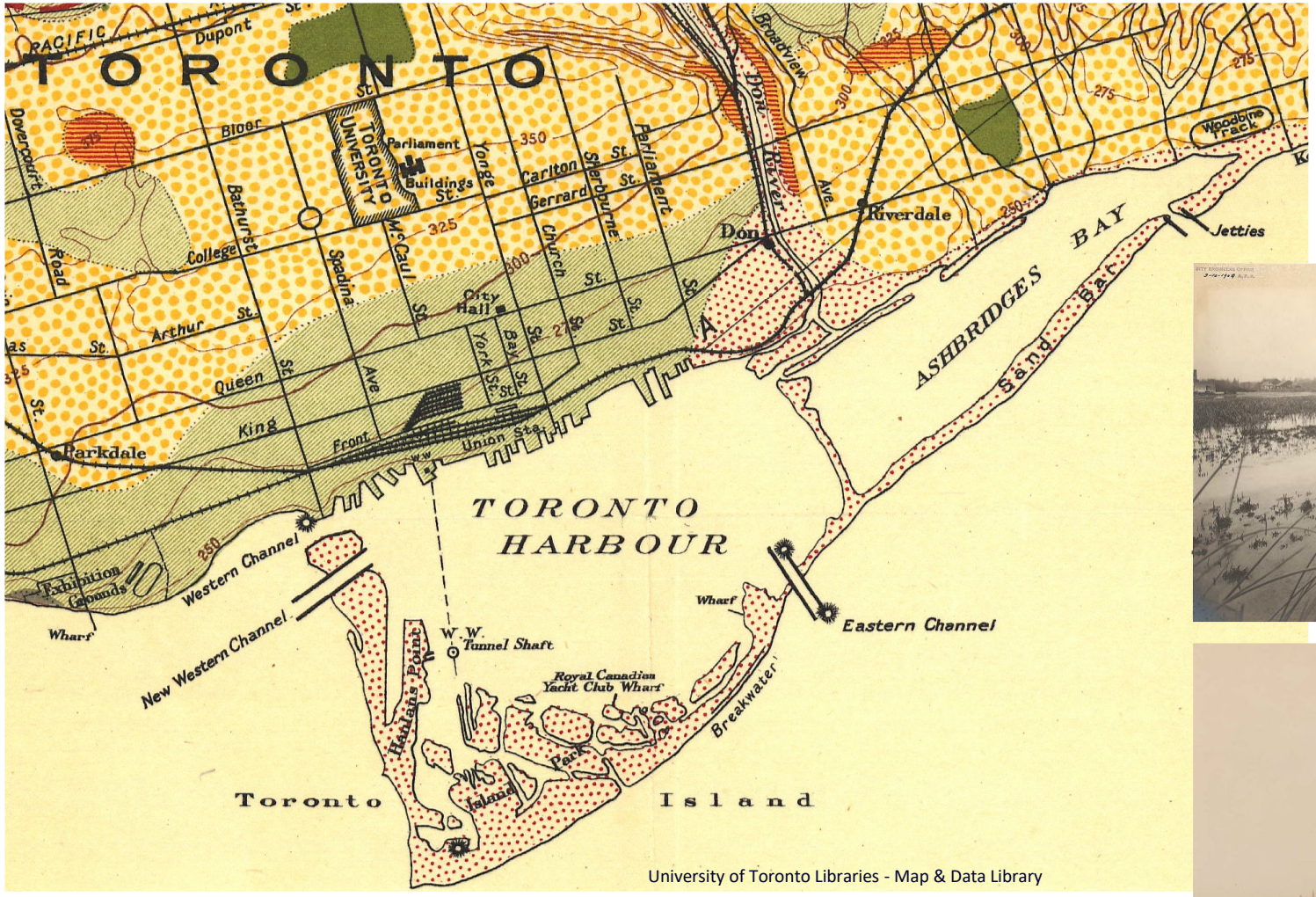
In 1858, Toronto islands were formed when a storm completely separated the peninsula from the mainland creating a gap too large to repair

Toronto Harbour 1913

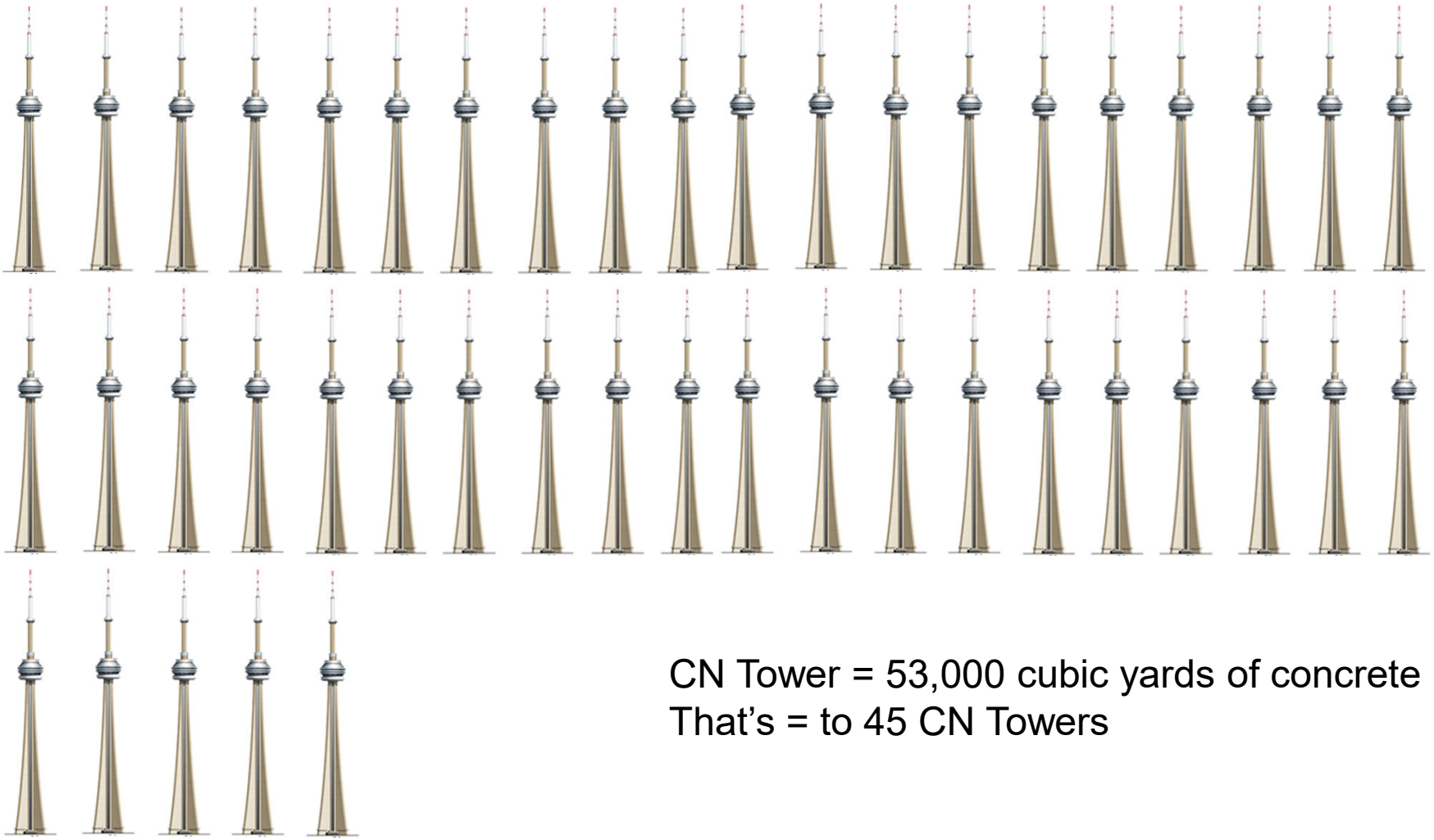


This map of Toronto Bay shows the creation of the Western and Eastern Gap, the Keating Cut, and the outline of Ashbridges Bay Marsh.

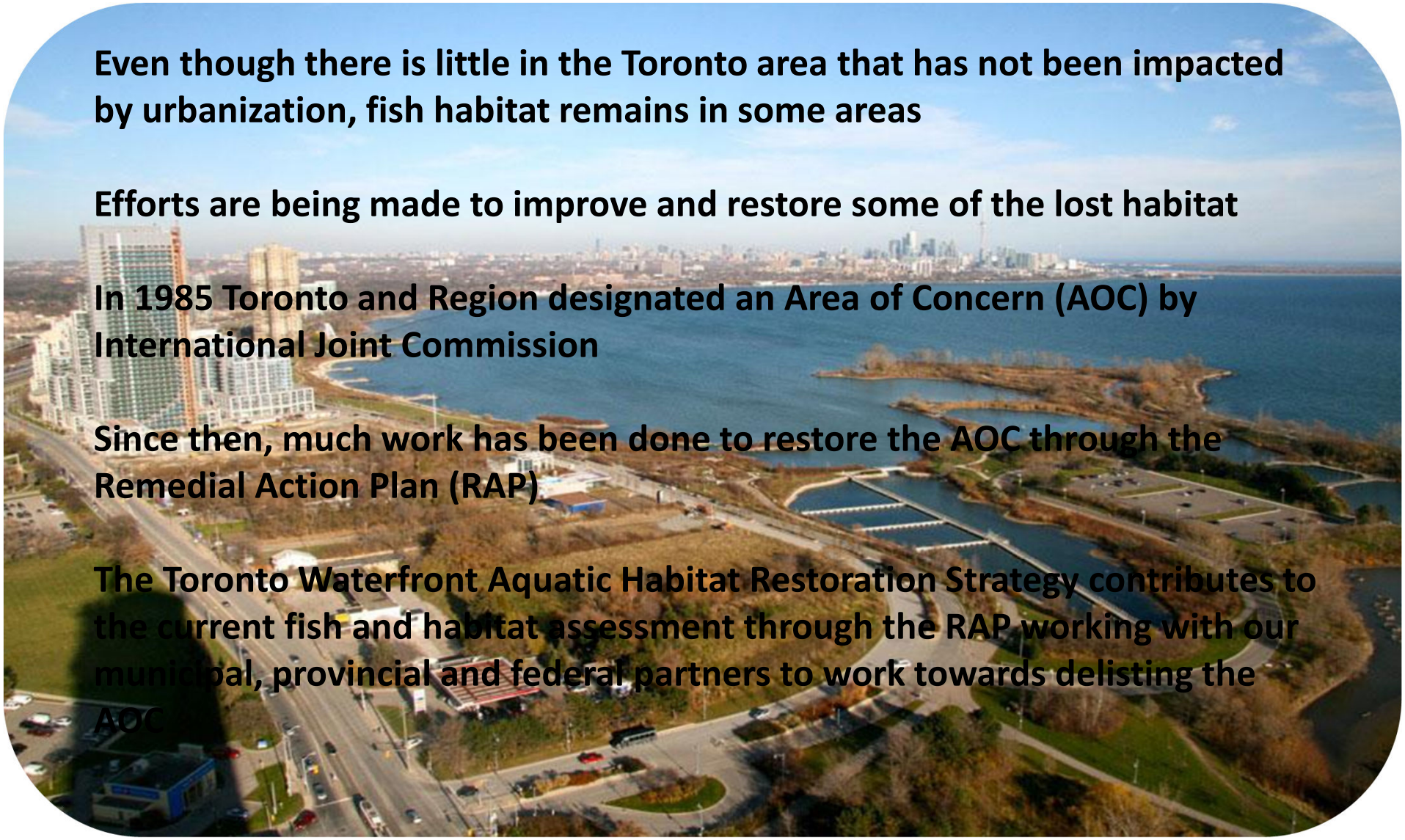
Toronto Harbour Today

Stonehooking in the Toronto Region 1815 -1920

Legacy of Impact due to Stonehooking
Let's Put this in Perspective: 2.4 million cubic yards =



CN Tower = 53,000 cubic yards of concrete
That's = to 45 CN Towers



Even though there is little in the Toronto area that has not been impacted by urbanization, fish habitat remains in some areas

Efforts are being made to improve and restore some of the lost habitat

In 1985 Toronto and Region designated an Area of Concern (AOC) by International Joint Commission

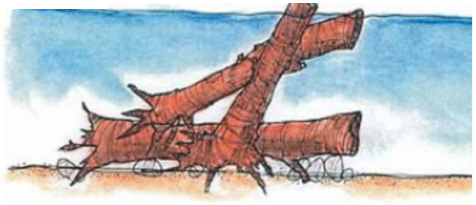
Since then, much work has been done to restore the AOC through the Remedial Action Plan (RAP)

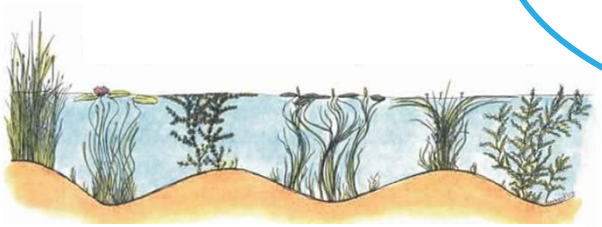
The Toronto Waterfront Aquatic Habitat Restoration Strategy contributes to the current fish and habitat assessment through the RAP working with our municipal, provincial and federal partners to work towards delisting the AOC

Aquatic Habitat Toronto

Developed by TRCA in 2003

Provides practical information for decision-makers, designers and regulatory agencies to ensure all waterfront projects incorporate opportunities to improve aquatic habitat





Toronto Waterfront Aquatic Habitat Restoration Strategy (TWAHRS)

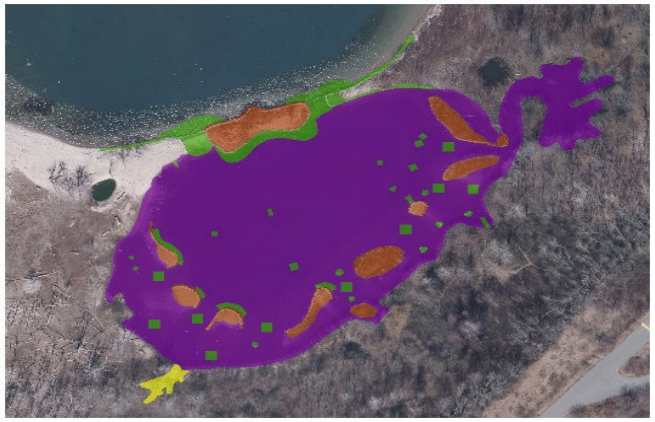
Ecosystem approach, ecological integrity, self-sustaining communities, native species, connectivity, conservation design, human use, consultative approach

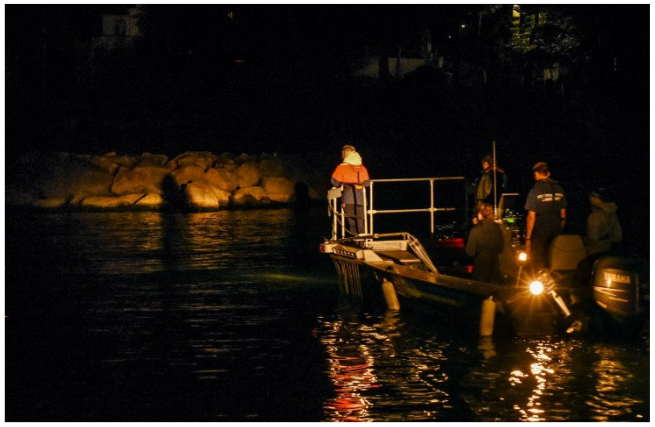
Compendium of restoration techniques

Targets

Objective

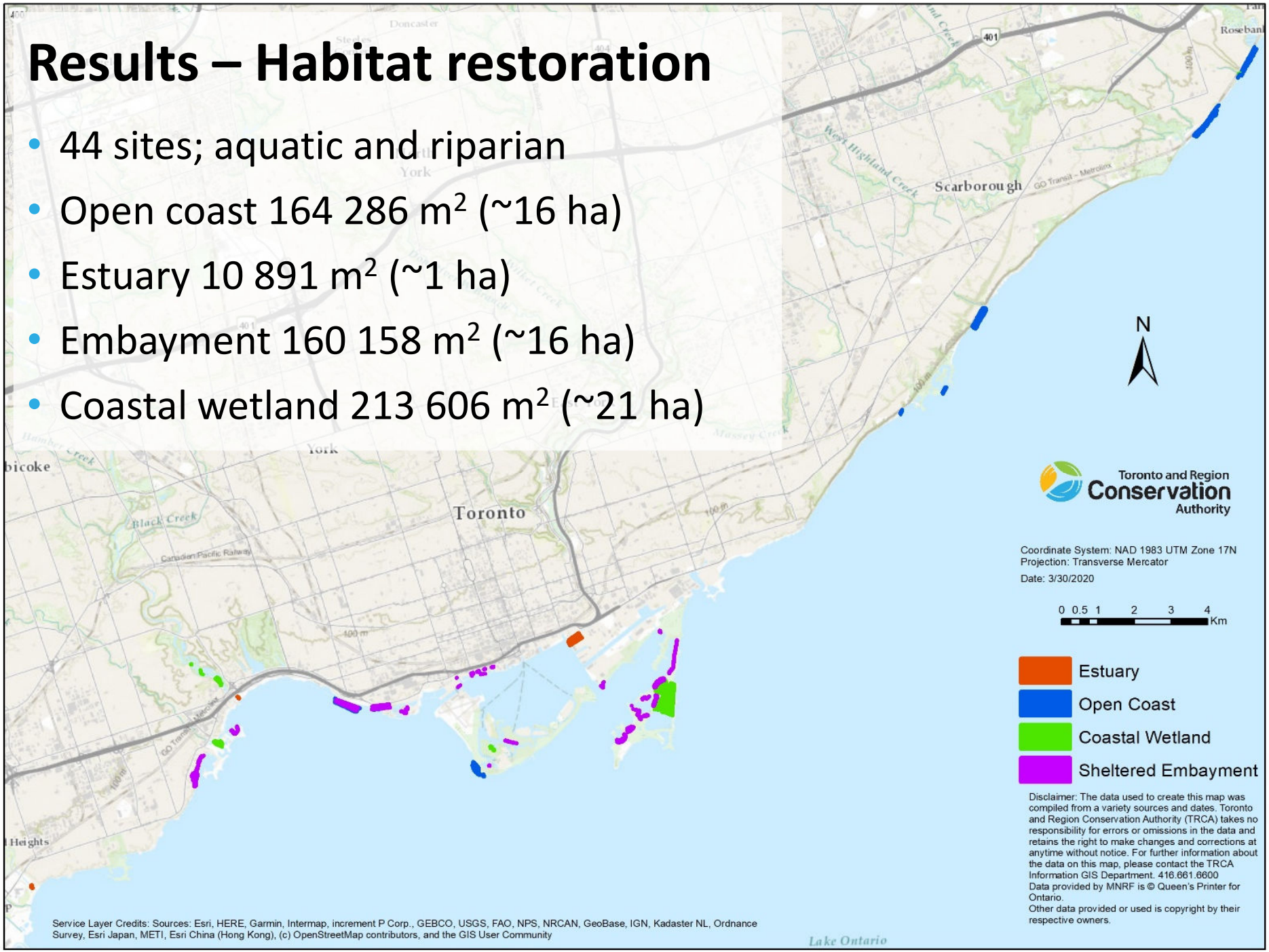
- To evaluate the *effectiveness* of fish habitat restoration using the Strategy
  - Quantify the *amount* of restored habitat
    - Net gain
    - Mapped restoration projects
  - Assess the *response* of fish communities to aquatic habitat restoration
    - Piscivores, forage, Common Carp, thermal guilds (IBI)
    - Waterfront electrofishing



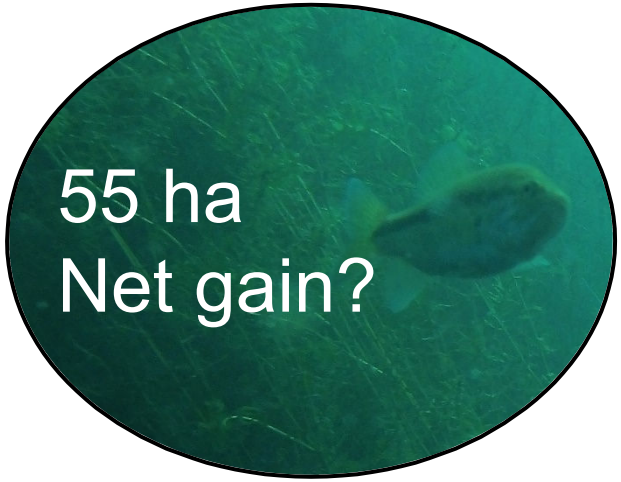


Results – Habitat restoration

- 44 sites; aquatic and riparian
- Open coast 164 286 m^2 (~16 ha)
- Estuary 10 891 m^2 (~1 ha)
- Embayment 160 158 m^2 (~16 ha)
- Coastal wetland 213 606 m^2 (~21 ha)



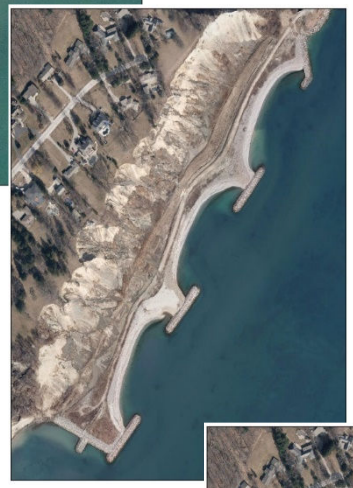
Did we meet the targets set in the Strategy?



Results – Open coast fish communities

- 4 restored, 1 reference
- Few species
- Cool and coldwater species
- Restored sites often had more species than the reference site
  - ↑ Smallmouth Bass, Rock Bass
  - ↓ Spottail Shiner, Emerald Shiner
- Round goby?

2002



2018

2018

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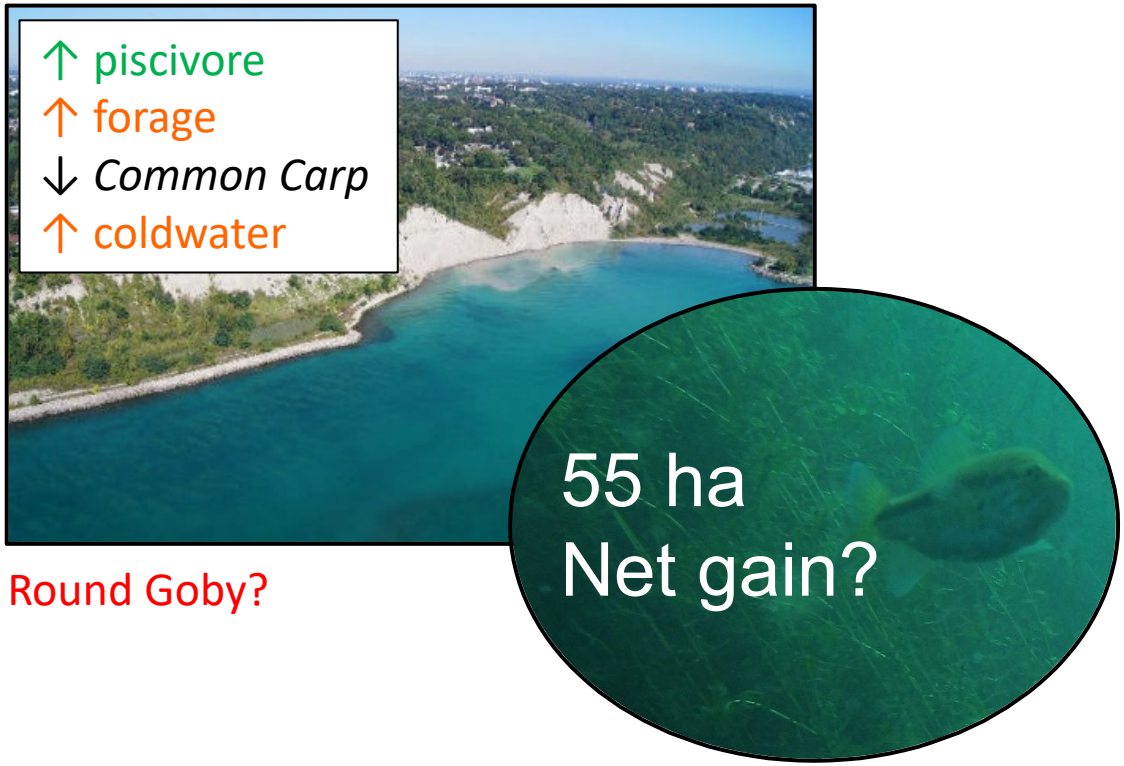
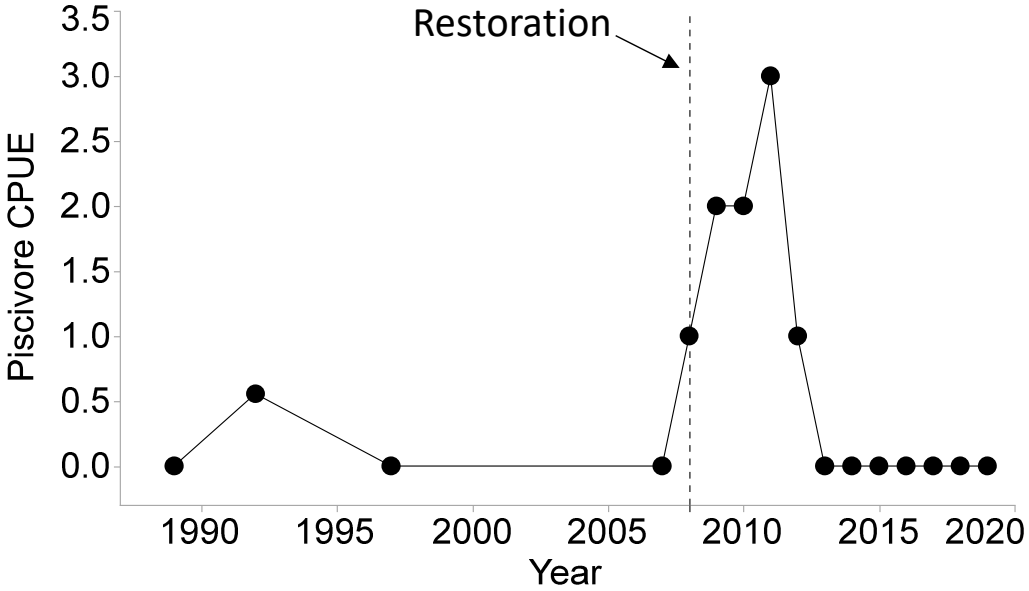


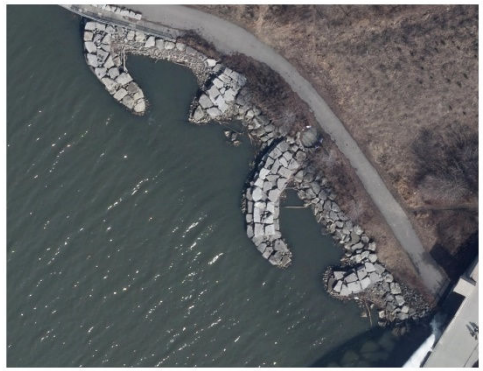
Round Goby?

Results – Estuary fish communities

- 2 restored, 1 reference
- Primarily coolwater species
- ↑ Rock Bass, shiners, minnows
- ↓ Spottail Shiner, Common Carp



2002



2018

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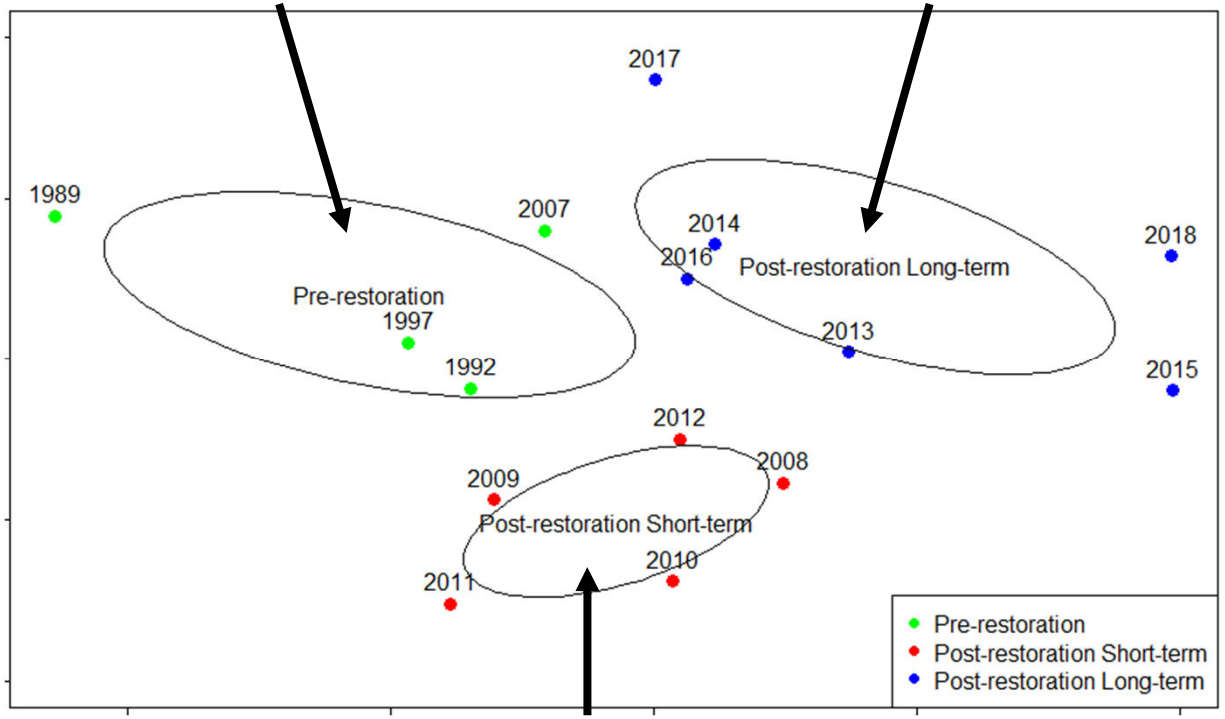
Results – Estuary fish communities

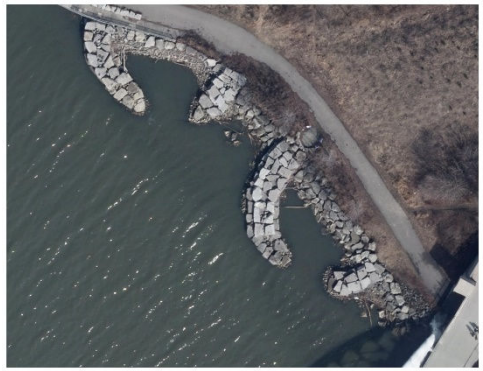
Emerald Shiner, Spottail Shiner Common Carp, Brown Trout, Trout-perch

Common Shiner, White Perch, Brown Bullhead, Rock Bass, Gizzard Shad



Yellow Perch, Spottail Shiner, Spotfin Shiner, Smallmouth Bass, Northern Pike, Bluntnose Minnow, Common Carp, Common Shiner, Emerald Shiner, Rock Bass

2002



2018

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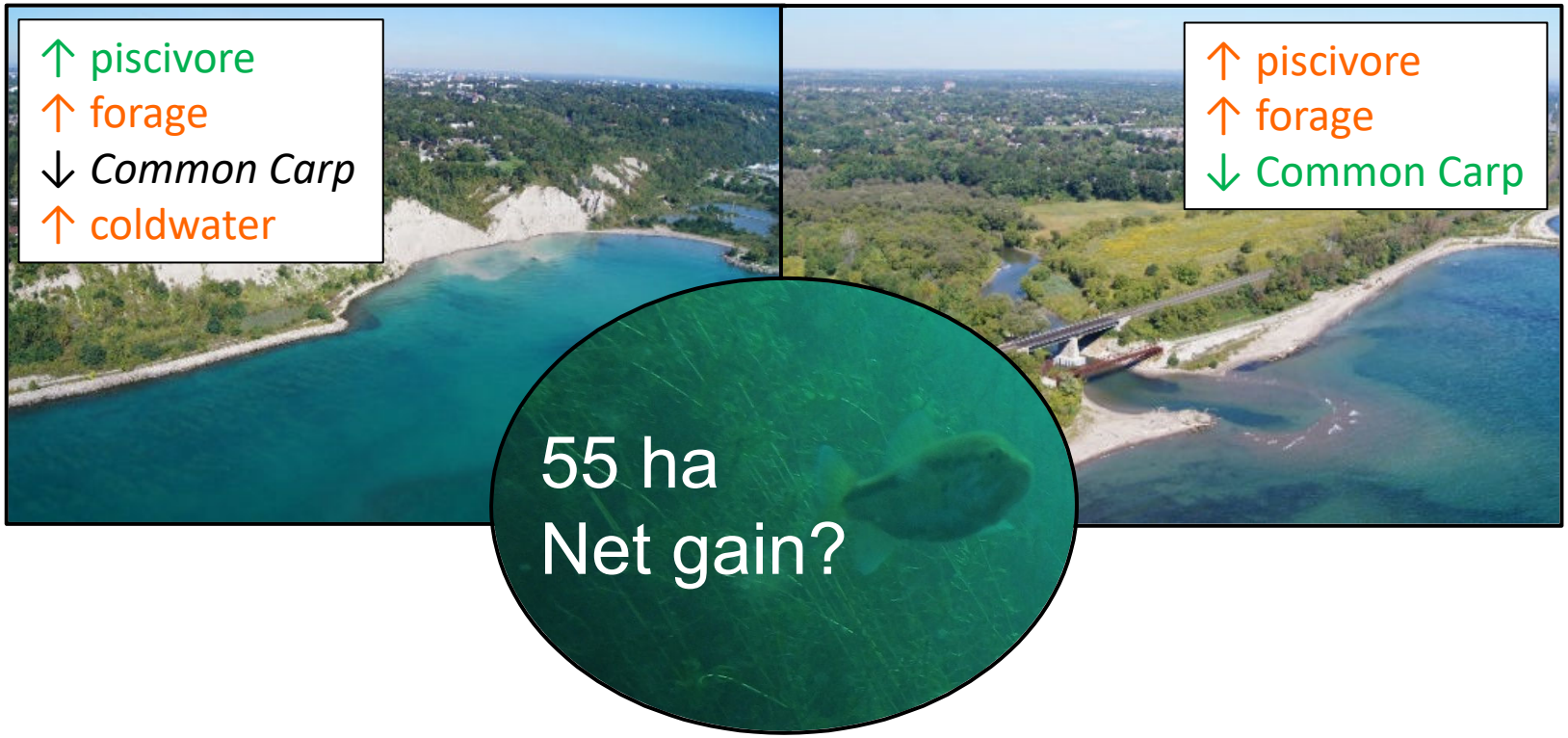
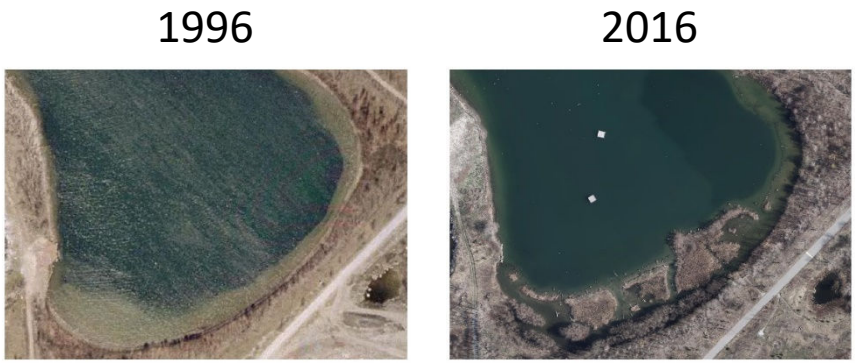


Round Goby?

Results – Embayment fish communities

- 10 restored, 1 reference
- Cool and warmwater species
- Juvenile Largemouth Bass and Northern Pike
- IBI metrics
  - ↑ Pumpkinseed, Largemouth Bass, Rock Bass, Yellow Perch, Northern Pike
  - ↓ Spottail Shiner, Emerald Shiner
  - Still degraded but improved



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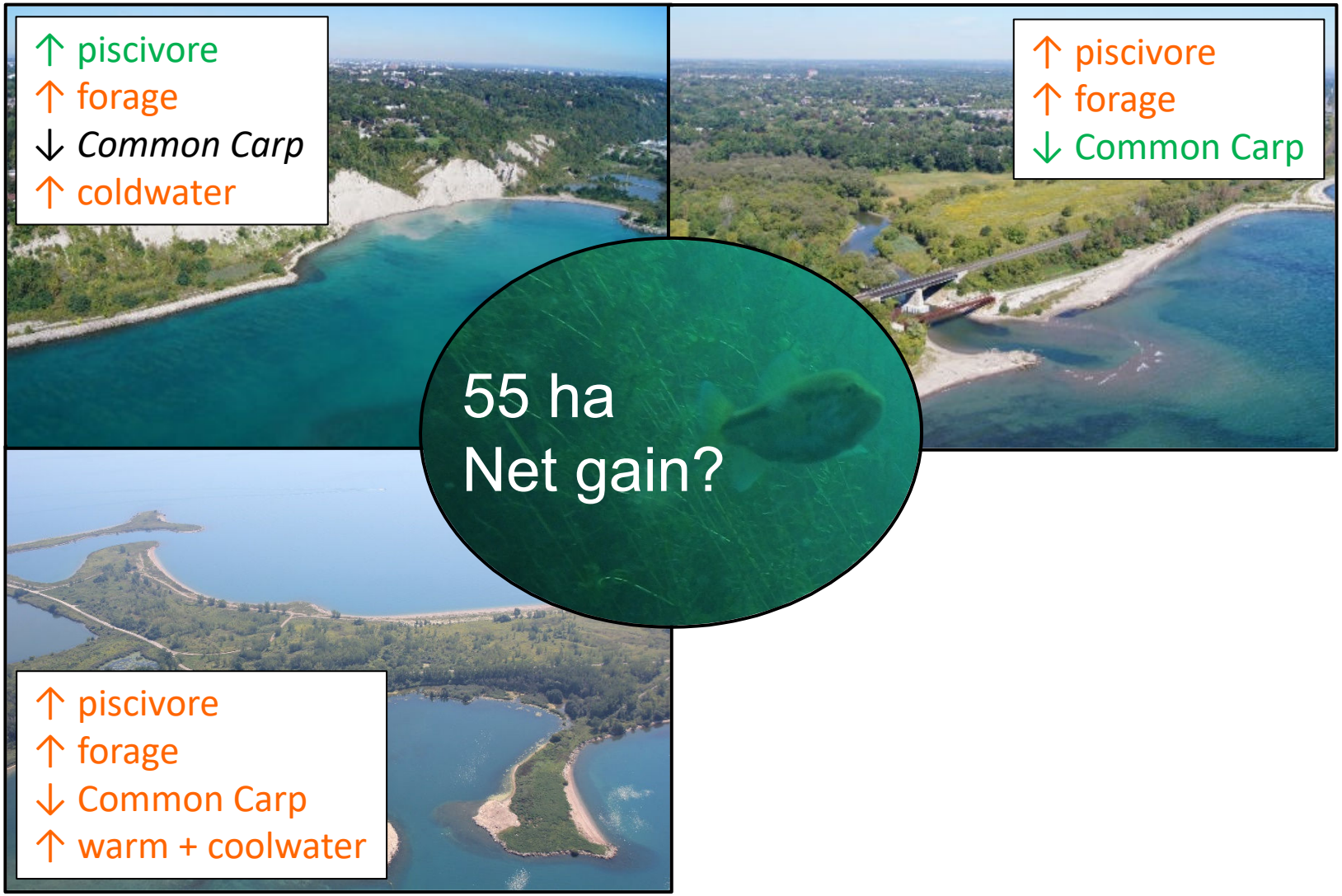
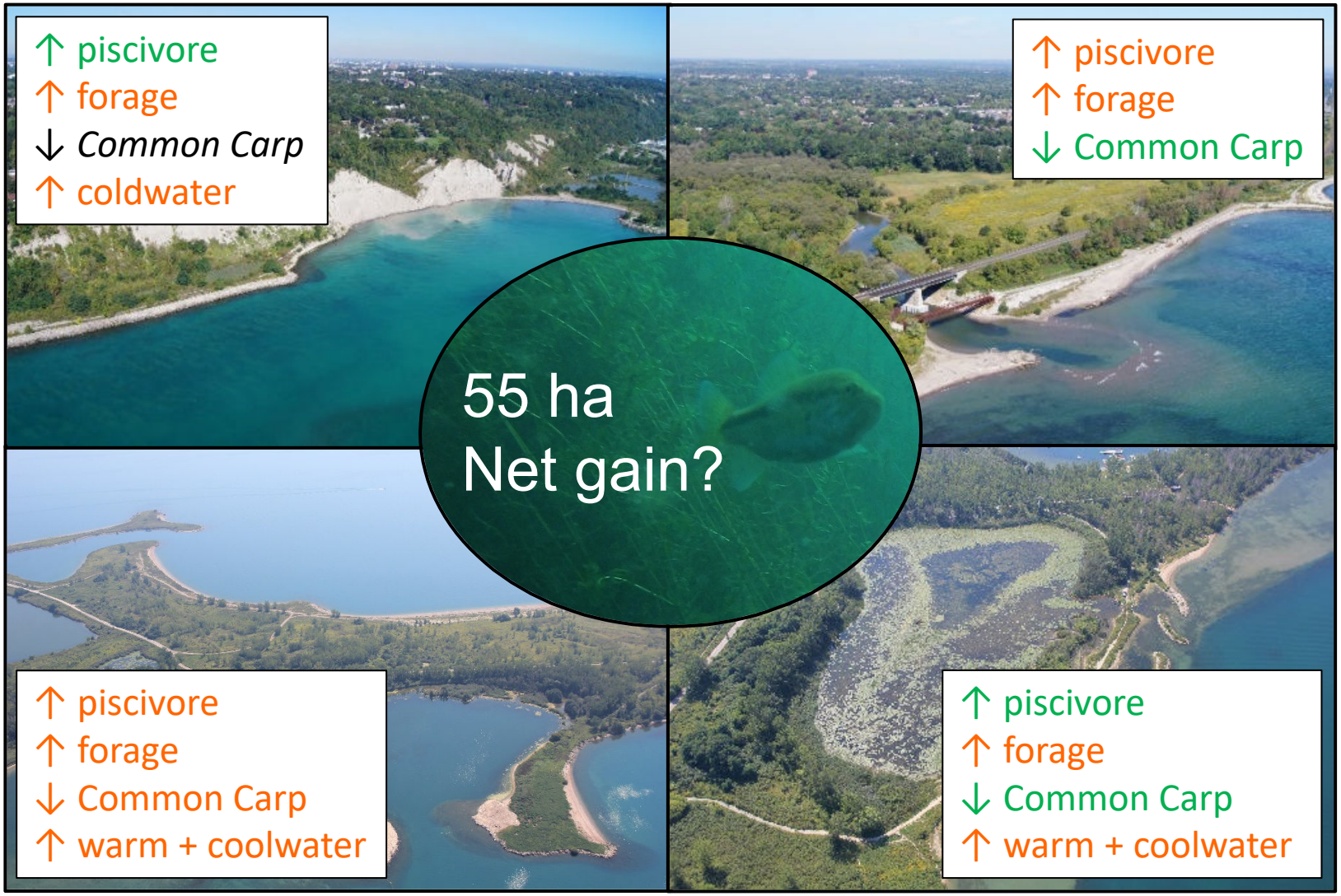


Round Goby?

Results – Coastal wetland fish communities

- 3 restored
- Many species, shift from cool to warmwater species, nursery, foraging habitat, carp
- ↑ Largemouth Bass, Yellow Perch, Pumpkinseed
- ↓ Spottail Shiner, Bluntnose Minnow

Did we meet the targets set in the Strategy?

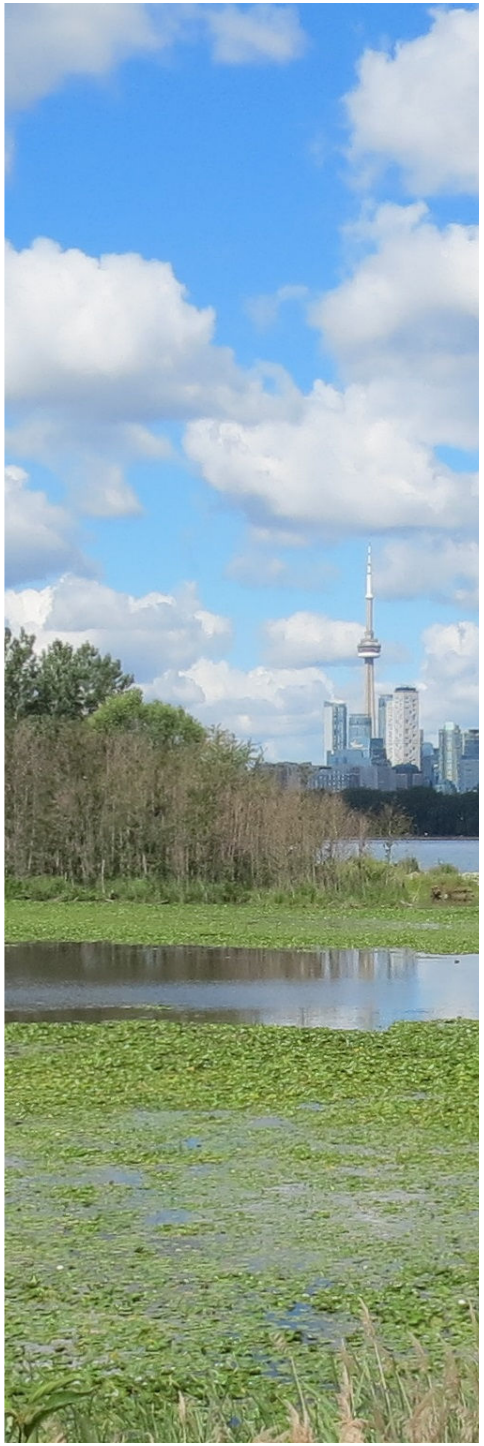


Round Goby?

Conclusions

- The Toronto Waterfront Aquatic Habitat Restoration Strategy:
  - Provides a holistic approach to waterfront development
  - Coordinated planning and management

- Restoration effectiveness was variable
    - Coastal wetland restoration



Next steps

- Aquatic Habitat Toronto consultation and implementation of the Strategy must continue to ensure targets are met and mitigate future threats
  - Invasive species, water quality, climate change

- Environmental monitoring needs to continue across the waterfront to support adaptive management decisions related to restoration activities

- Continue to work with our research and development partners using the innovative approach to aquatic habitat improvement outlined in the Strategy to achieve our common goal of a sustainable environment

Acknowledgements

Questions or comments?
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Fisheries and Oceans Canada | Pêches et Océans Canada

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