



# Using Acoustic Telemetry to Assess Fish Response to Ecological Restoration

*Morgan L Piczak*

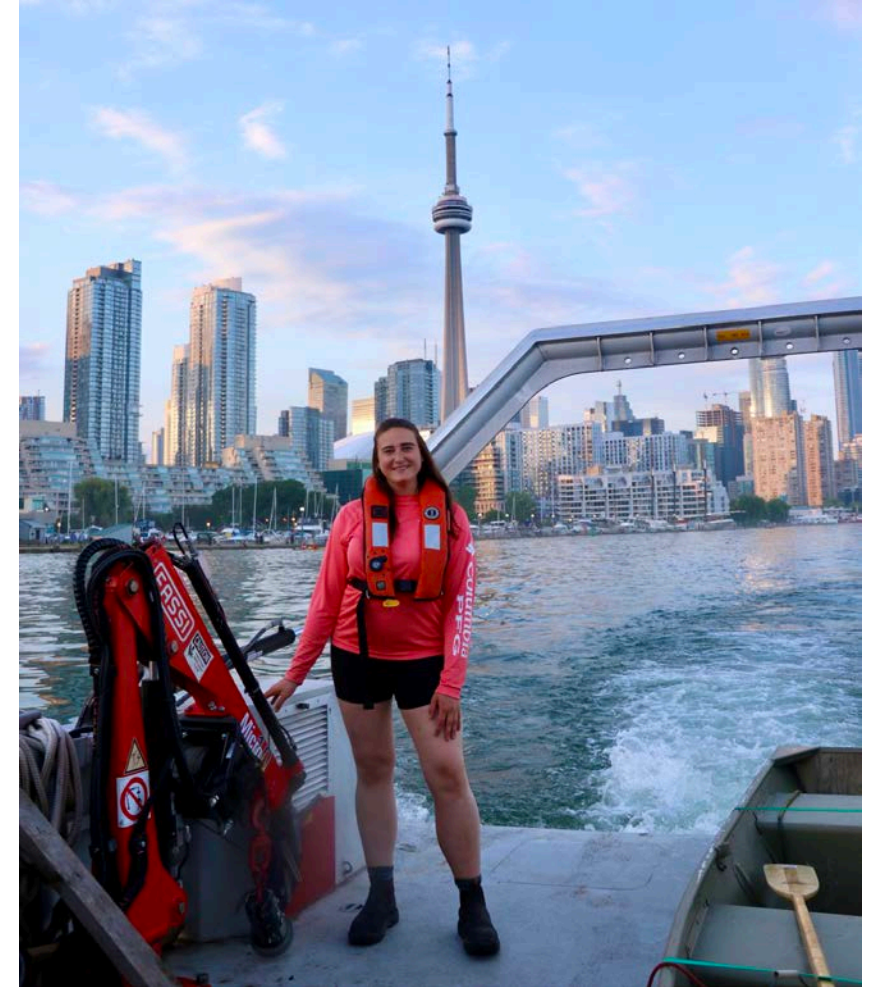
*@morganpiczak*

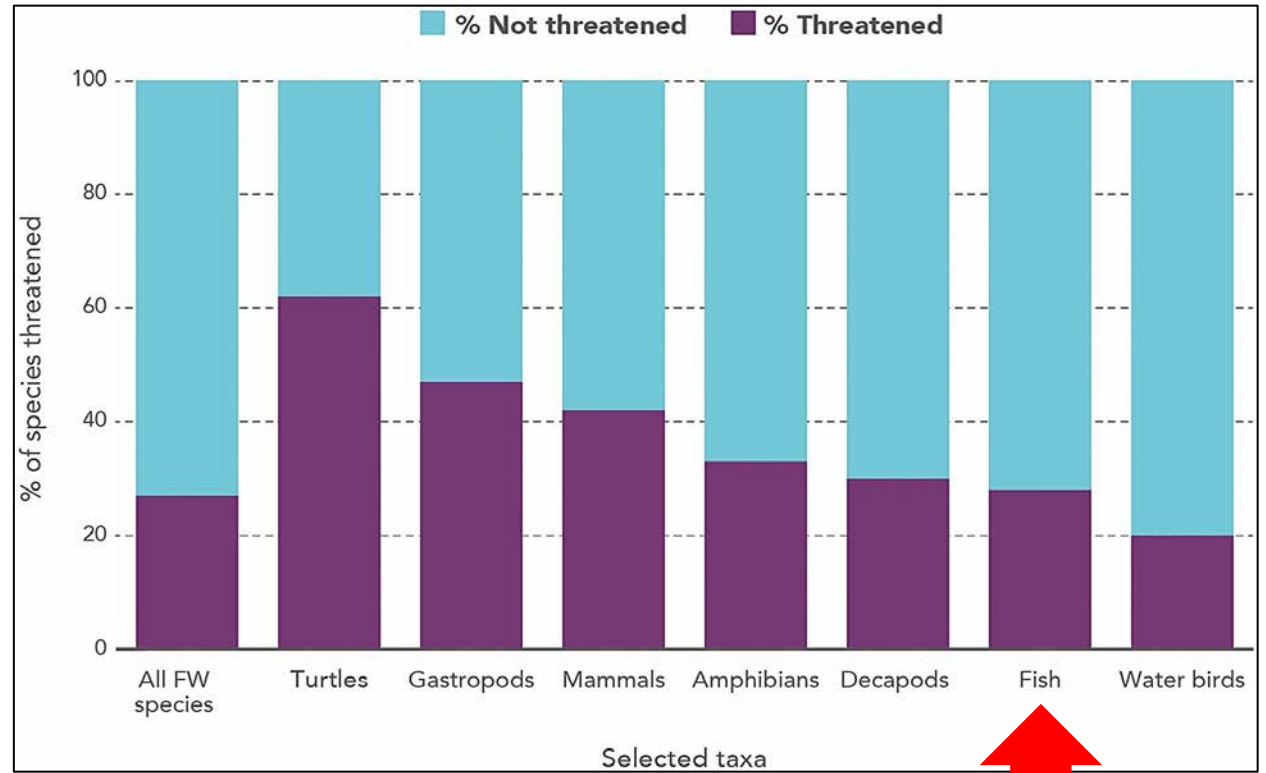
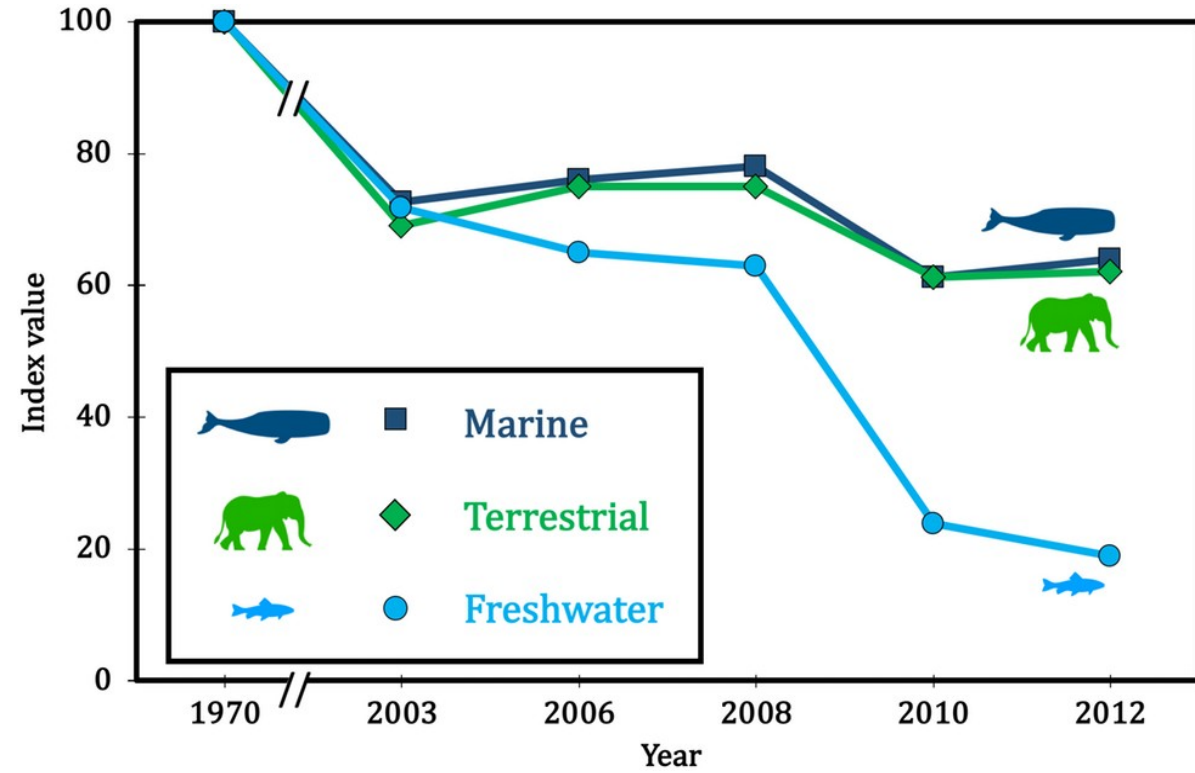
*Carleton University, Ottawa, Canada*

*WWW.FECPL.CA*



- BSc Zoology (University of Guelph)
- MSc Biology (McMaster University)
  - Thesis: threats facing common snapping turtles
- Fisheries and Oceans Canada Great Lakes Science
- PhD- Advancing foundations of restoration ecology for freshwater fishes in the Laurentian Great Lakes
- Next stop: Post-Doctoral Fellowship at Dalhousie University







Fragmentation



Loss



Degradation





Fragmentation



Loss



**Cumulative effects!**  
**Watershed scale!**

Degradation

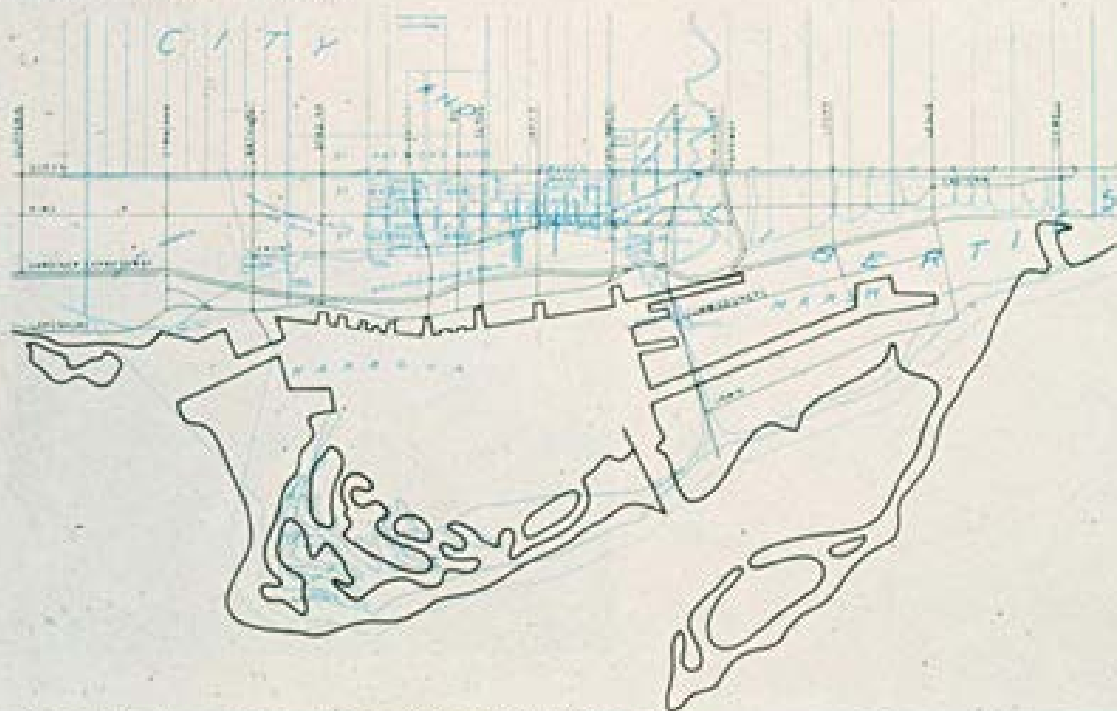




# THE WATERFRONT THEN and NOW

## The Central Waterfront Historically

Toronto's Central Waterfront has evolved and expanded in step with the City itself. Much of the present land area, which covers about 2,700 acres, is man-made, a result of landfill operations which have been an ongoing feature of the last two centuries of waterfront history.



1974



1959



1912



1886



1834

TORONTO WATERFRONT

Then and Now/ 1

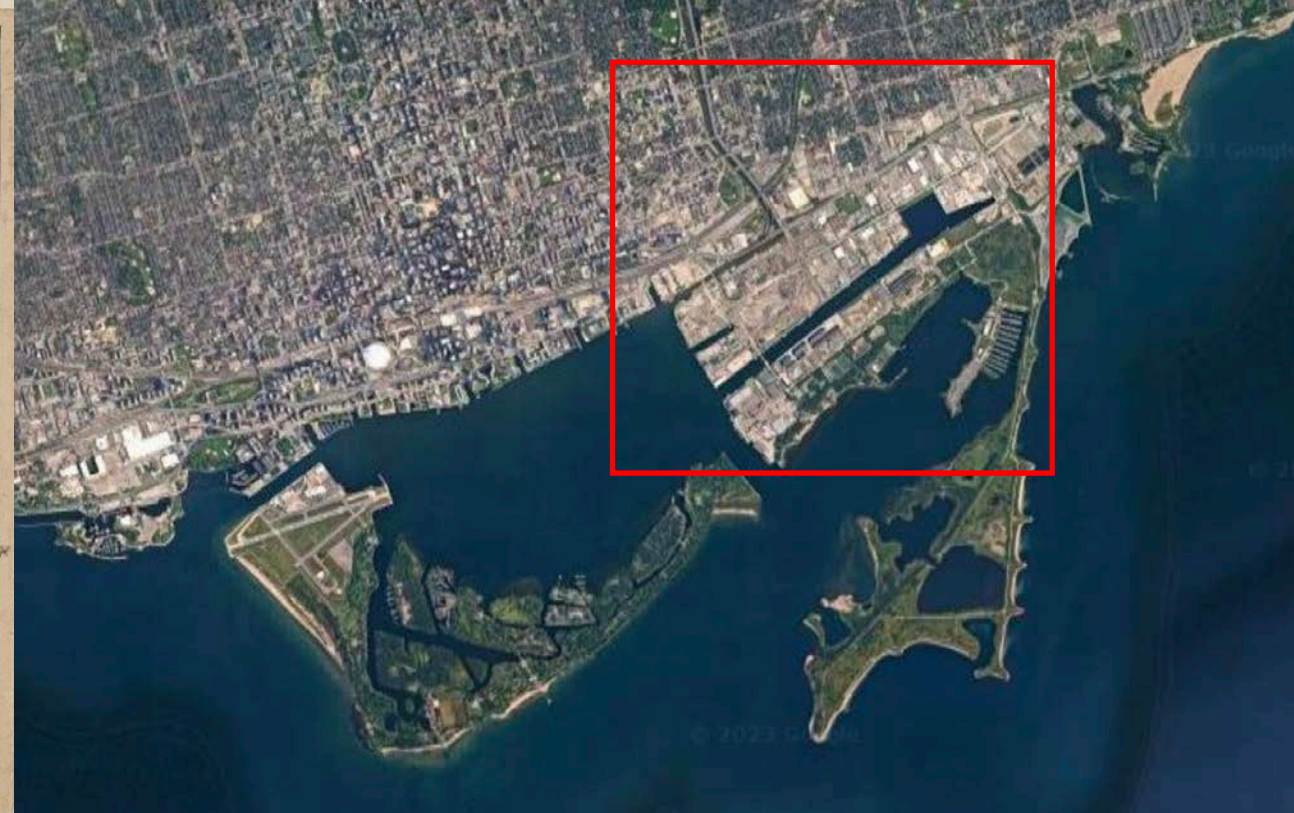
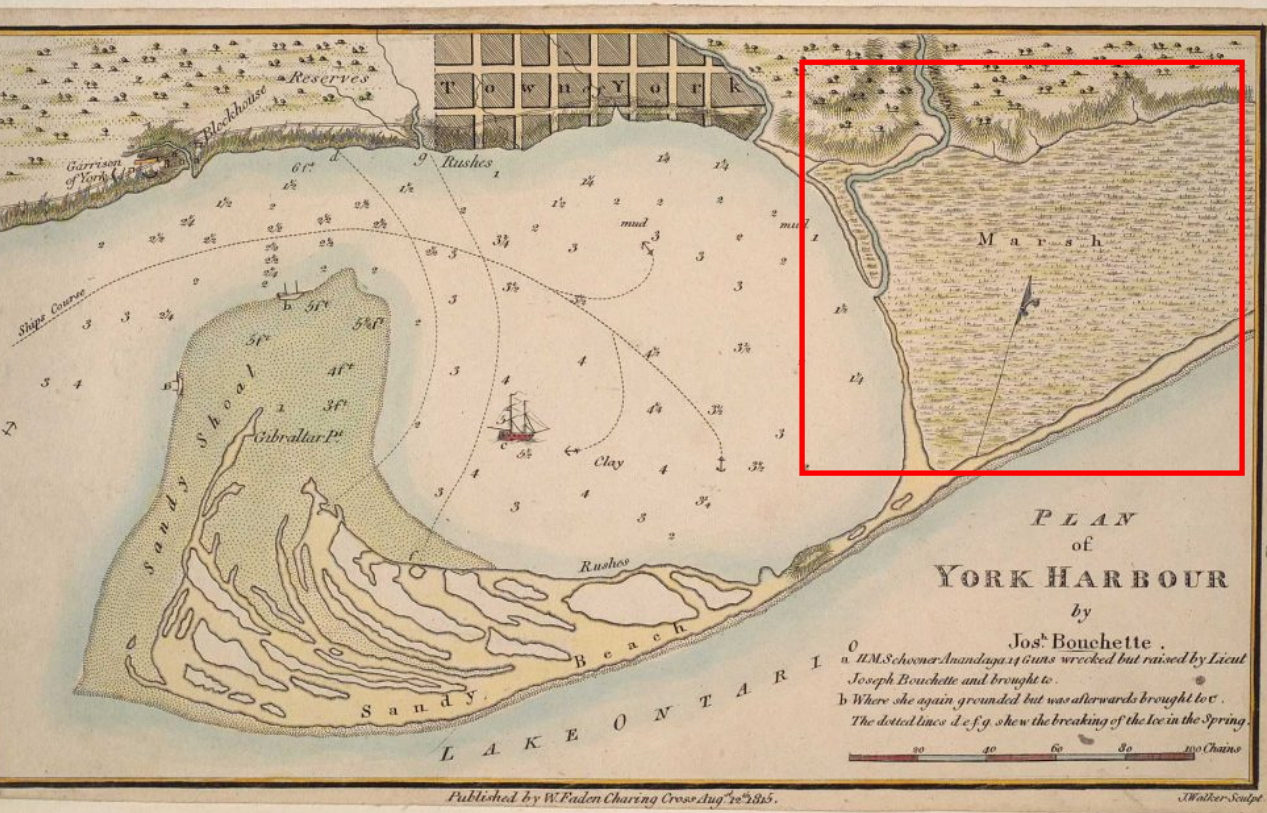


1974



1834

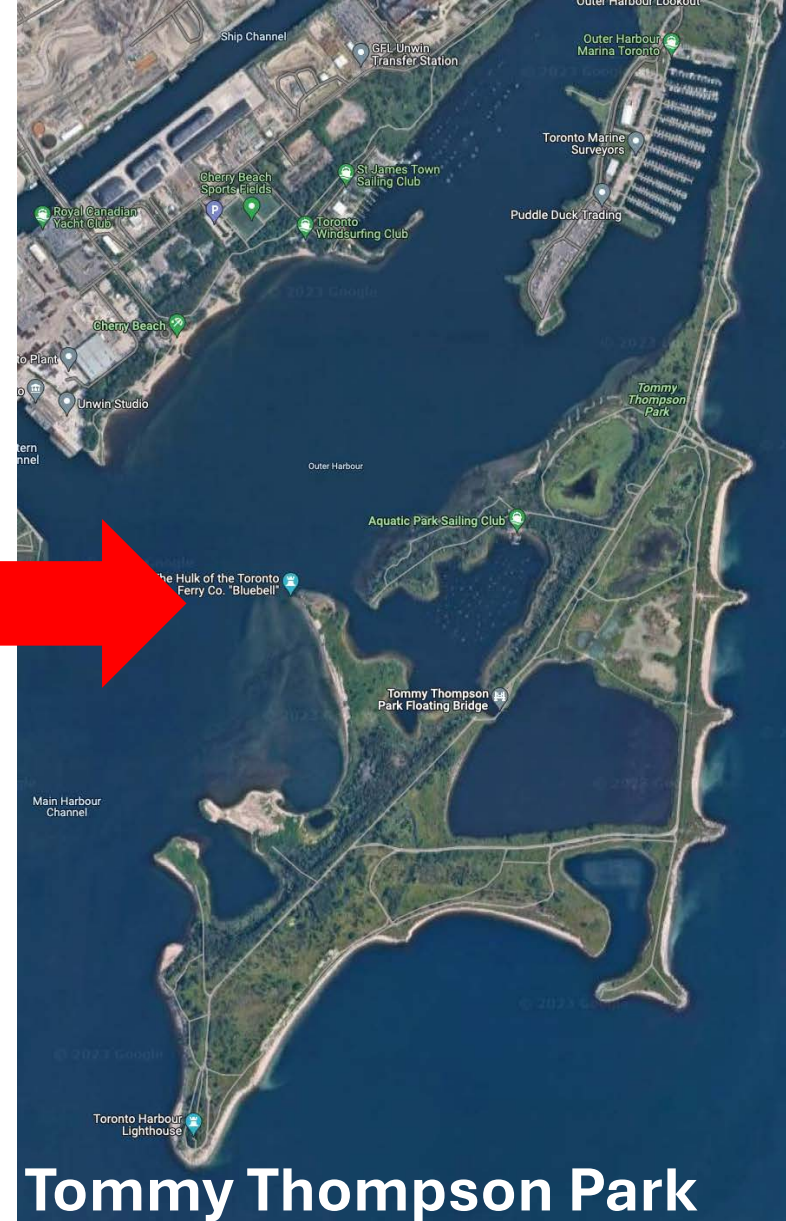














**Increase shoreline complexity**



**Add woody materials**



**Vegetation planting**



**Exclusion Barriers**



**Add shoals and substrate**



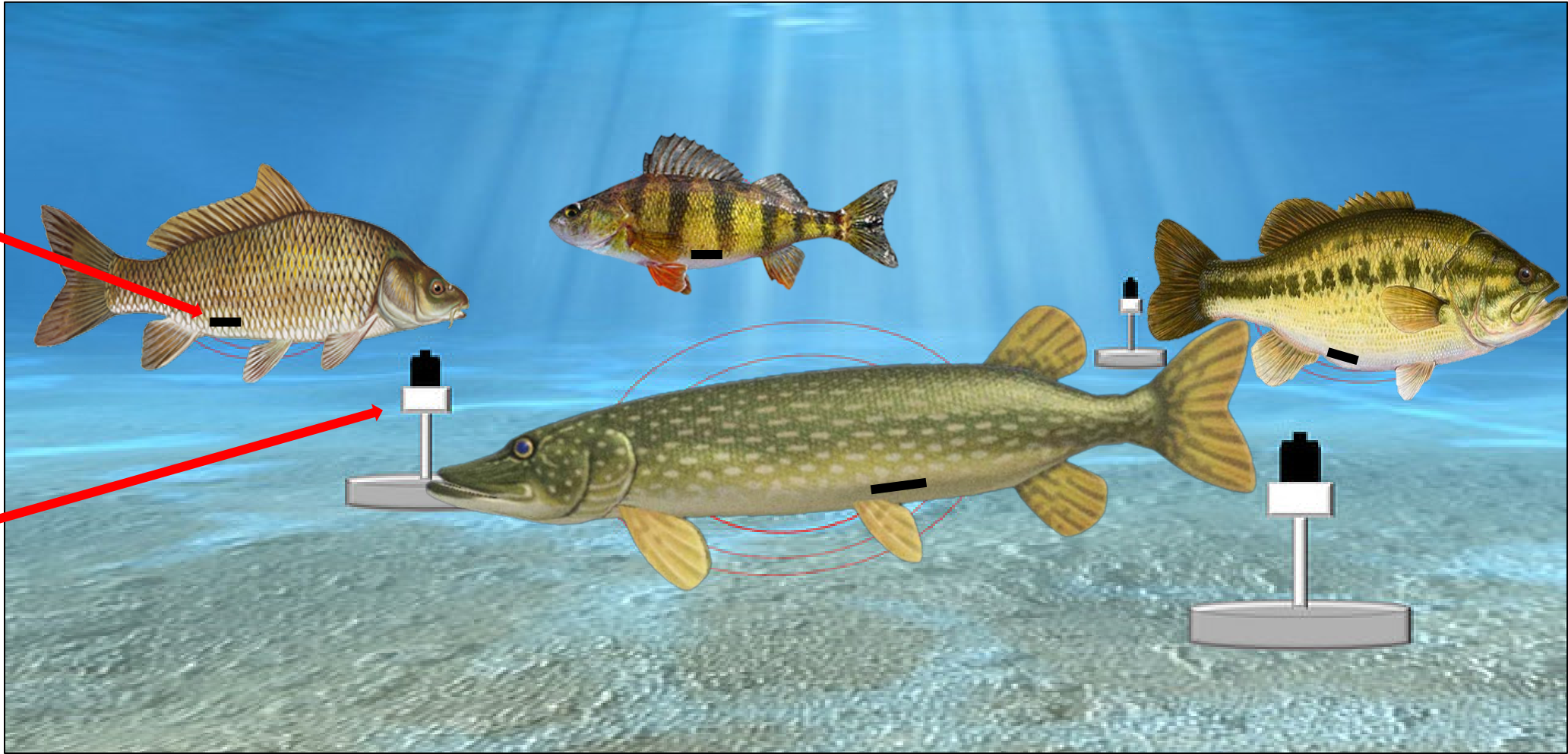
**Alter bathymetry**



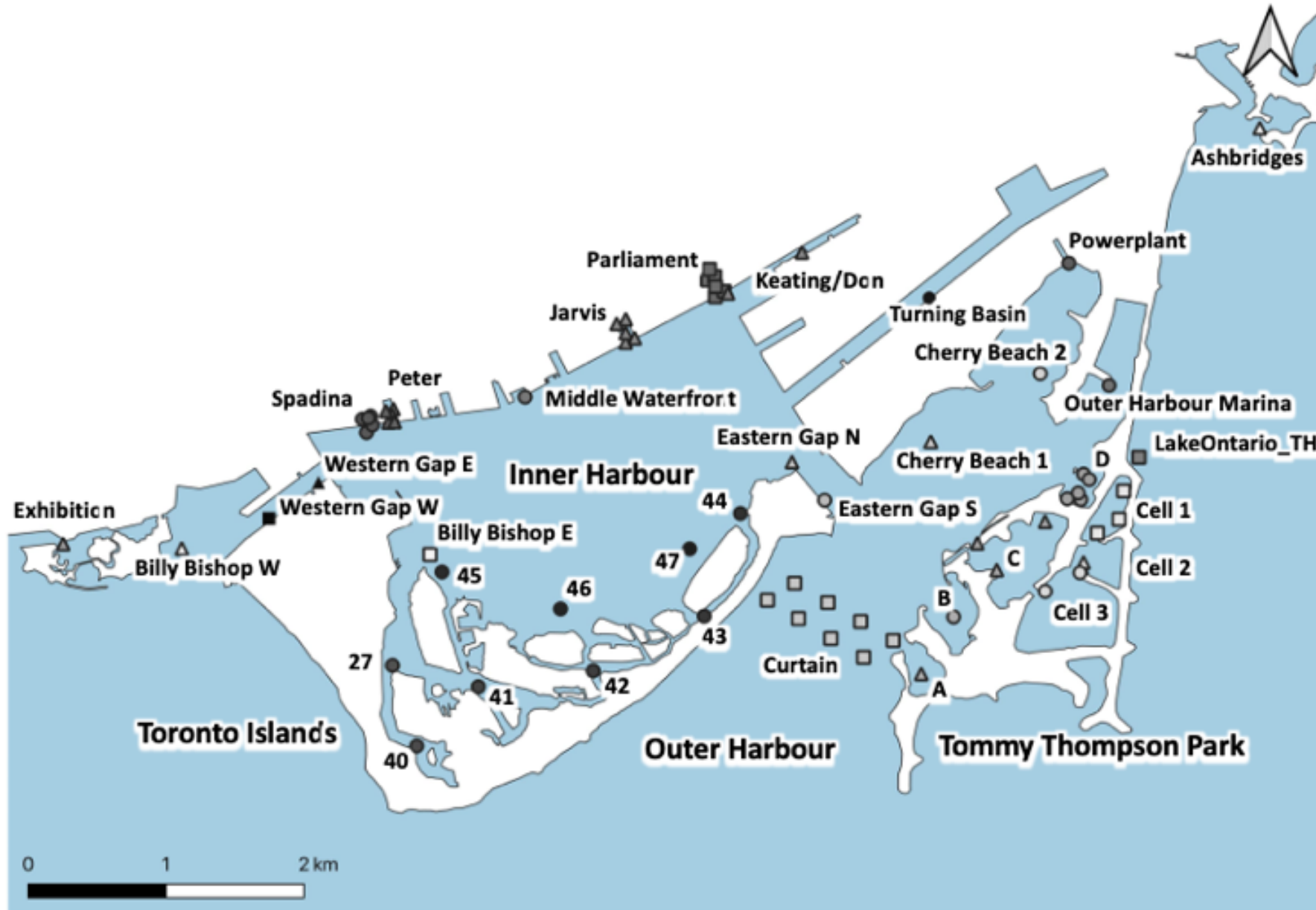






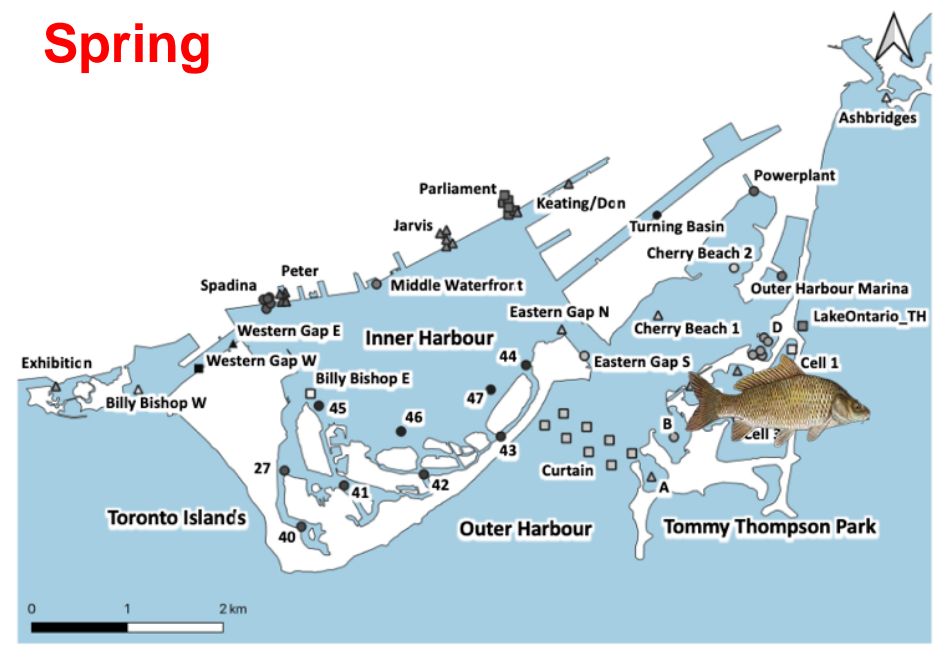






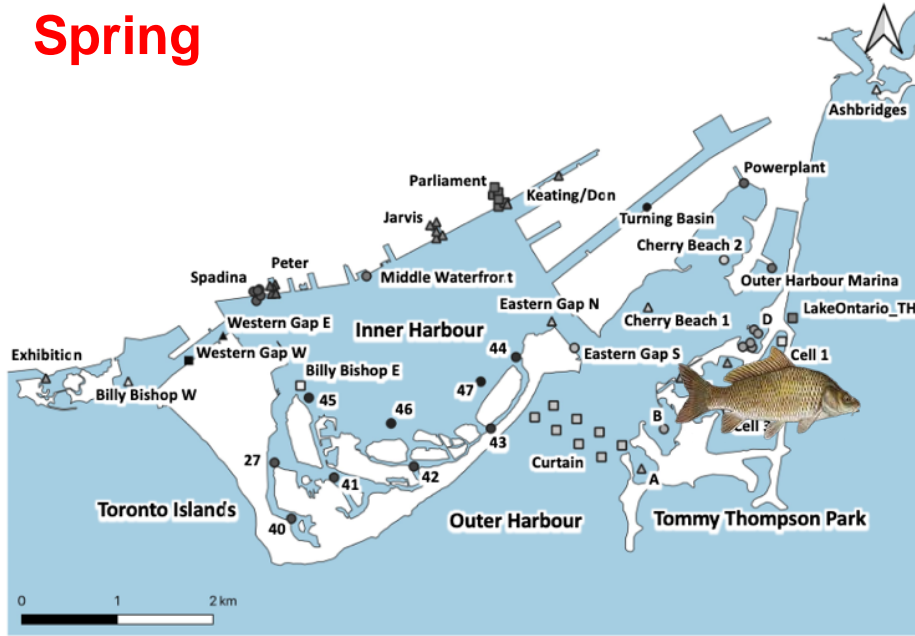


**Spring**

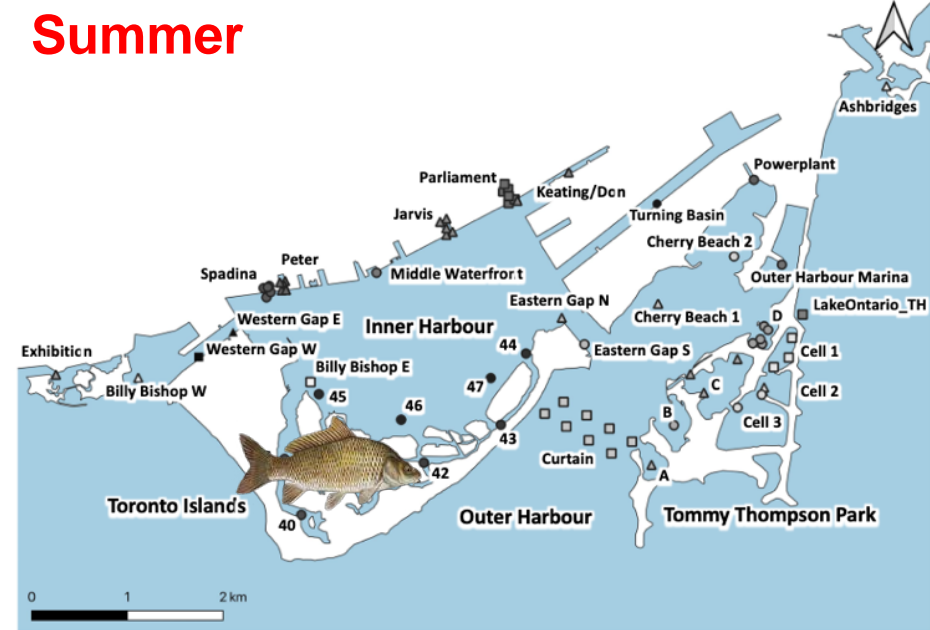




## Spring



## Summer



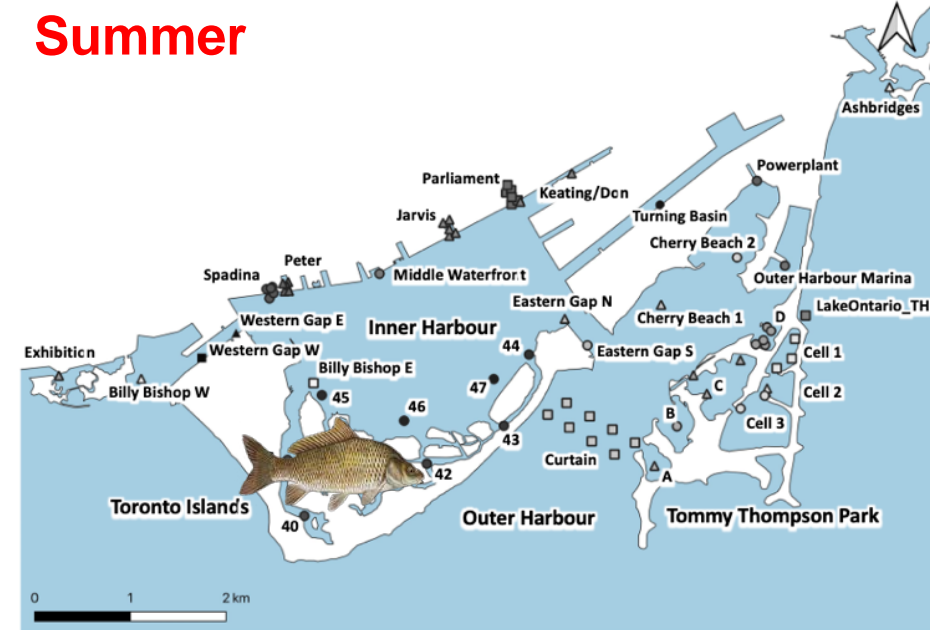




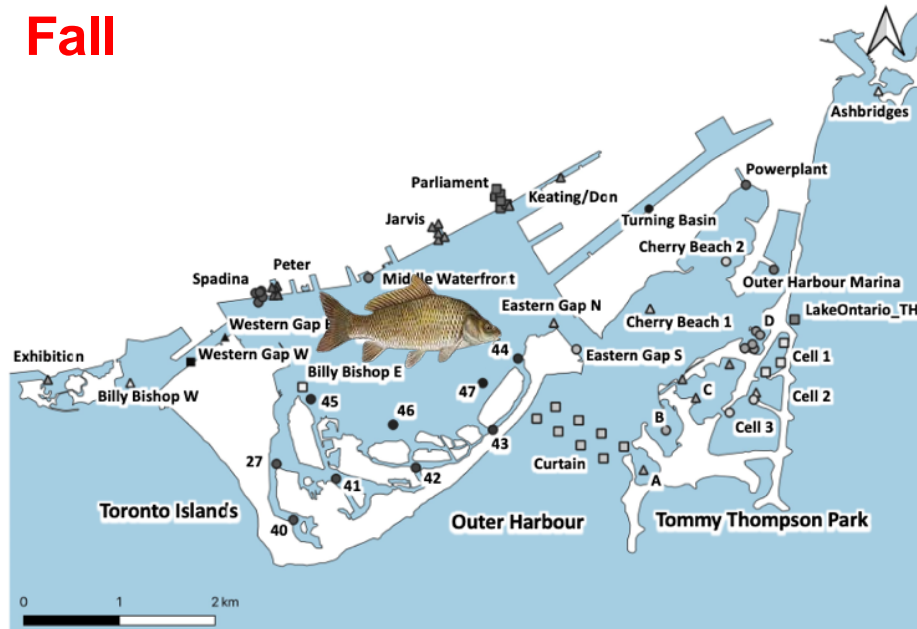
## Spring



## Summer

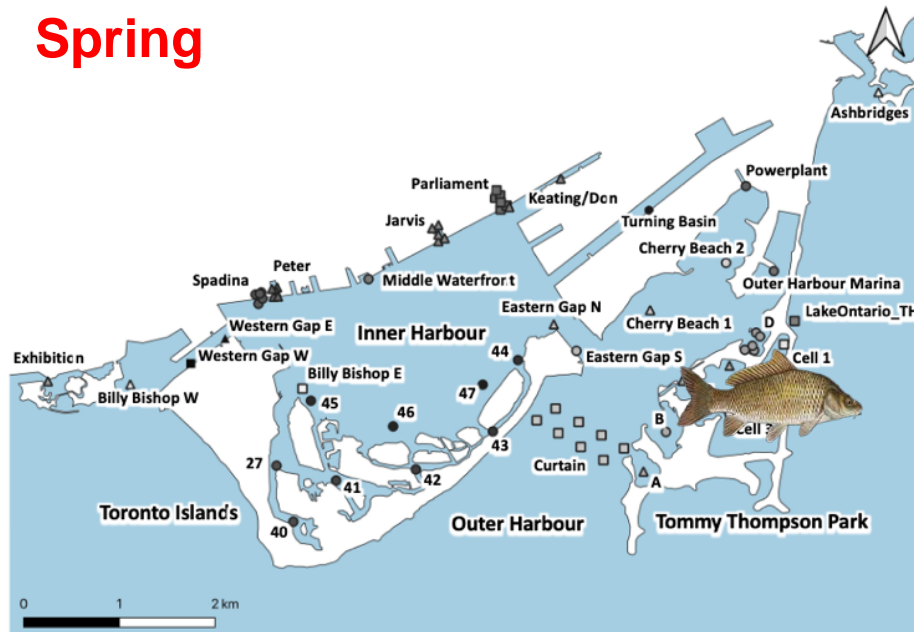


## Fall

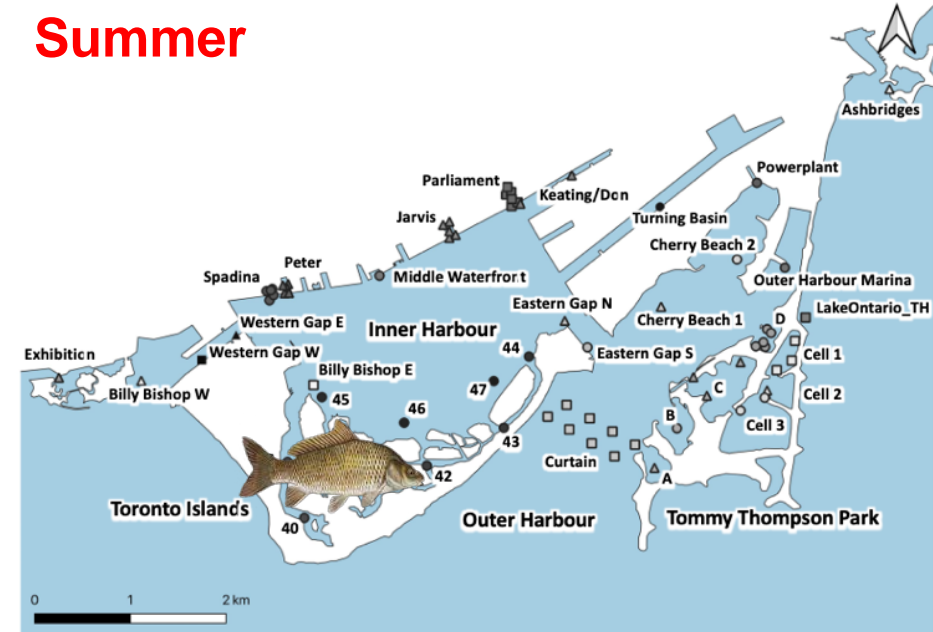




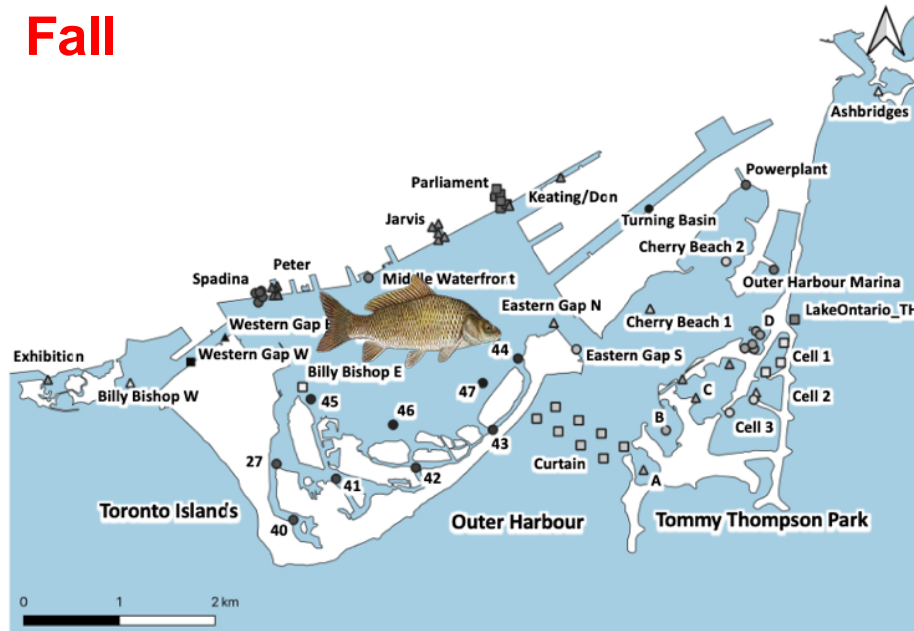
## Spring



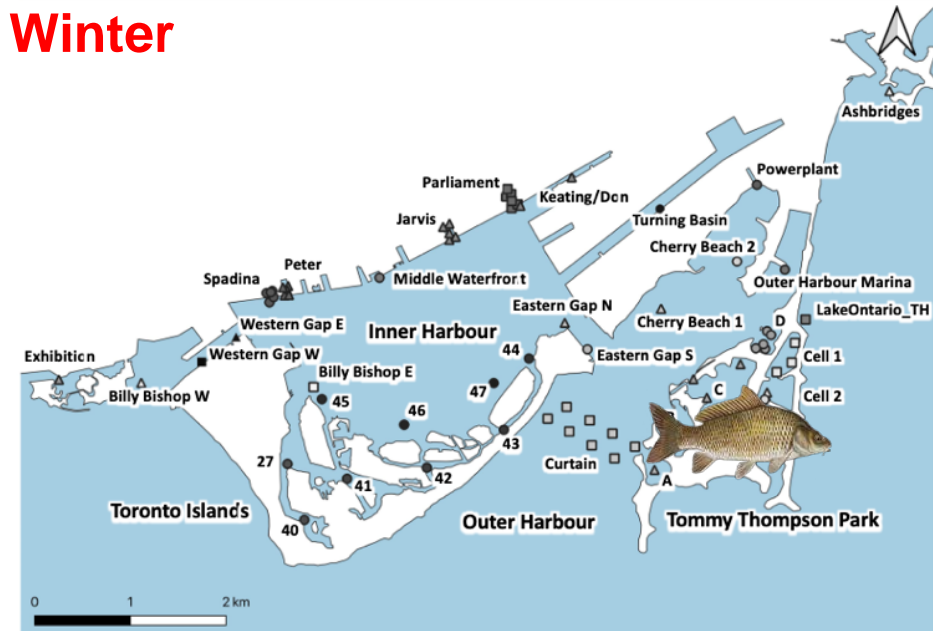
## Summer



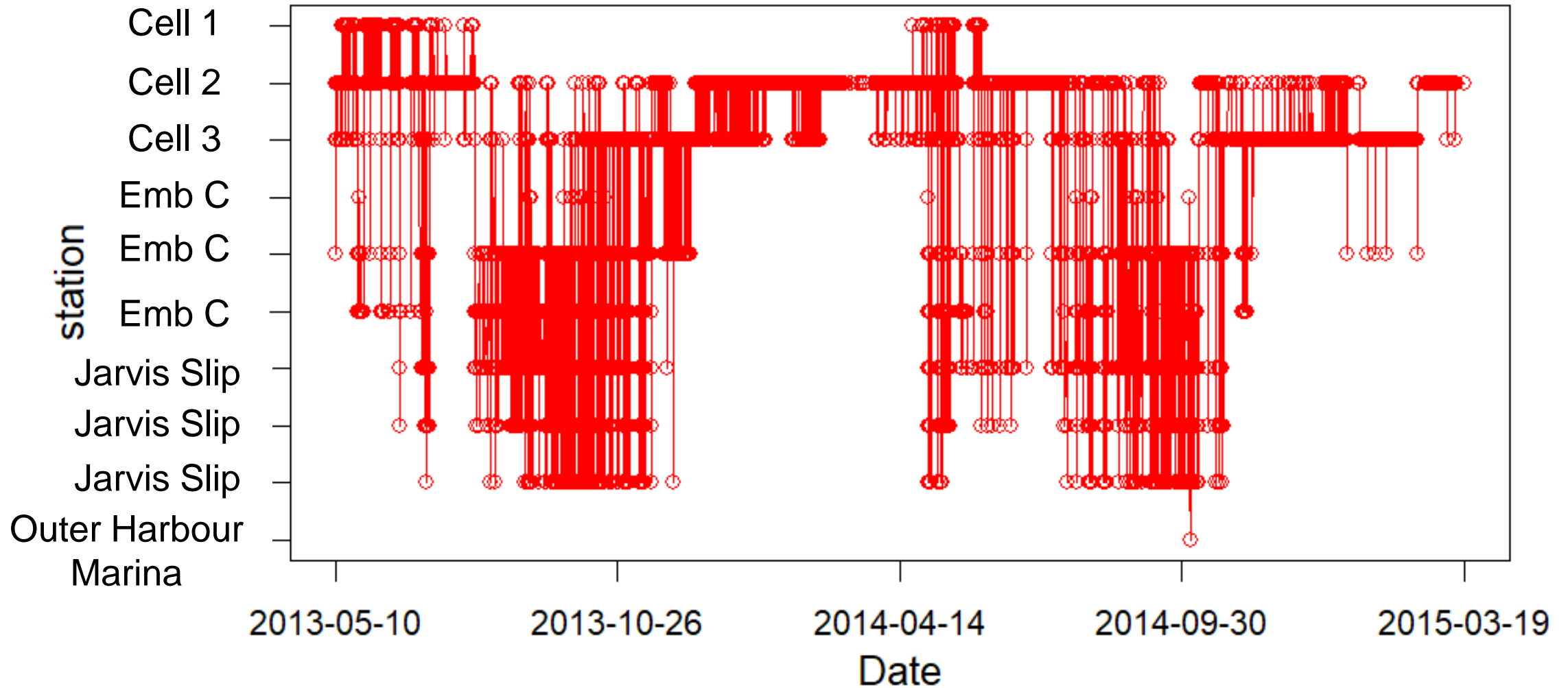
## Fall



## Winter

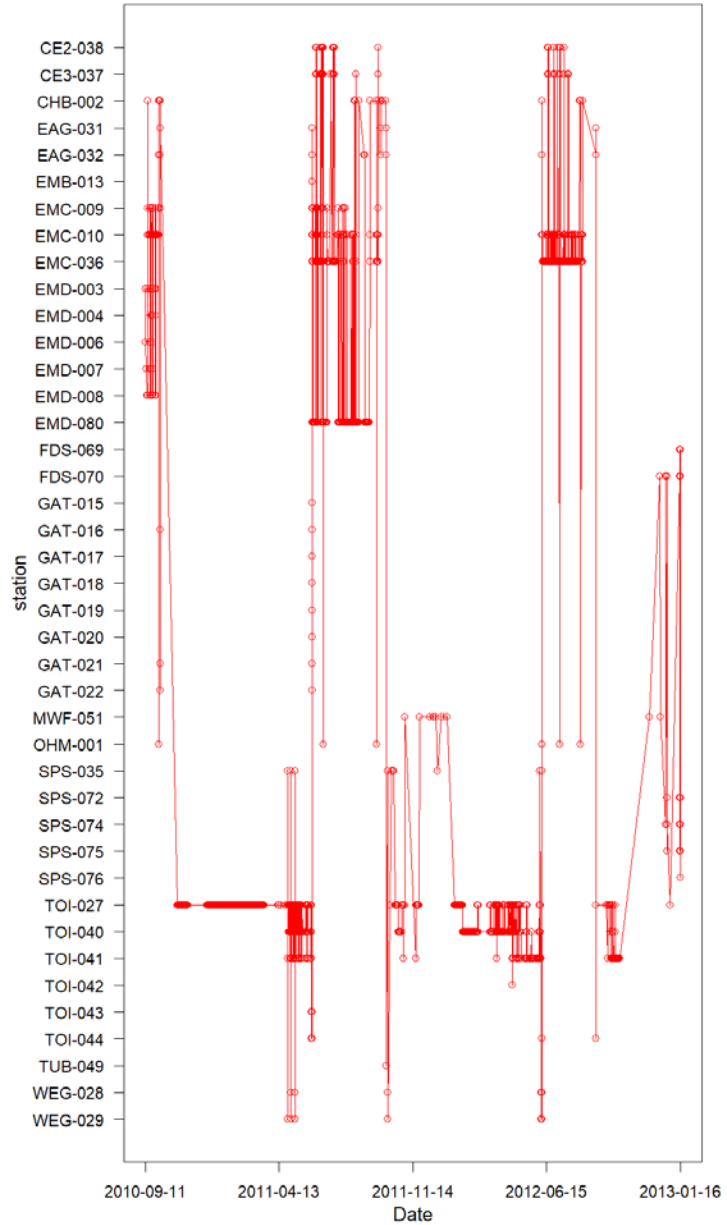


### Carp 583 -





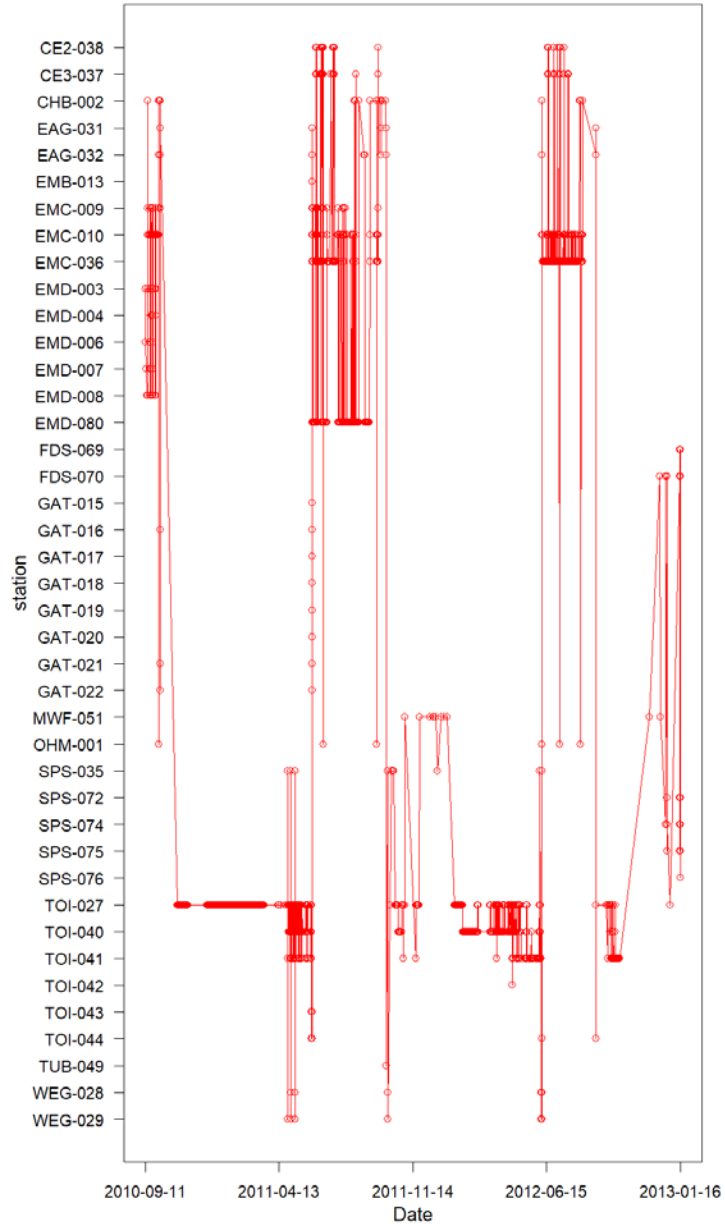
Bass 460 -



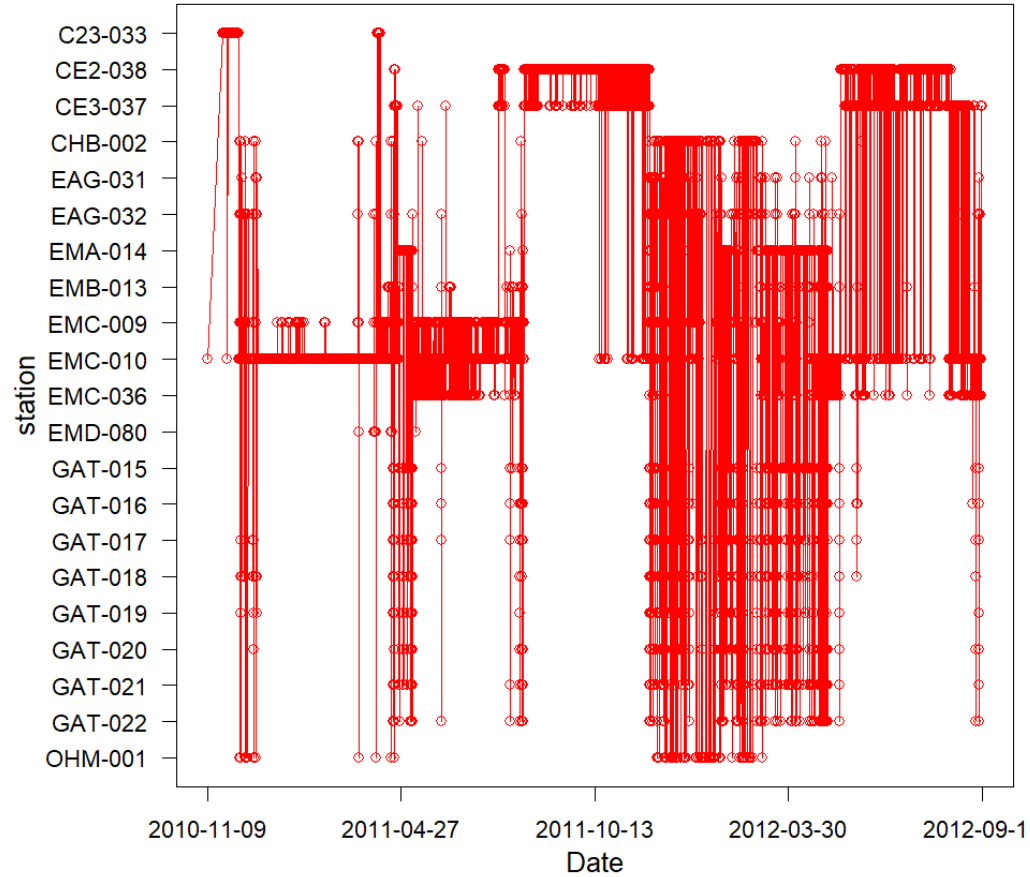




**Bass 460 -**

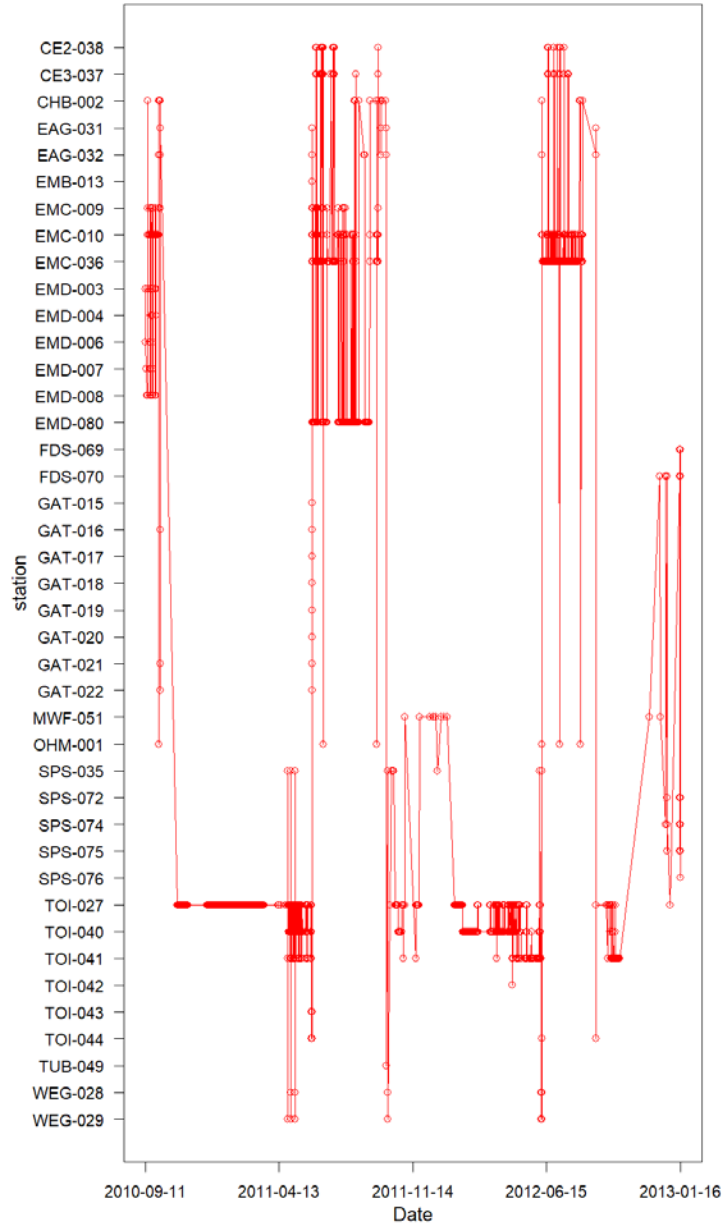


**Pike 614 -**

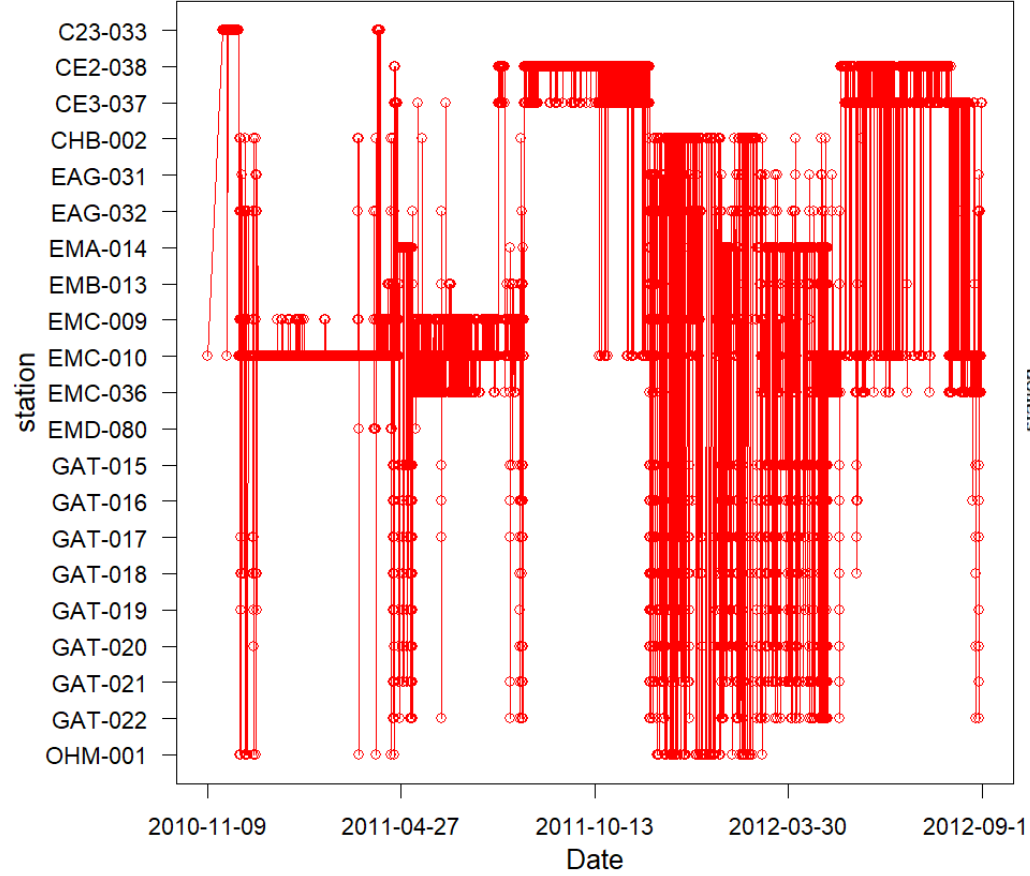




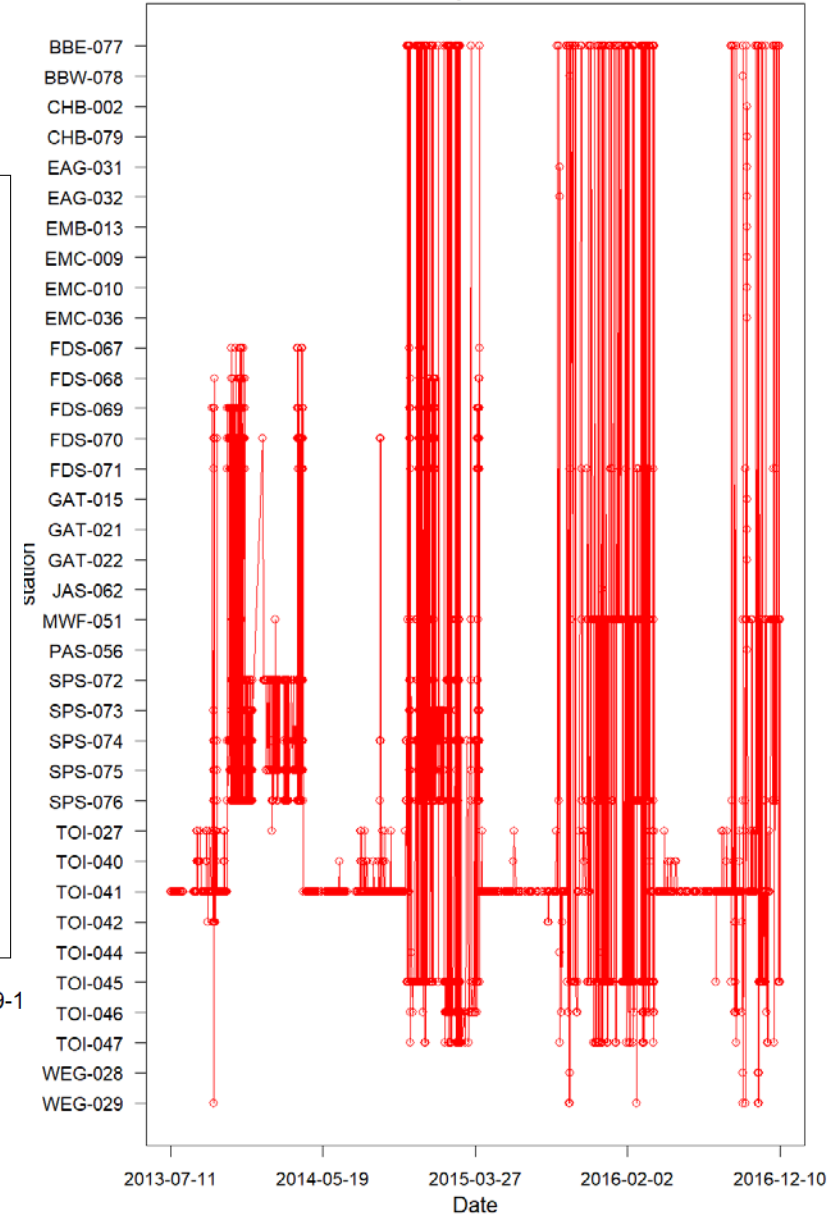
**Bass 460 -**



**Pike 614 -**

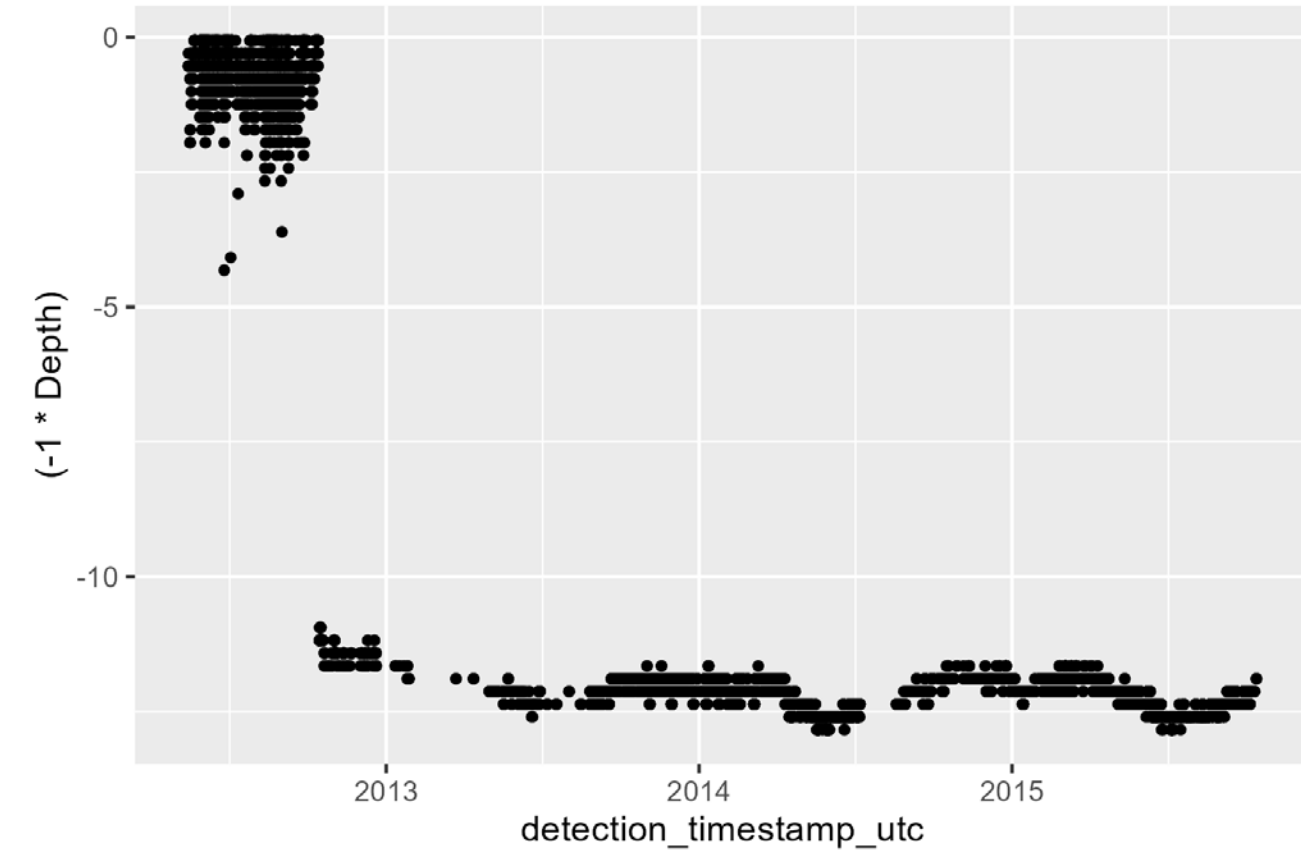


**Carp 547 -**





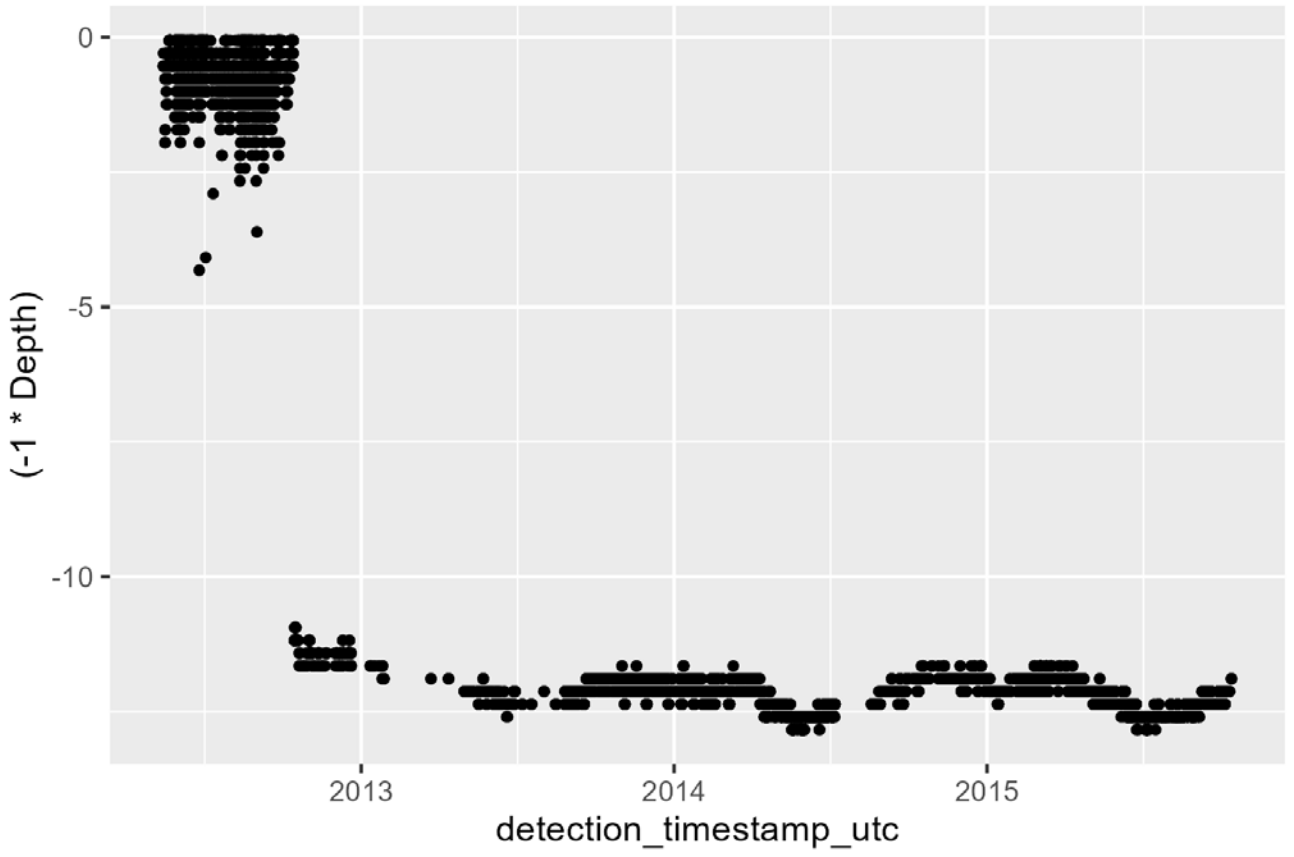
Bass 535-14489



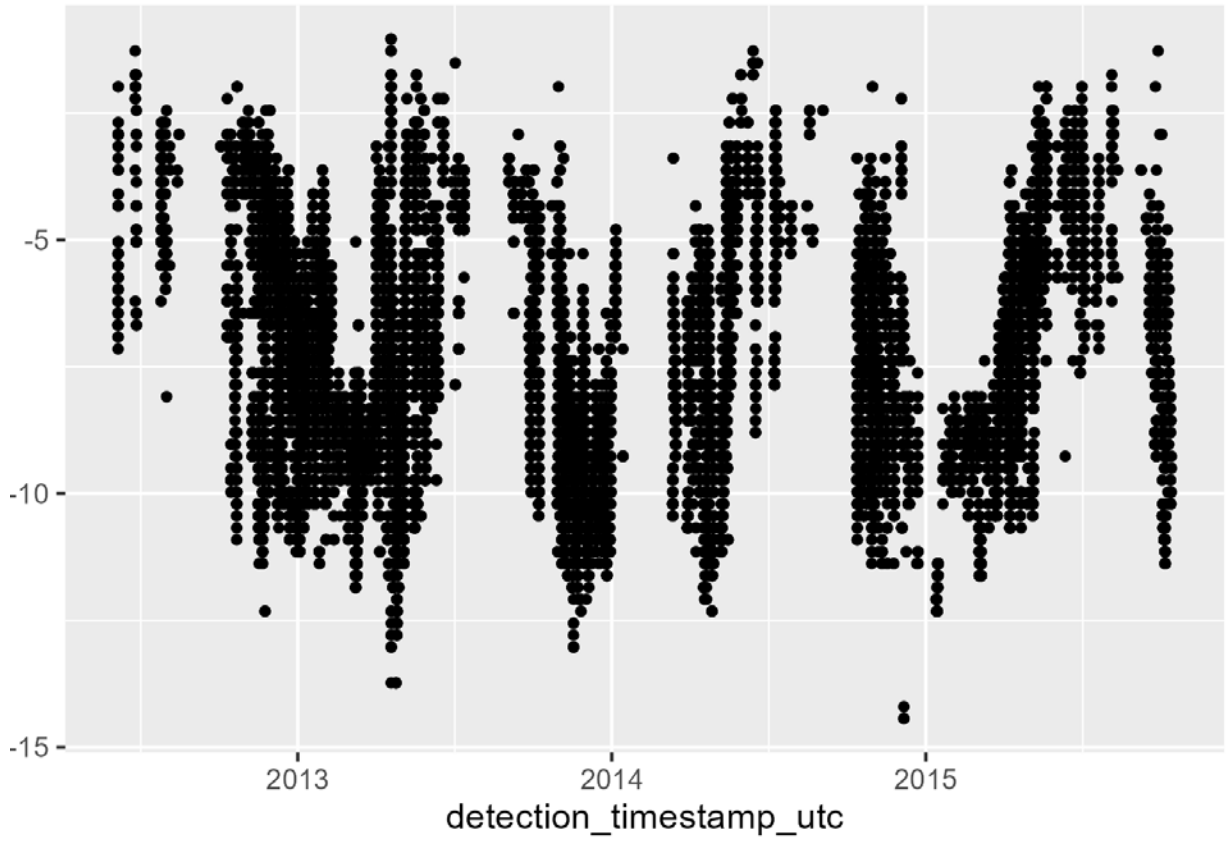




Bass 535-14489



Pike 624-14461





## Native



Northern Pike



Largemouth Bass

## Invasive



Common Carp





★ Control Site

★ Restoration Site





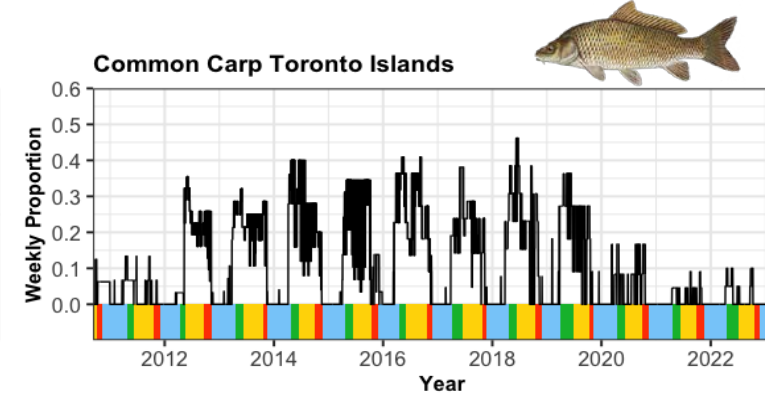
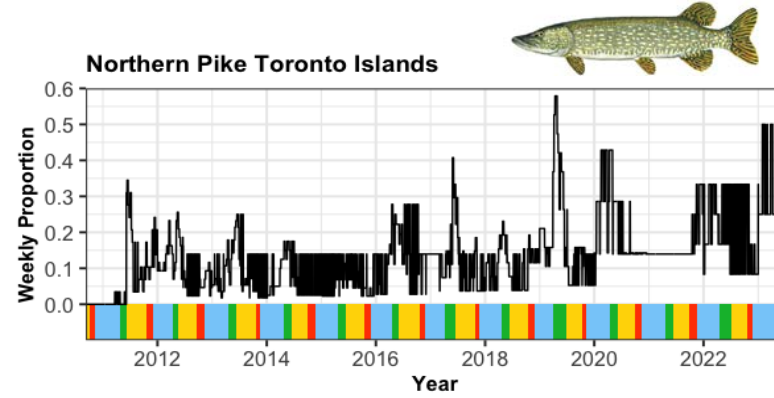
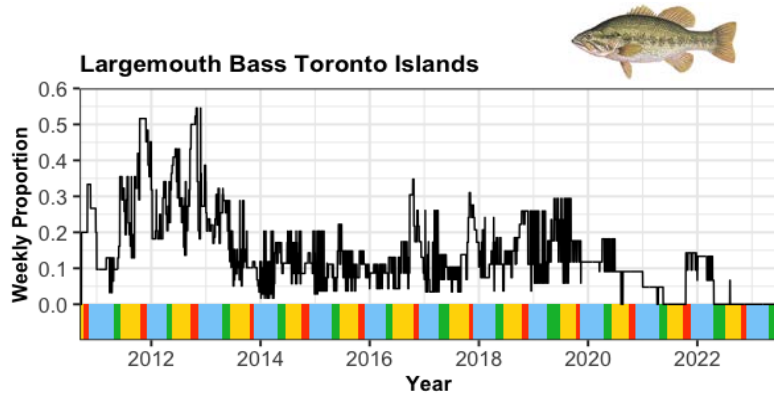


**Cell 2**

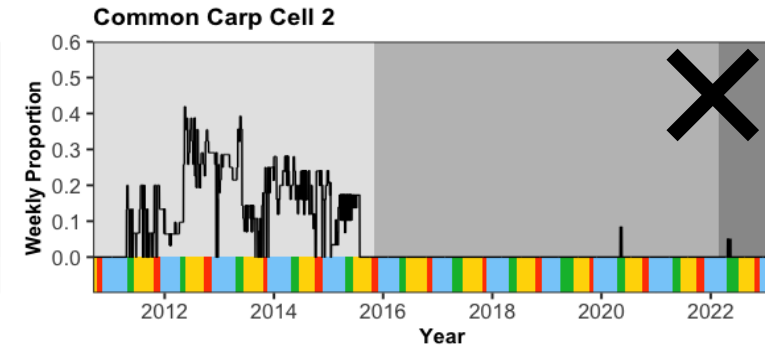
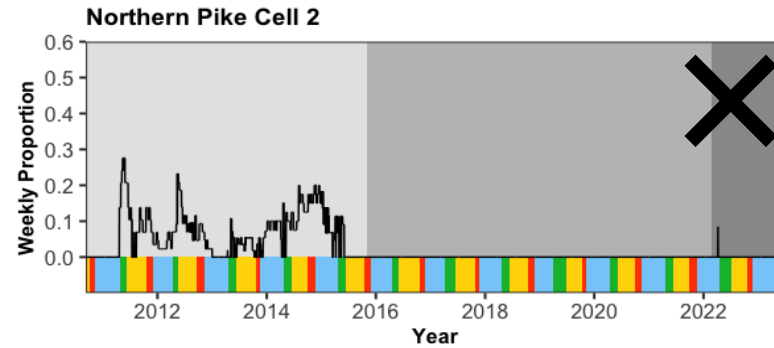
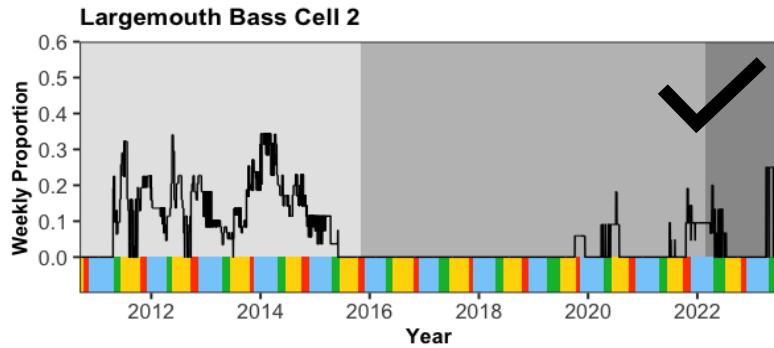
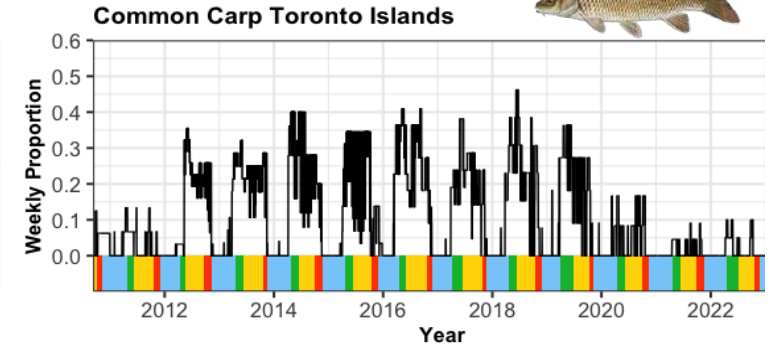
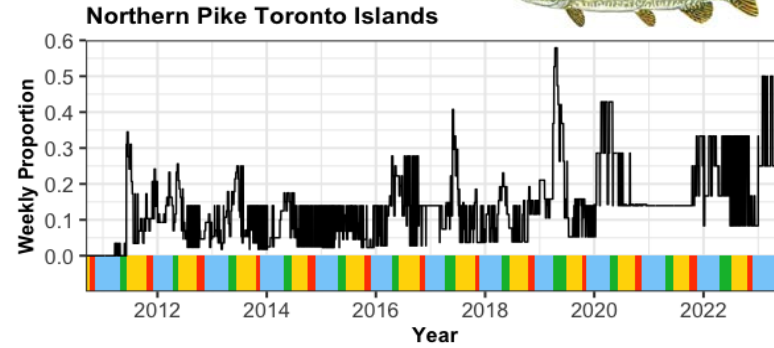
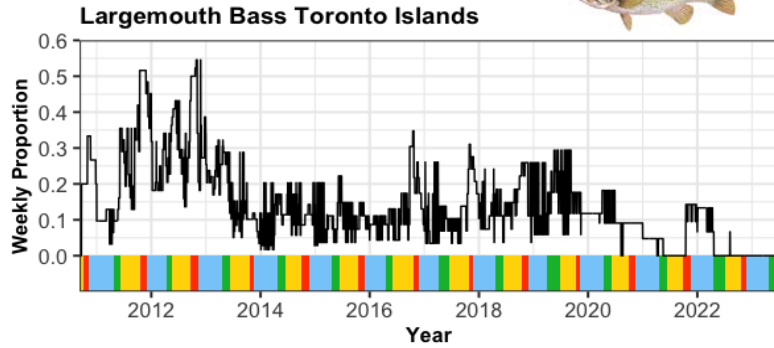
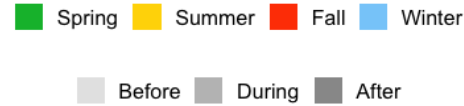


**Embayment D**





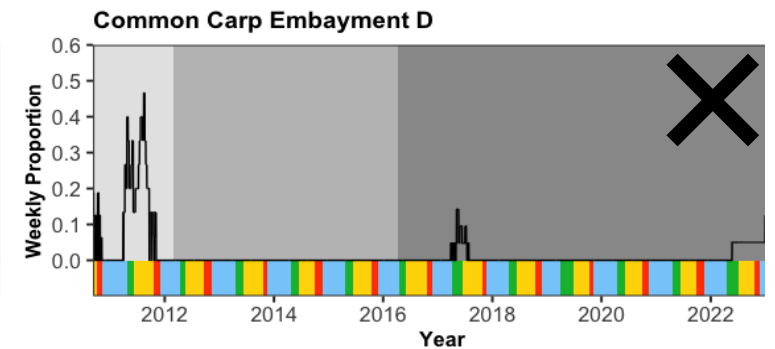
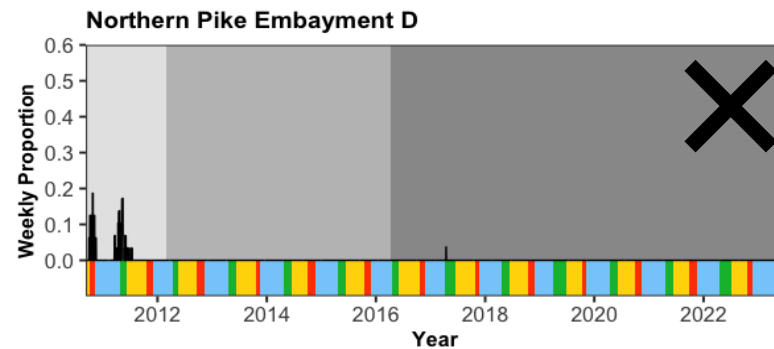
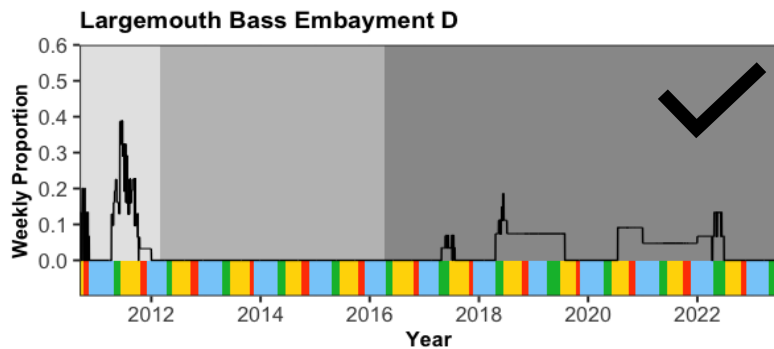
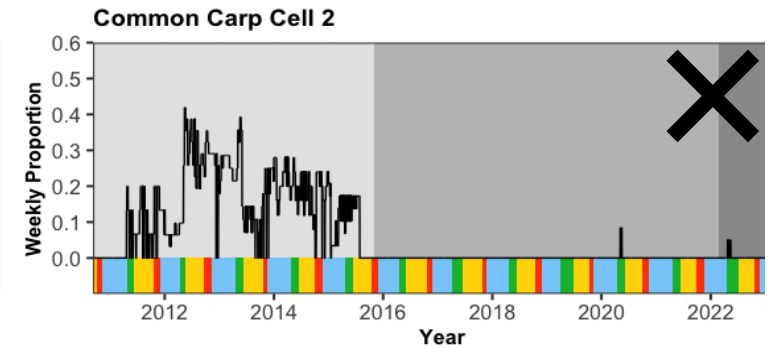
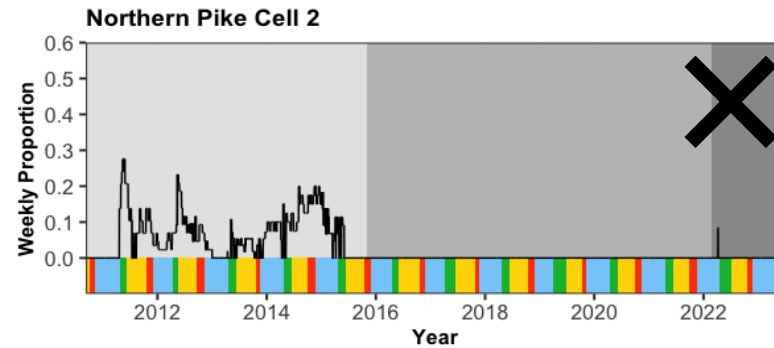
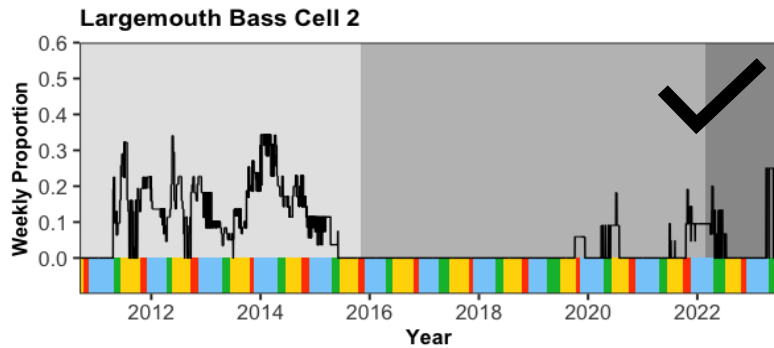
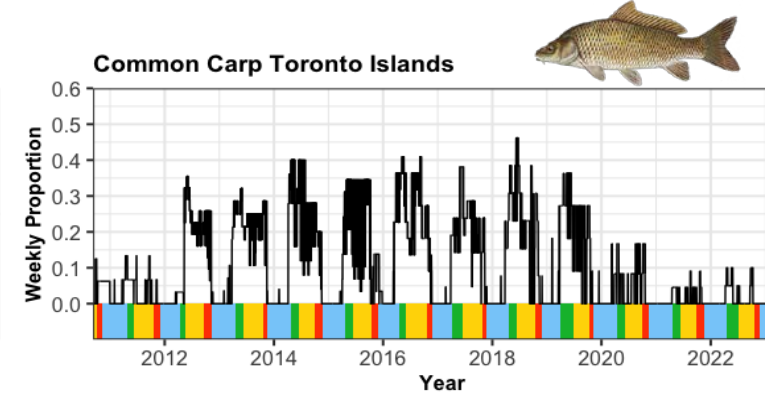
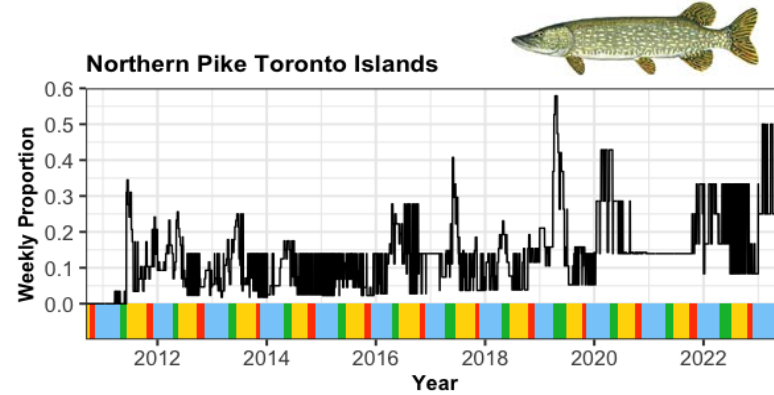
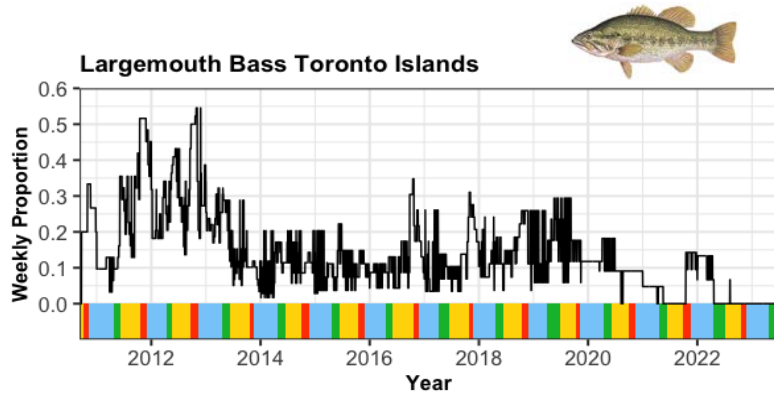






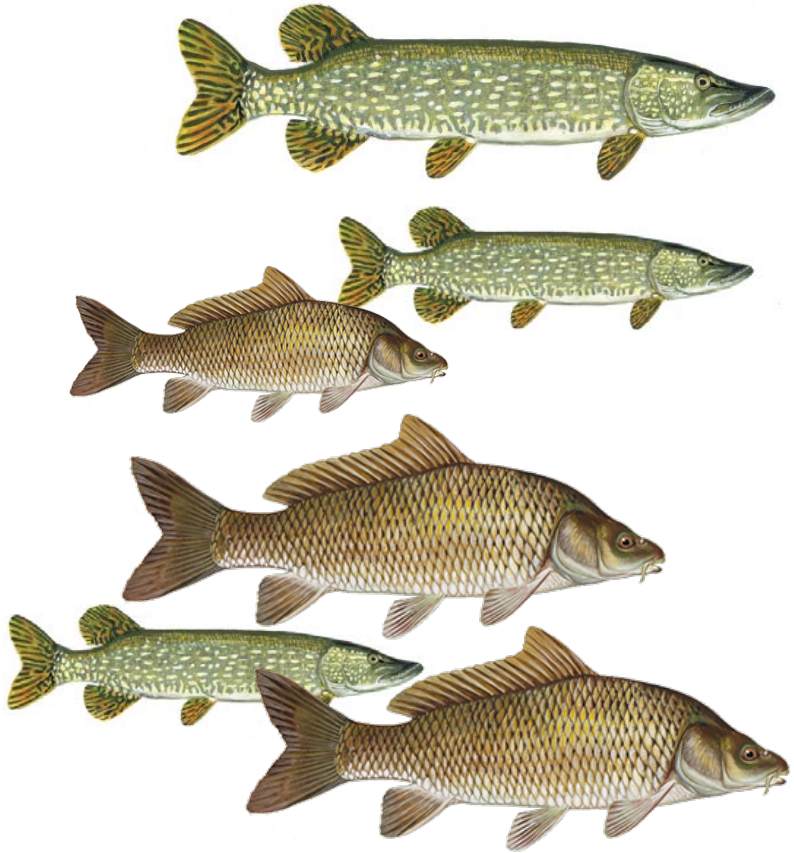
■ Spring 
 ■ Summer 
 ■ Fall 
 ■ Winter

■ Before 
 ■ During 
 ■ After

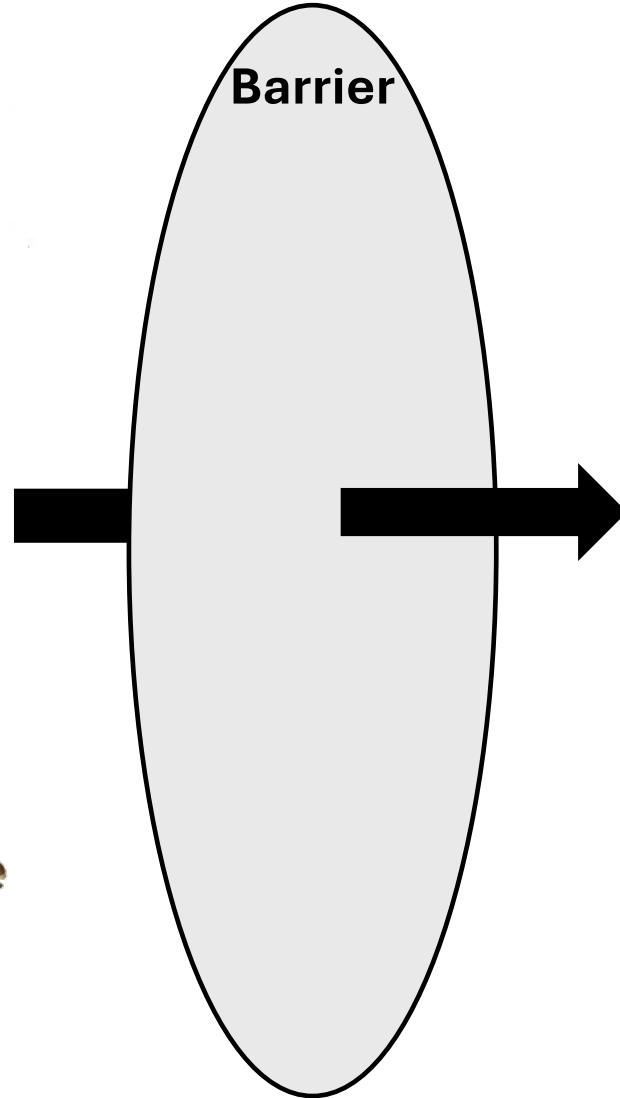




## Current Habitat



Barrier



## Restored Habitat



**5-14°C**



**17-28°C**









- Issues with hydrologic connectivity
  - Floods & droughts
  - Beaver dams!
- Uneven sampling periods → less after data
- Challenges of telemetry in urban environments
  - Angling?! Subway pike?!





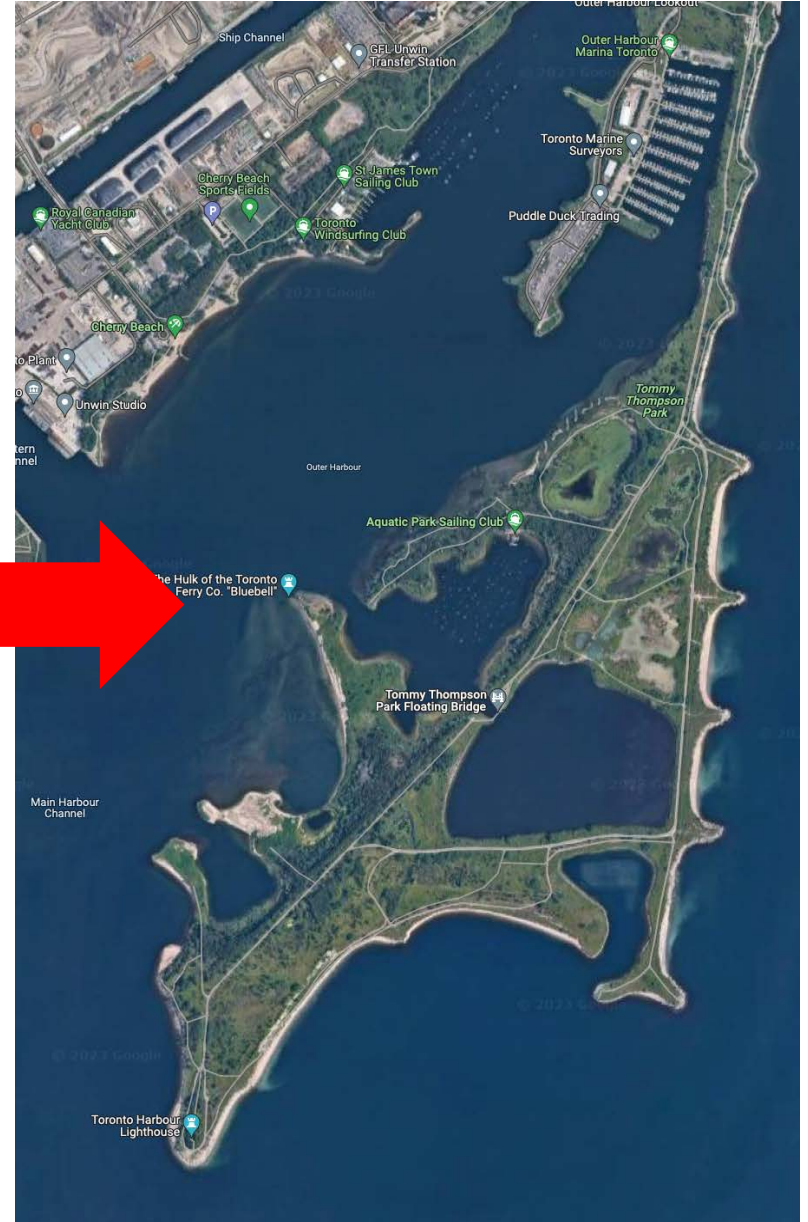
**Impaired**



Loss of fish and wildlife habitat



Degradation of fish and wildlife populations





- Ecological restoration is complicated!!! Response was species specific
- Good: habitat use by largemouth bass, in spring → spawning!
- Good: barriers decreased access and habitat use of common carp
- Bad: barriers likely blocked northern pike → modify operation
- Evidence of lag times, need longer term monitoring









**Fish Ecology & Conservation Physiology  
Laboratory at Carleton University**

THANK  
YOU



 **@morganpiczak**  
**morganpiczak@gmail.com**

QUESTIONS?

