



# Nearshore Waters of the Great Lakes

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# Great Lakes in North America





# Nearshore Water of the Great Lakes





# Spatial Extent of the Niagara Plume





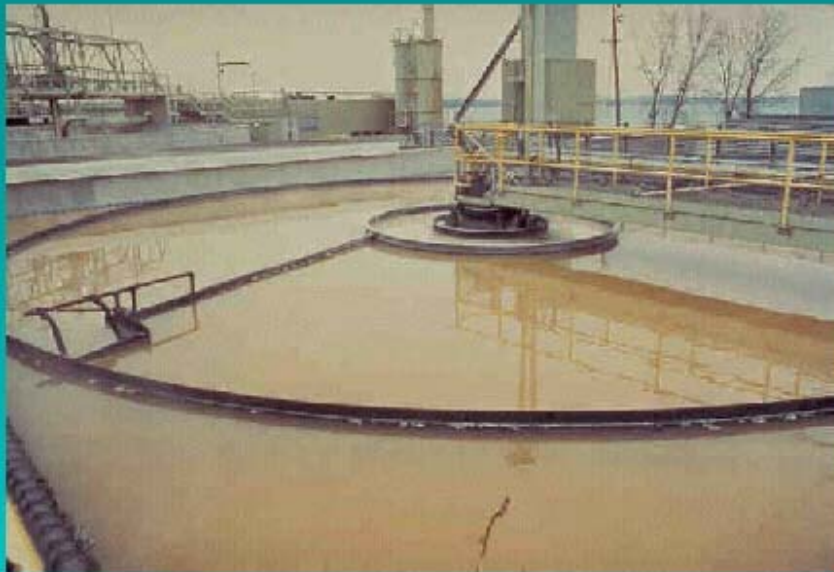
# Nearshore Waters

- Sewage
- Exotic Species
- Toxic Chemicals
- Fish Habitat



# Sewage

- Dissolved oxygen depletion of bottom waters
- Water clarity/algae blooms







# Exotic Species

## ■ Status of exotic species





# Toxic Chemicals

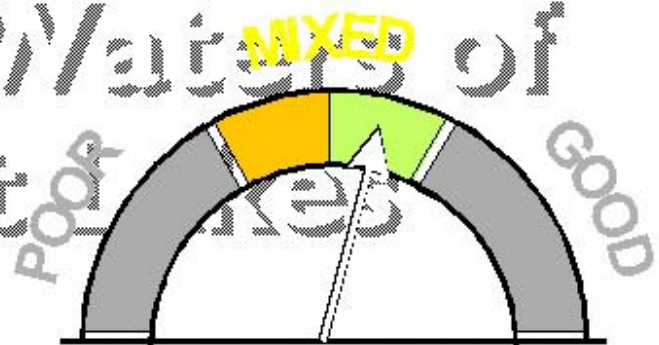
- Levels of persistent toxic chemicals
- Concentrations of persistent toxic substances in biota





# Fish Habitat

Nearshore Waters of the Great Lakes  
Status of native species and their habitats





# Sewage

Bacteria

Phosphorus

Health Threat  
Beach Closings

Too Much Algae =  
"Eutrophication"

Sewage Treatment Plant (STP)

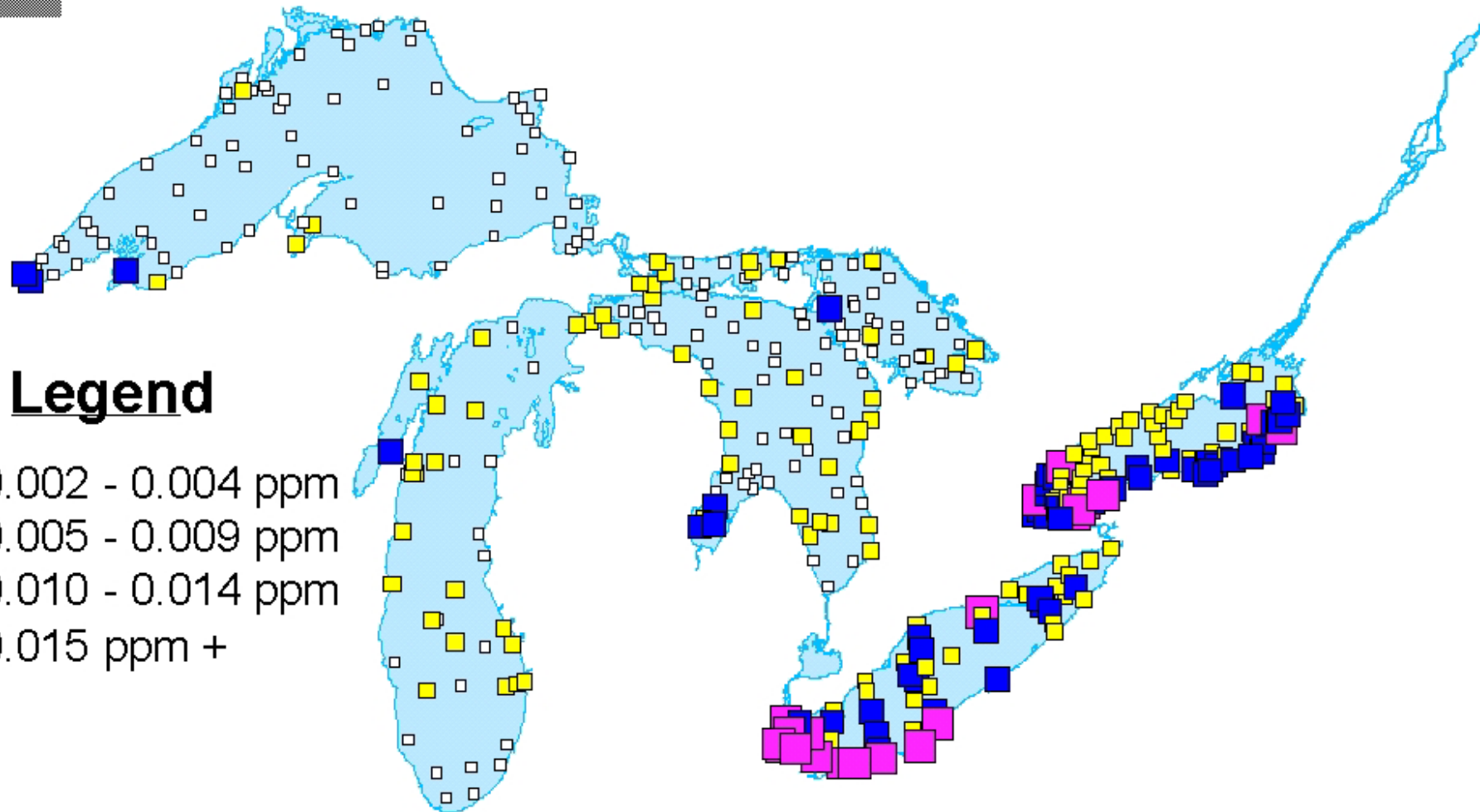
~~Bacteria~~

~~Phosphorus~~





# Total Phosphorus Concentrations in the Great Lakes

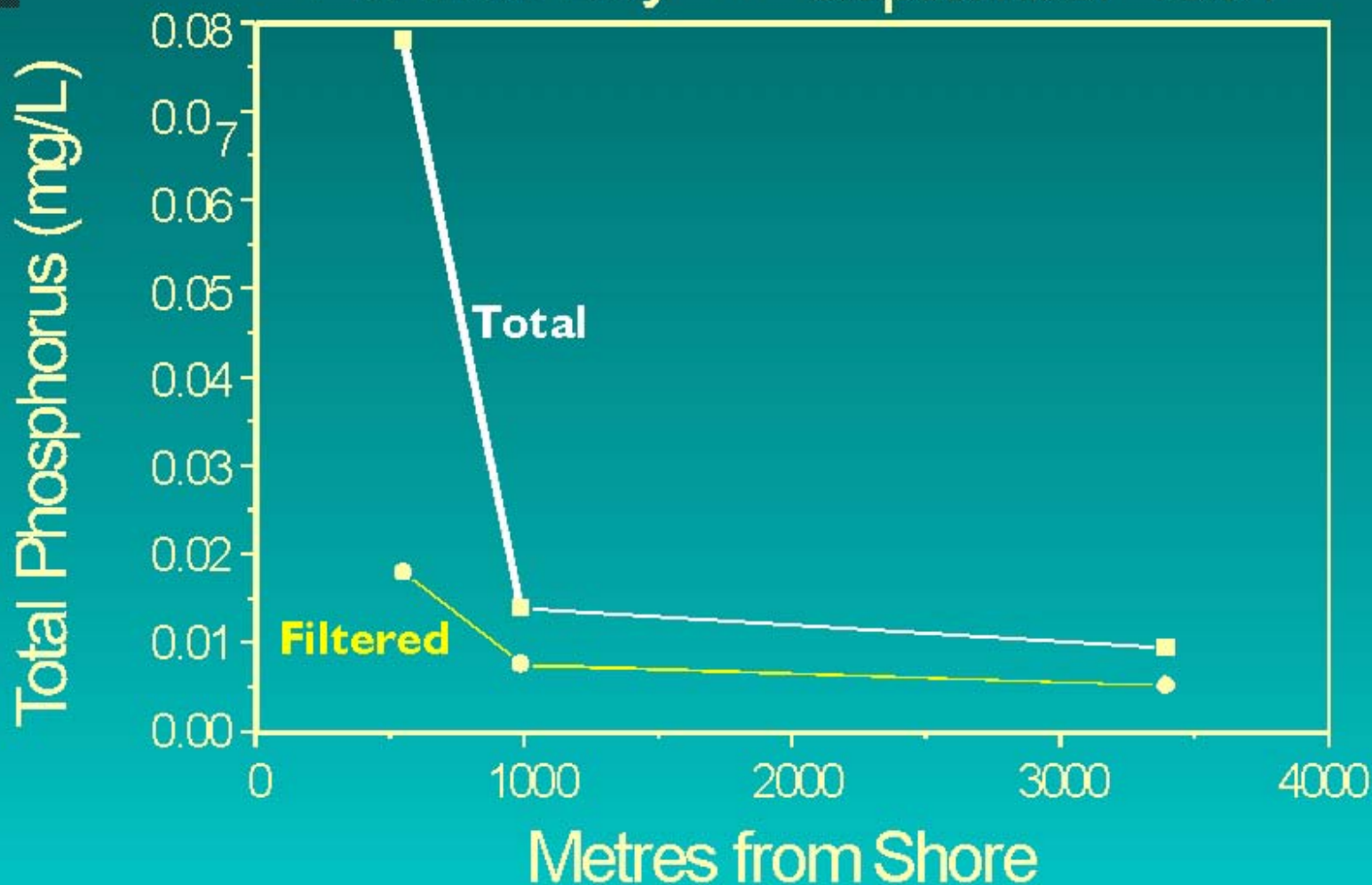






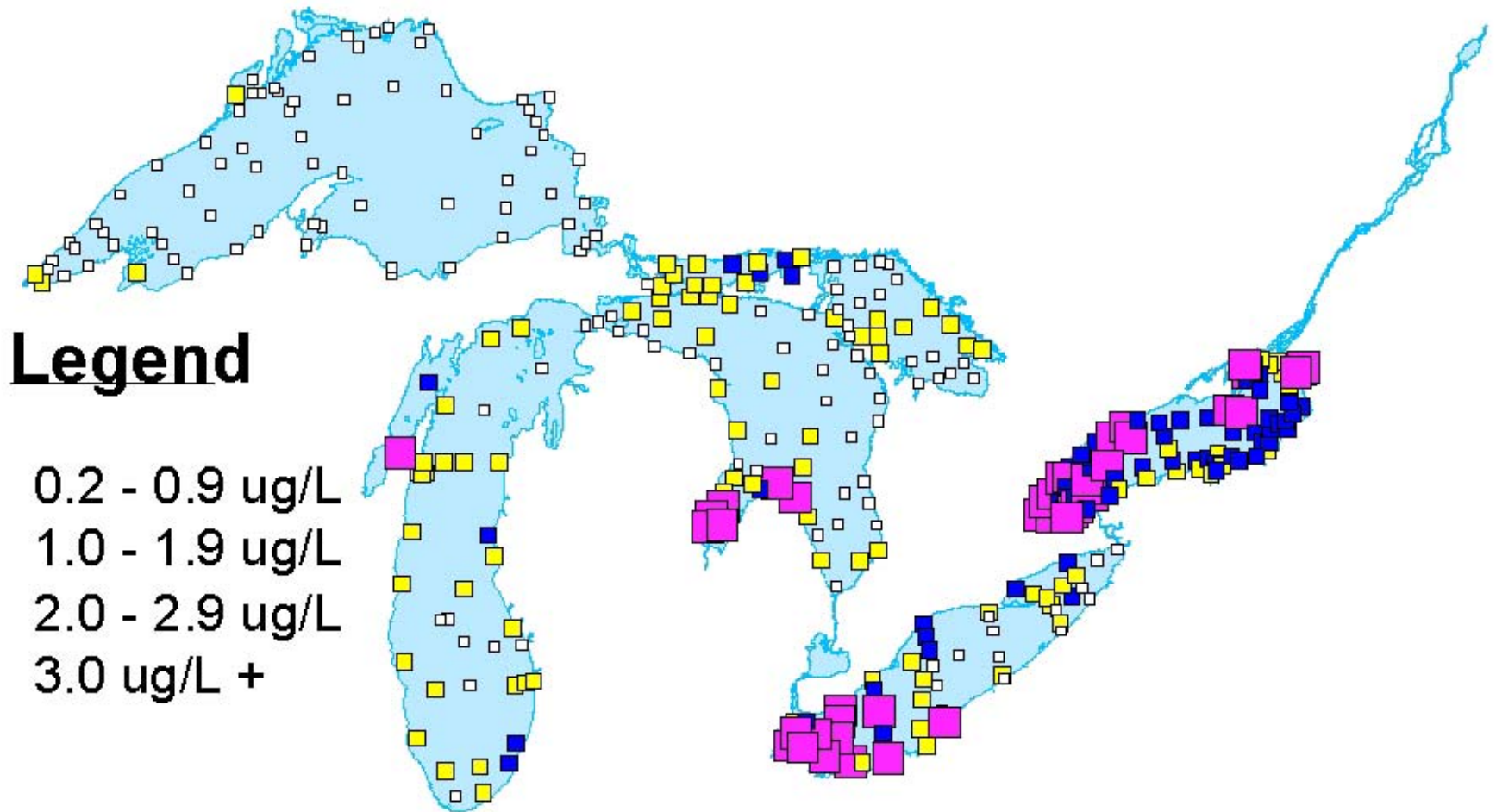
# Phosphorus Gradient in Lake Ontario

Humber Bay - September 1991



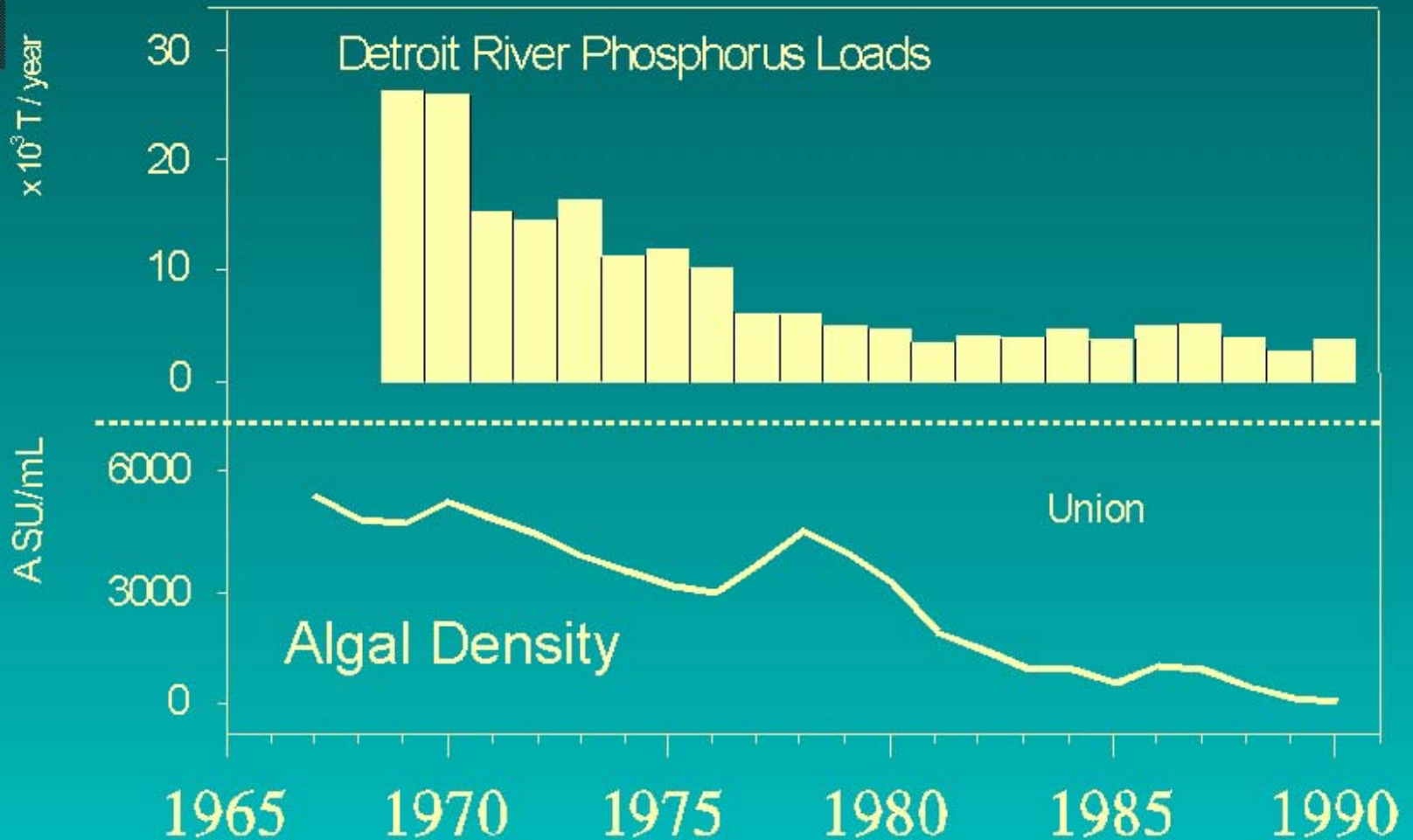


# Chlorophyll Concentrations in the Great Lakes





# Algal Response to Phosphorus Loading







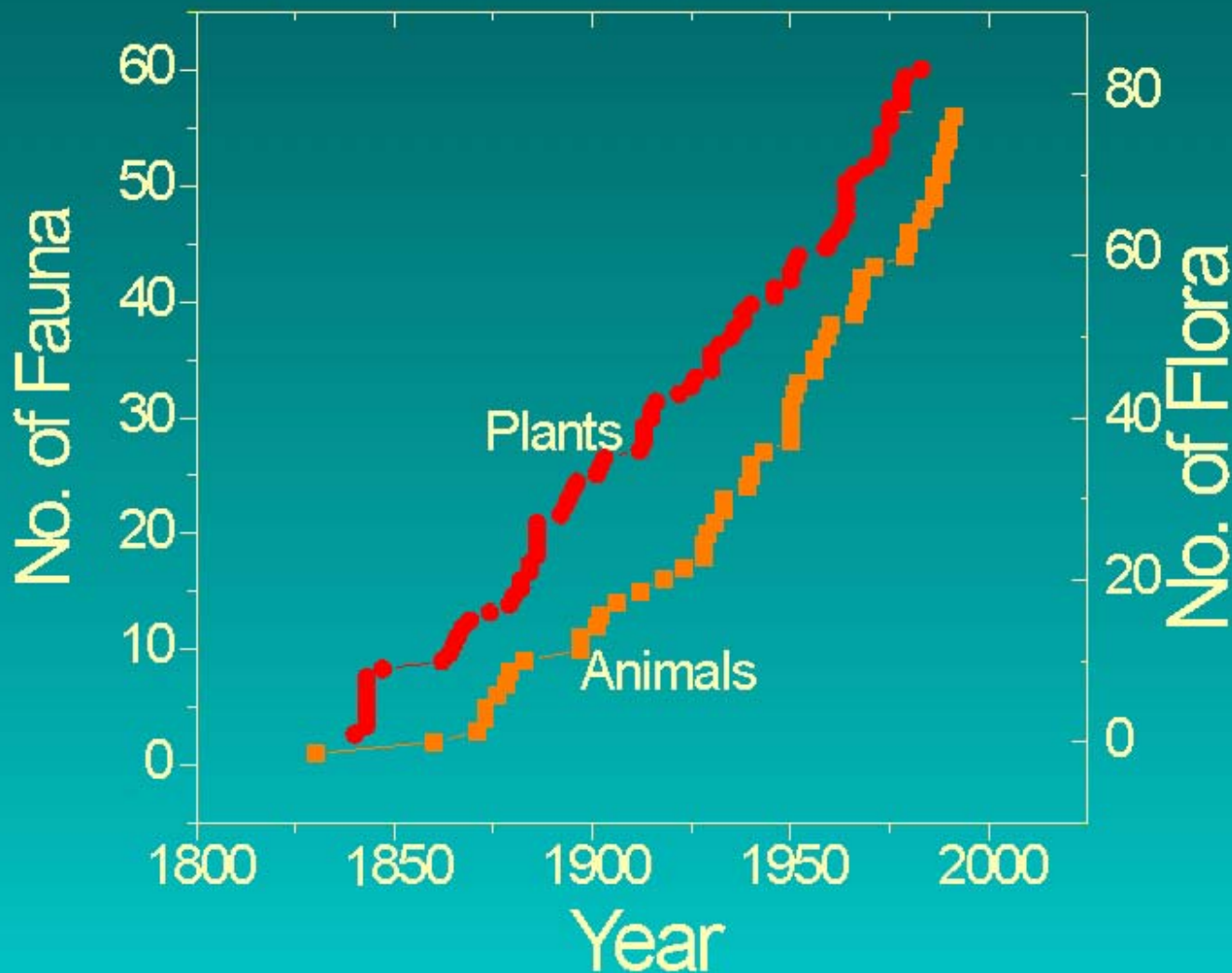
# Beach Closures

- **U.S. - 44% of counties report good conditions**
- **Can - 56% of beaches open**
  - ▶ **Lake Ontario: 21% open**





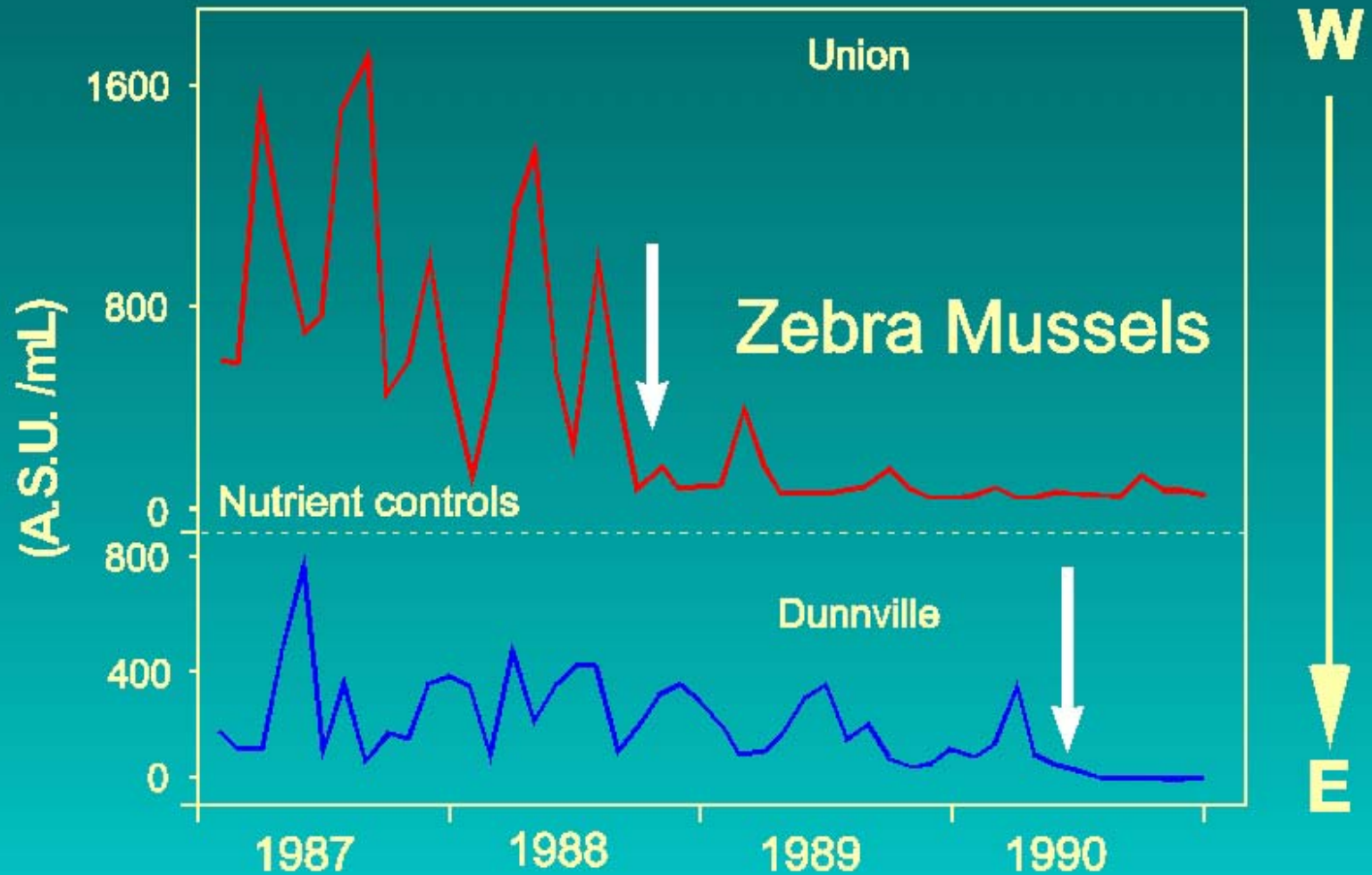
# Introduced Species in the Great Lakes





# Algal Density

## Lake Erie

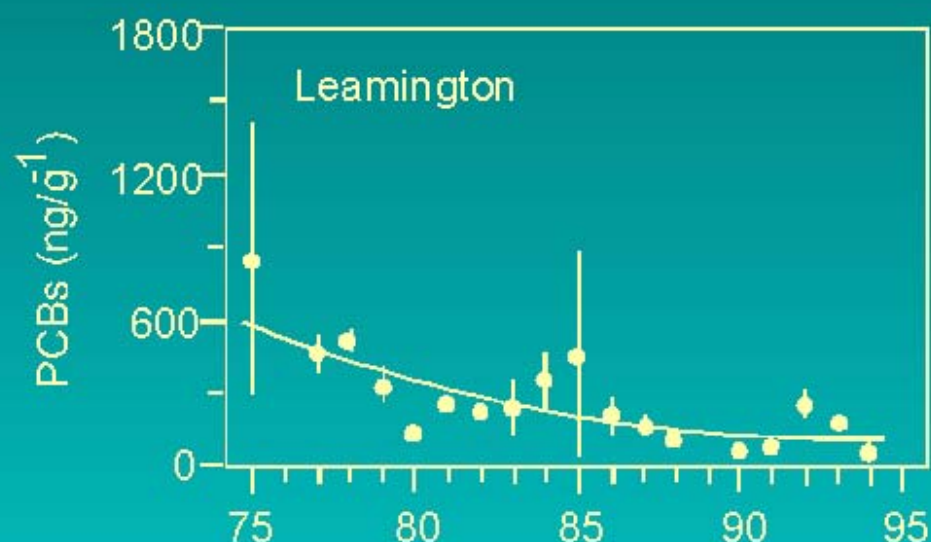
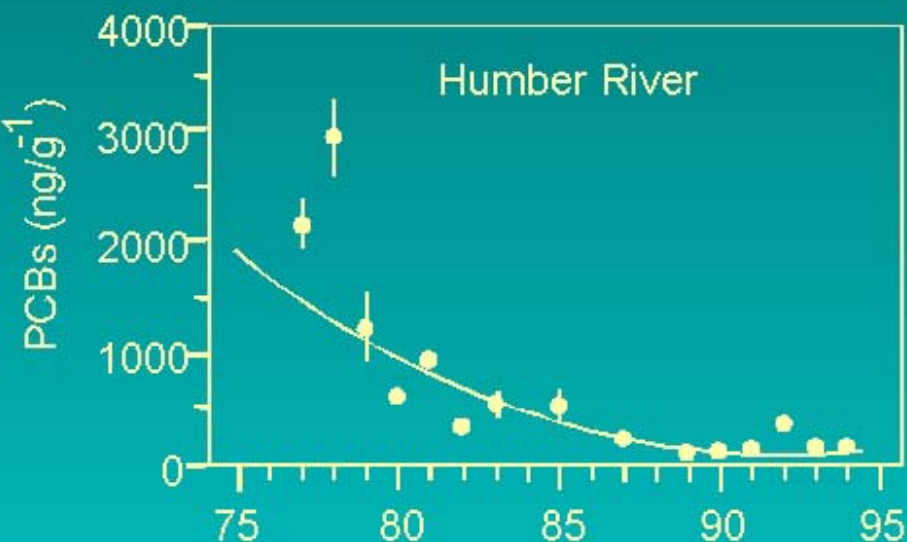






# Temporal Trends of Total PCB Concentrations

## Spottail Shiners (Minnows)





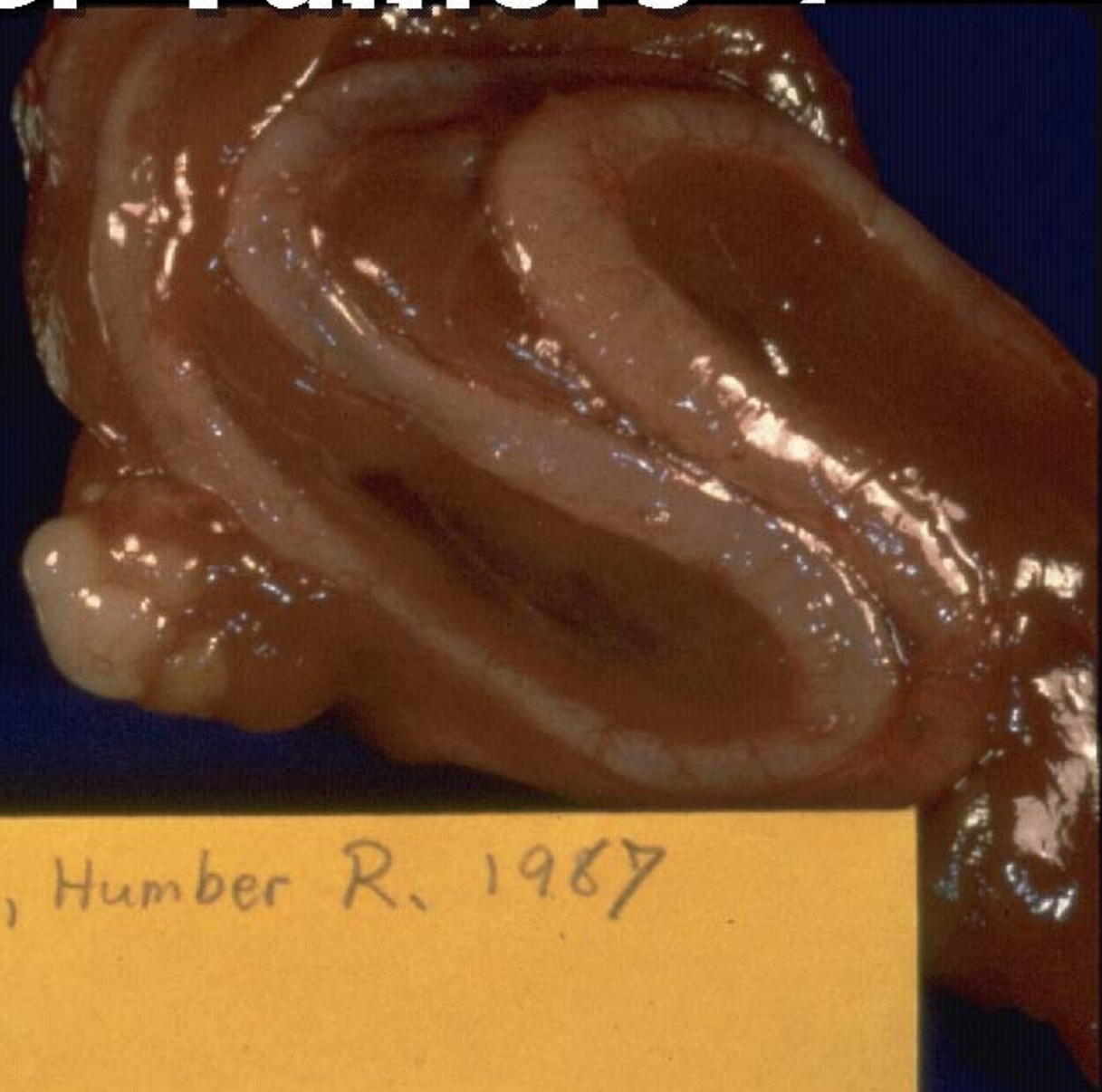
# Human Health

- **United States and Canada monitor contaminants in sport fish**
- **Consumption advisories are issued for each lake**





# Liver Tumors



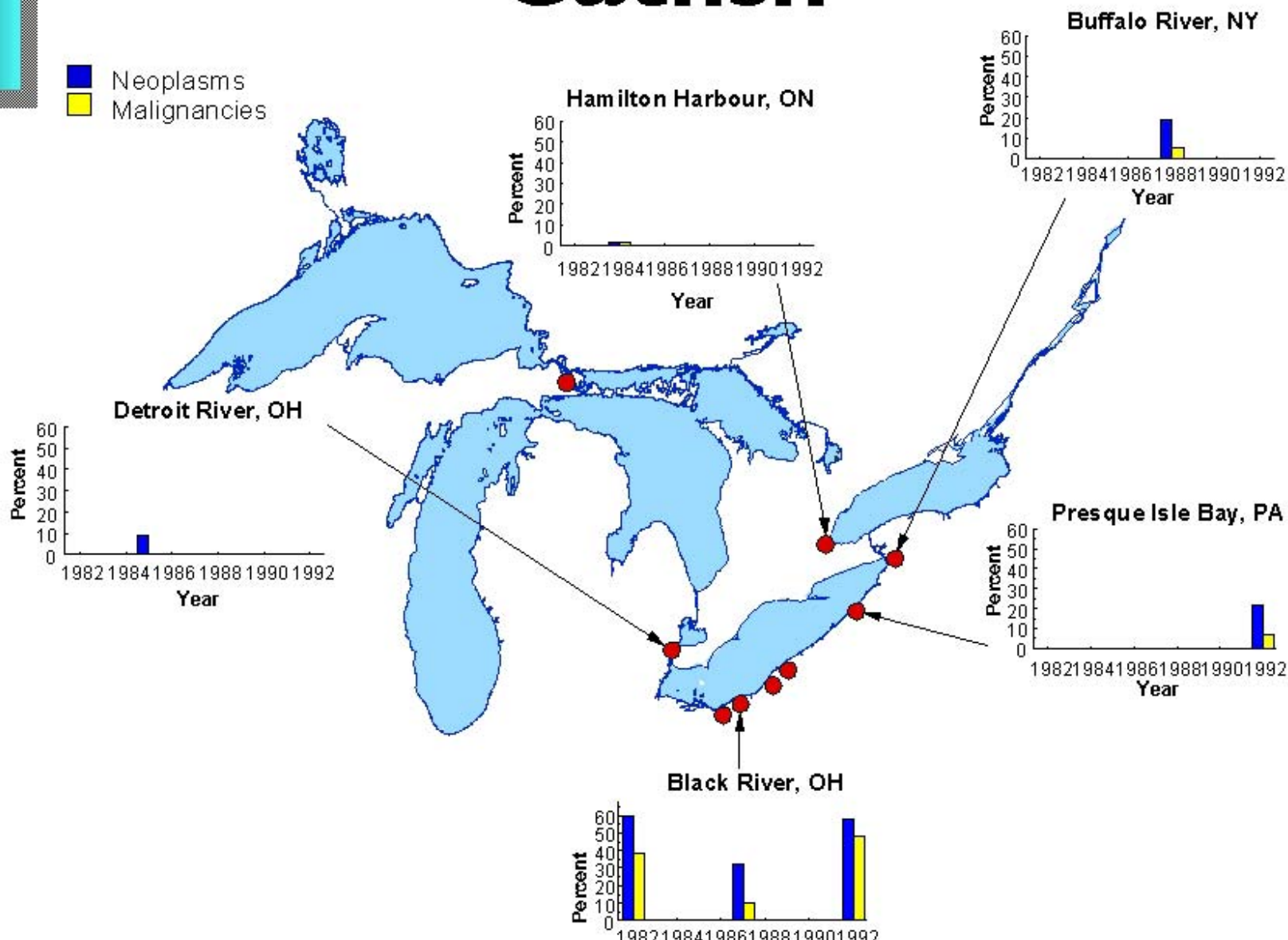
Fish 163, Humber R. 1987





# Liver Tumors in Catfish

■ Neoplasms  
■ Malignancies



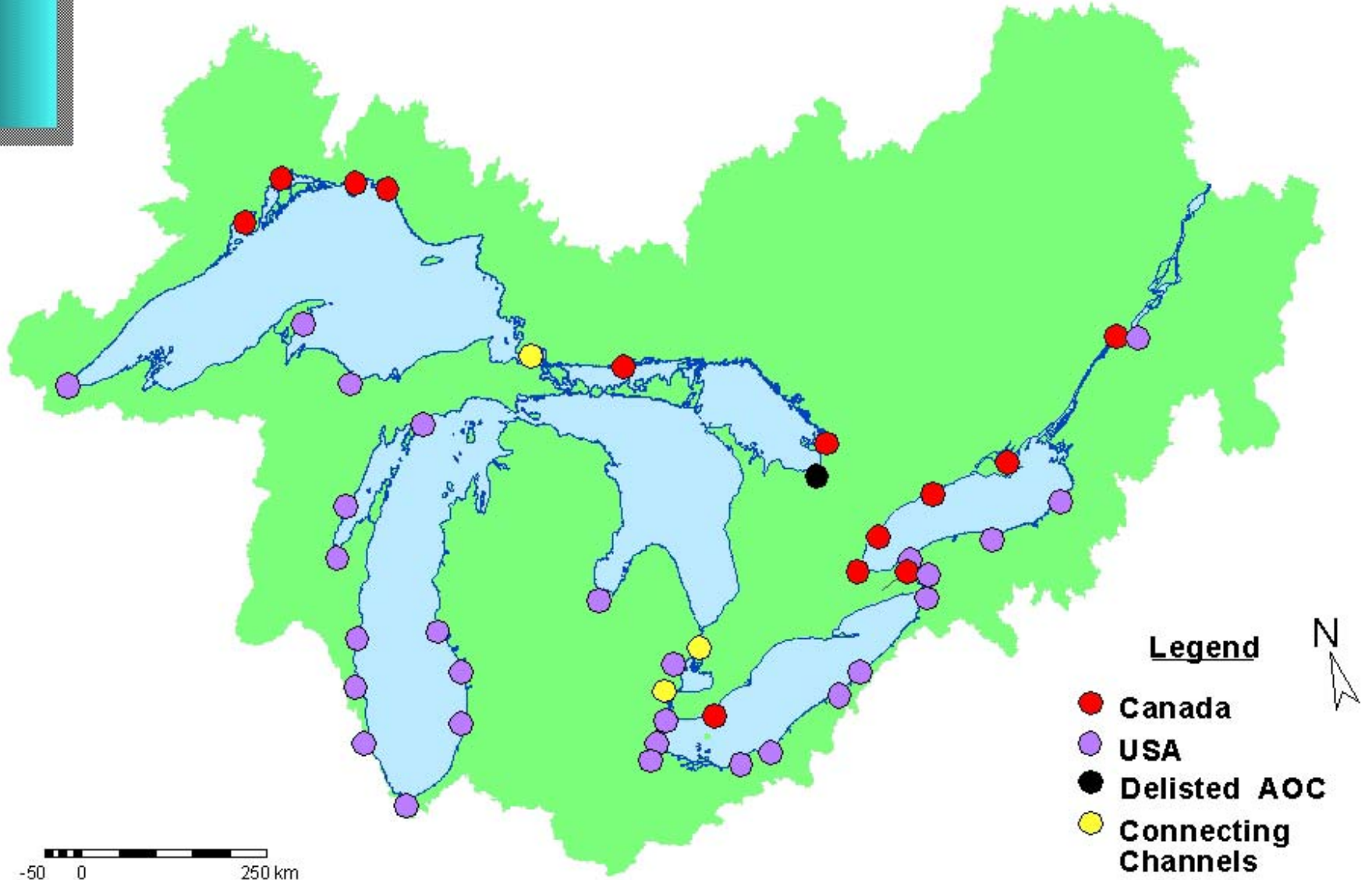


# Birds

- **Colonial bird populations are stable or increasing**
  - ▶ **Black and Forster's Terns stressed**
- **Water fowl are stable**
- **Osprey: slowly returning, common some places**
- **Bald Eagle: established Lakes Erie, Huron, Superior**



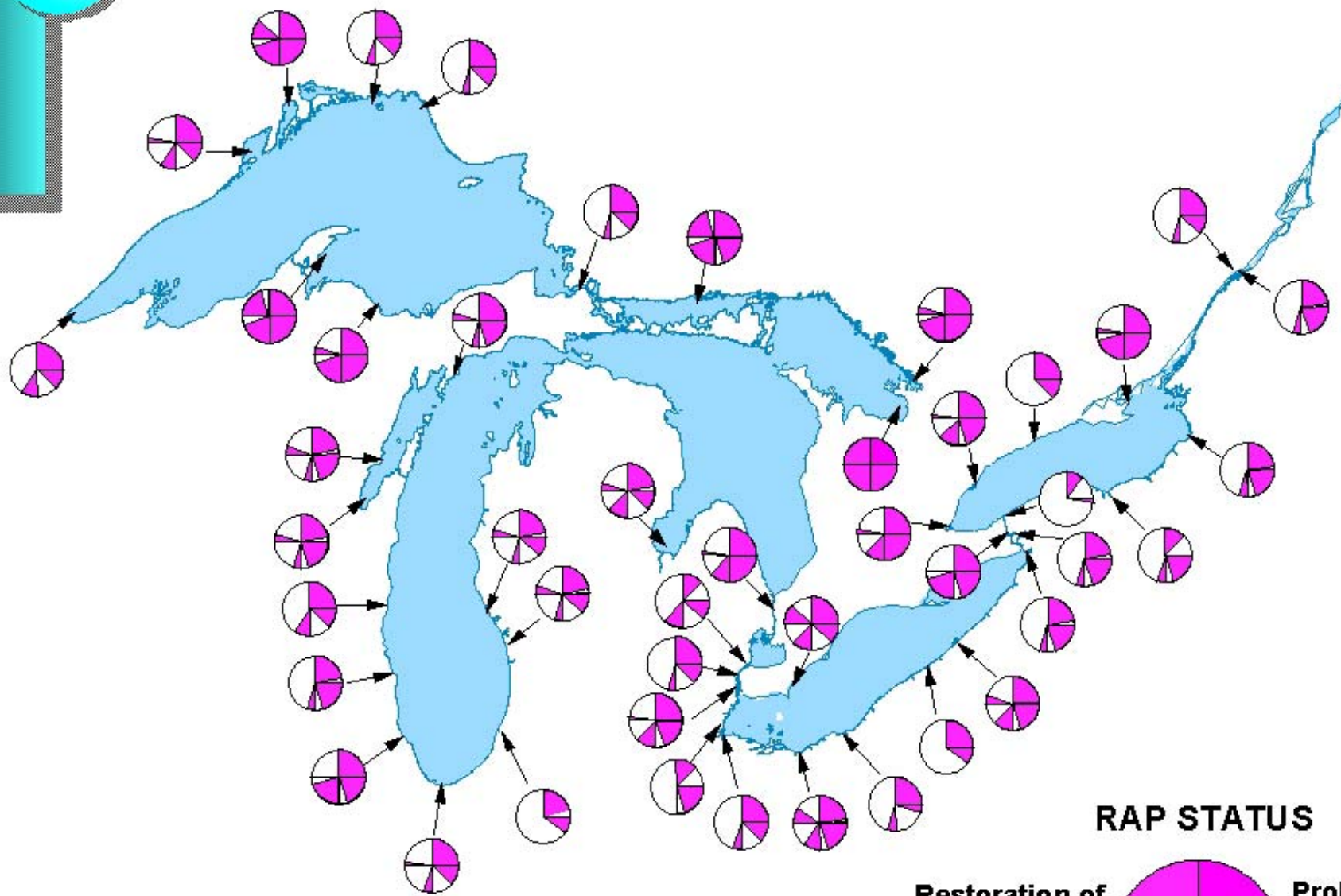
# Areas of Concern



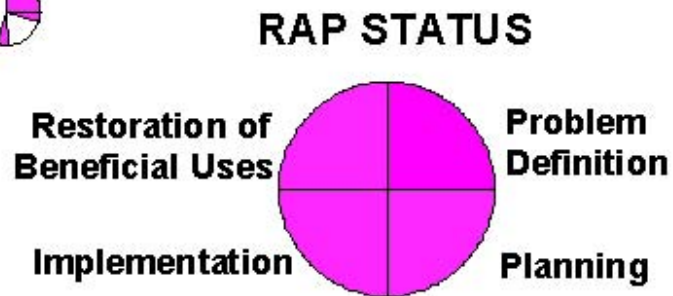




# Status of Remedial Action Plans



Note: Shaded areas represent percent completed





# Fish Habitat

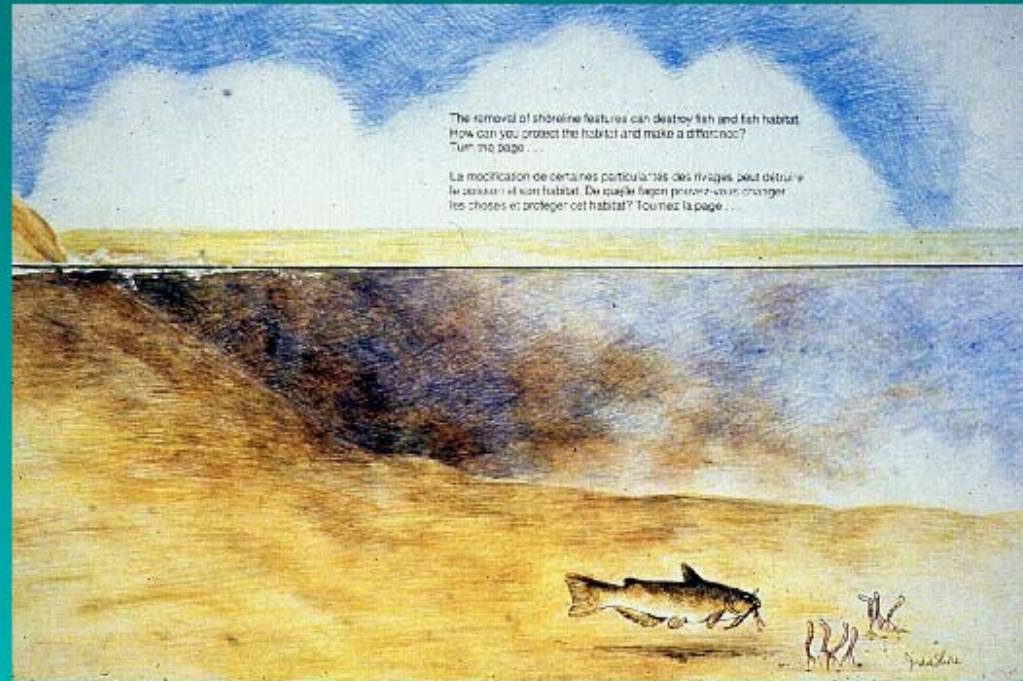
- **Urban shorelines hardened or filled**
- **Habitat diversity decreased**
- **80% of fish species use the nearshore**





# Fish Habitat in the AOCs

- Degradation - 29
- Loss - 34
- At least 47 projects to improve habitat are underway.

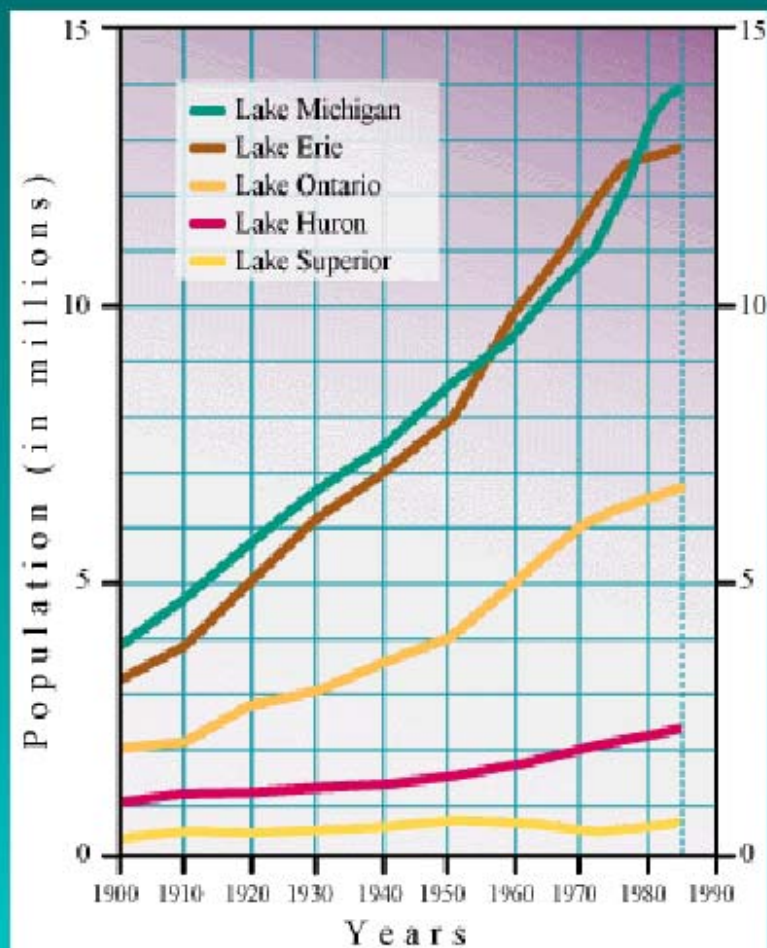




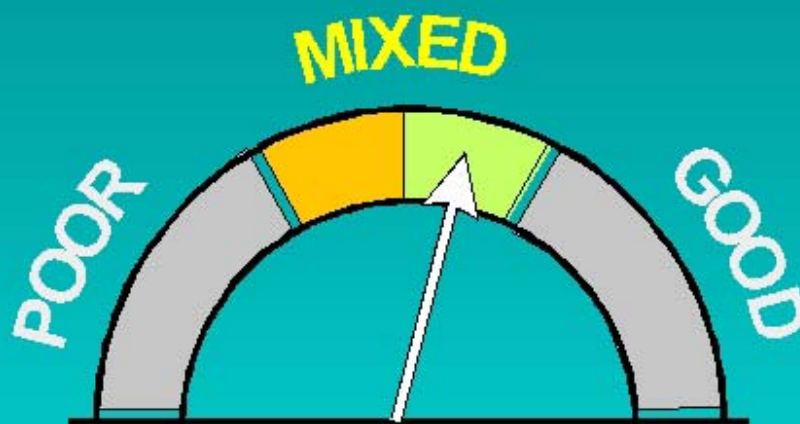


# Summary and Conclusions

## Sewage



**Under control but more treatment needed to protect nearshore and accomodate growth.**





# Summary and Conclusions

## Exotic Species

- Likely affecting fisheries
- Little to do but adapt to them
- Prevention guidelines in place
- Future instability likely



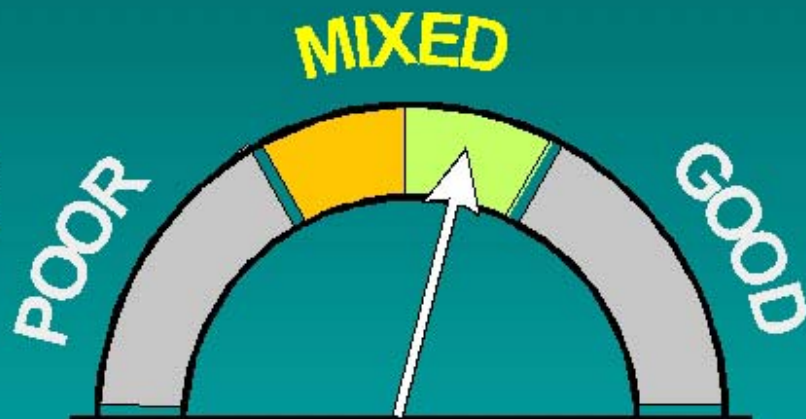




# Summary and Conclusions

## Toxic Chemicals

- Situation improved
- Birds are back
- Fish consumption advisories remain
- Sediment cleanups underway



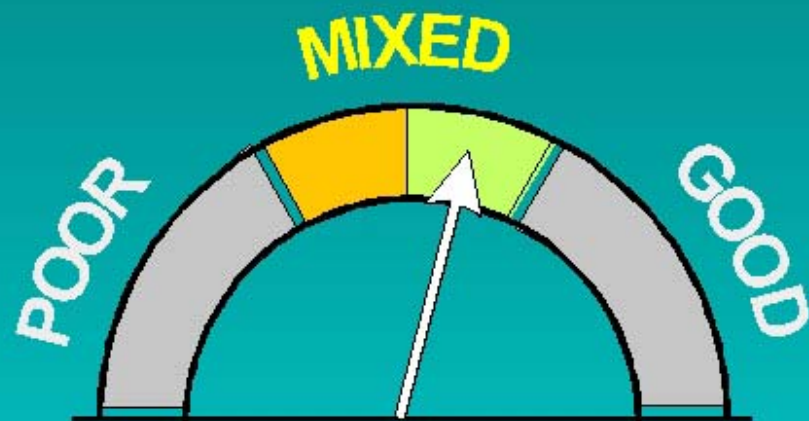




# Summary and Conclusions

## Fish Habitat

- Shore modifications destroyed habitat
- Some reconstruction underway



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