



## Presentation overview

- Indicator list and overview
- Overall status assessment
- Individual indicator discussions
- Future developments

### Coastal Wetland indicators (reported)

- Coastal Wetland Area by Type
- Plant Community Health
- Invertebrate Community Health
- Fish Community Health
- Amphibian Diversity and Abundance
- Wetland Bird Diversity and Abundance
- Contaminants in Snapping Turtle Eggs
- Effect of Water Level Fluctuations

### Coastal Wetland indicators (not reported)

- Coastal Wetland Restored Area by Type
- Land Cover Adjacent to Coastal Wetlands
- Phosphorus and Nitrogen Levels
- Sediment Flow and Availability
- Human Impact Measures

### Index of Biotic Integrity (IBI)

- Biological indicators assessed using IBIs
- IBI combines many biological metrics into a relative scoring system
- Adjusted for major regional differences and water level influences
- Allows for relative comparison across basin
- System tested by comparing across wetlands with a range of disturbance

### Overall assessment

	POOR	MIXED	FAIR	GOOD
<b>Overall Assessment</b>				
Area by Type	←			
Plants	←			
Invertebrates	●			
Fish	●			
Amphibians	←			
Birds	←			
Contaminants	◆			
Water Levels	●			

Status: Mixed      Trend: Deteriorating

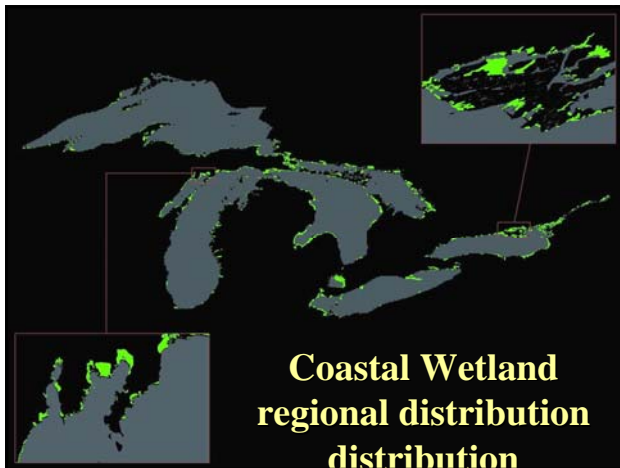
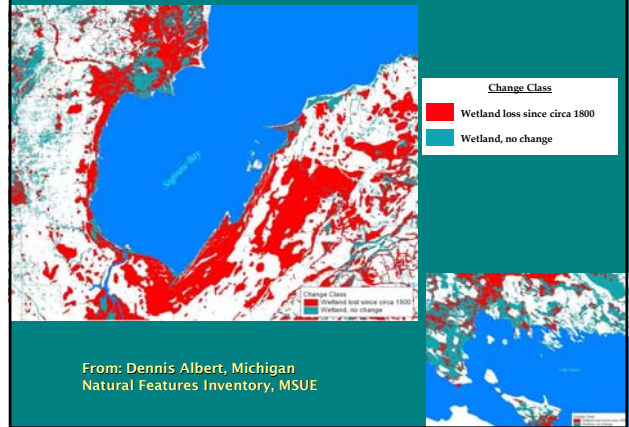
## Coastal Wetland area by type

- Current baseline: 216,000 ha
- No basinwide trends yet established
- No assessment yet of impact of regulation or restoration
- Local losses due to development, hydrologic alteration, shoreline change
- Differences in types across the basin

Status: Mixed

Trend: Deteriorating

## Coastal Wetland losses up to 95 % in some areas, ~ 50 % overall



## Area estimates by lake/river basin

Lake / River	Area (ha)
Lake Superior	26,626
St. Mary's River	10,790
<b>Lake Huron **</b>	<b>61,461</b>
<b>Lake Michigan **</b>	<b>44,516</b>
St. Clair River/Lake St. Clair/Detroit River	16,452
Lake Erie	25,127
Niagara River	196
Lake Ontario	22,925
Upper St. Lawrence River	8,454
<b>Total</b>	<b>216,545</b>

\*\* Note: ½ of total is located within Lake Huron and Lake Michigan basins

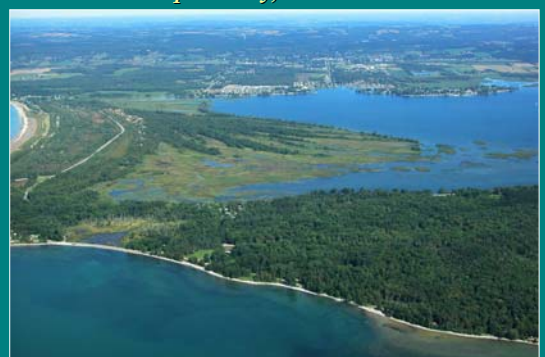
## Lacustrine – open

*Search Bay, Lake Huron*



## Lacustrine – protected

*Presqu'île Bay, Lake Ontario*



## Riverine – drowned river-mouth

*Hay Bay, Lake Ontario*



## Riverine – connecting channel

*St. Mary's River*



## Riverine – delta

*St. Clair River delta*



## Barrier protected – barrier beach

*Big Sand Bay, Lake Ontario*



## Barrier protected – swale complexes

*Stockton Island, Lake Superior*

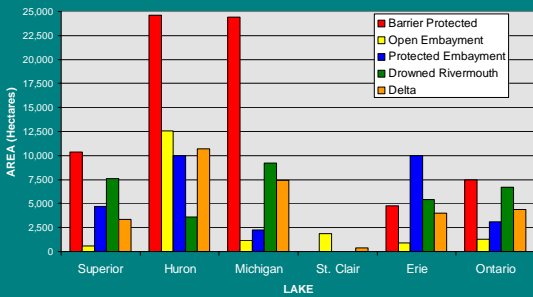


## Modified wetlands

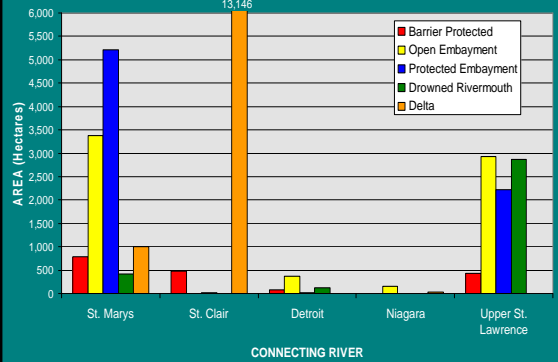
*Metzger Marsh, Lake Erie*



## Coastal Wetland area by type



## Coastal Wetland area by type



## Wetland bird diversity and abundance

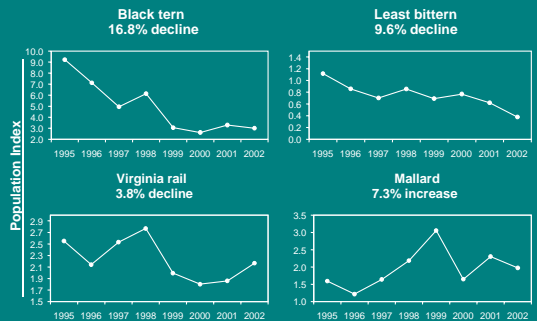
- 53 wetland species monitored by Marsh Monitoring Program (MMP)
- Significant declines in seven sensitive species



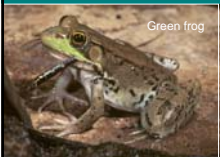
- Significant increases in three tolerant species: Willow Flycatcher, Common Yellowthroat, and Mallard
- Declines may be due to change in water levels
- Habitat change may also be a factor

Status: Mixed Trend: Deteriorating

## Wetland bird diversity and abundance



## Amphibian diversity and abundance

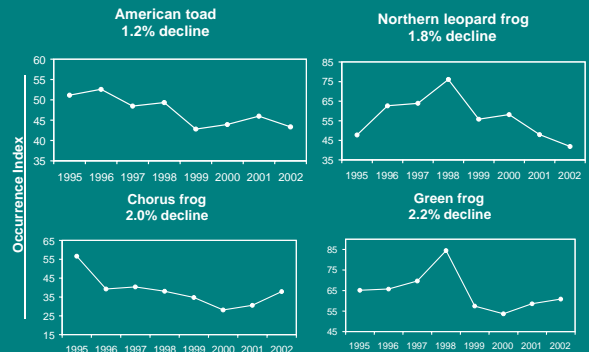


- Significant basinwide declines detected in four amphibian species - American toad; chorus, green, and northern leopard frogs

- Habitat loss and deterioration are the major threats
- Further work to develop basinwide IBI

Status: Mixed Trend: Deteriorating

## Amphibian diversity and abundance



## Contaminants in snapping turtle eggs

- Site specific trends show stable contaminant levels in eggs from most Area of Concern wetlands
- Total PCB levels remain above consumption guidelines

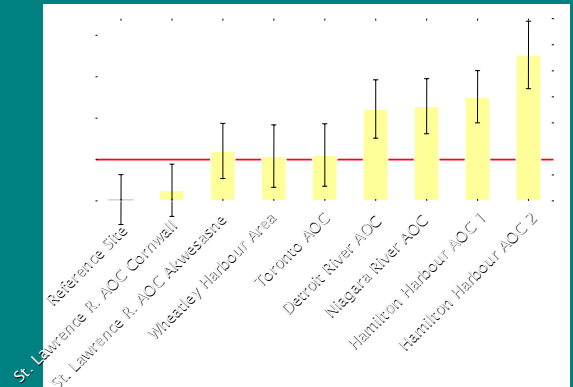


Impact: High levels found to impair turtle development

Status: Mixed

Trend: Unchanging

## PCB concentrations in eggs (2001-03)

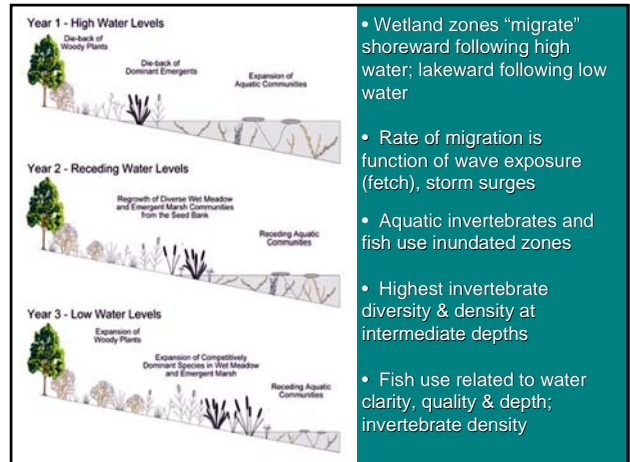


## Effect of water level fluctuations fluctuations

- Periods of water level fluctuation favor diversity and native plant species
- Water level control in Lake Ontario and Superior has resulted in:
  - More narrow wetland zones
  - Lower diversity
  - Increasing dominance of invasives

Status: Mixed

Trend: Undetermined



• Wetland zones "migrate" shoreward following high water; lakeward following low water

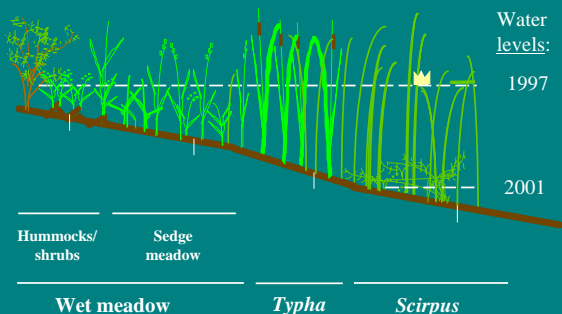
• Rate of migration is function of wave exposure (fetch), storm surges

• Aquatic invertebrates and fish use inundated zones

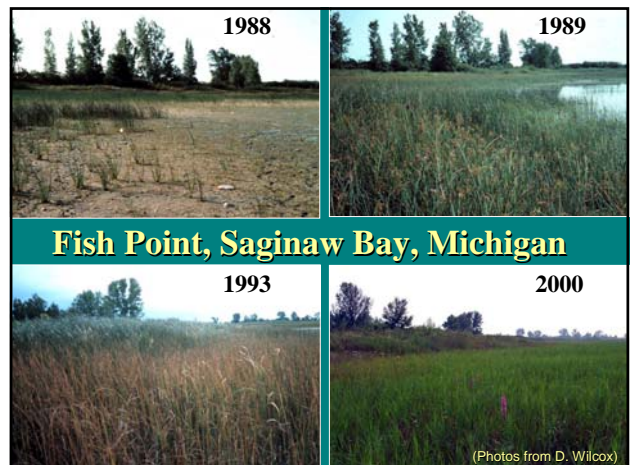
• Highest invertebrate diversity & density at intermediate depths

• Fish use related to water clarity, quality & depth; invertebrate density

## Vegetation zonation along transects (vertical scale exaggerated)



Water levels in Lake Huron dropped over 1 m from 1997 to 2001. Fish and invertebrate habitats were reduced as a result.



## Fish Point, Saginaw Bay, Michigan

(Photos from D. Wilcox)

## Plant community health

- Total area of plant communities is correlated with water level change
- Shoreline and hydrologic alterations result in spread of non-native species (e.g. purple loosestrife)
- Turbidity in wetlands in lower lakes, Green Bay and Saginaw Bay impairing submergent plant diversity

Status: Mixed

Trend: Deteriorating

## Invertebrate community health

- 61 lacustrine wetlands investigated basinwide
- IBIs assessed within plant zones to account for lake level change
- Northern wetlands have higher IBI scores
- Saginaw Bay and southern wetlands have lower scores

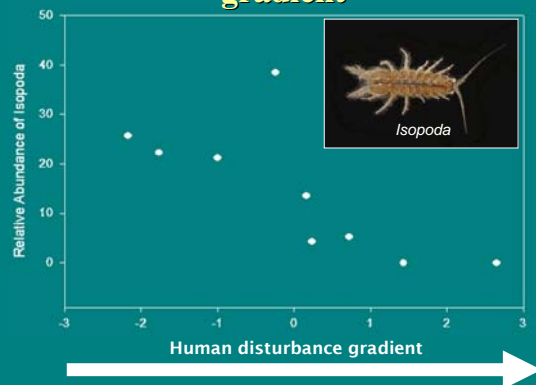
Status: Mixed

Trend: Undetermined

## Invertebrates in lacustrine wetlands

- Over 250 species documented for wetlands of Northern Lake Huron and Saginaw Bay
- Densities as high as 50,000 m<sup>2</sup>
- Highest diversity and density in medium depths and inner edge of deep emergent zone
  - Lowest at the outer edges of emergent zones

## Metric response to disturbance gradient



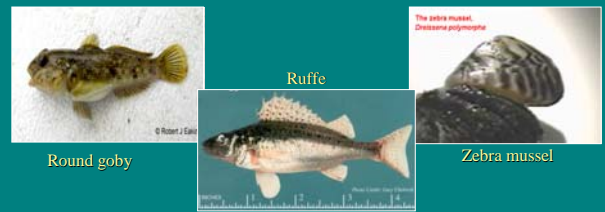
## Fish community health

- Round gobies and ruffe do not thrive in wetlands even when common in adjacent lakes
- Fish community composition is correlated with plant community composition
- Dominance by cattail or other invasive species correlates with lower fish diversity

Status: Mixed

Trend: Undetermined

- Wetlands may offer refugia for native species from invasive non-native species
- Recent invaders have not done well in these systems (round gobies, ruffe, and zebra mussel)



- Coastal wetlands do not harbor an abundance of mosquitoes – of the 56,000 invertebrates collected from coastal wetlands in 2002, a total of 80 were mosquitoes

Yellow perch

Spotfin shiner

Largemouth bass

Common shiner

Redear sunfish

N. Brook silversides

Nutrients and % adjacent agriculture

## Summary

- Coastal wetland area declining locally
- Natural water level fluctuation maintaining native communities
- Non-native plants spreading in altered wetlands
- Several IBIs have been developed and are ready for basin wide use in assessment
- Native fish potentially using diverse coastal wetlands as refuge from non-natives

## Summary

- Northern invertebrate communities more diverse than southern communities
- Sensitive bird and amphibian species declining
- Little change in biological accumulation of historically monitored contaminants

## Future developments

- Finalize work on methods and indicator development (including IBIs)
- Develop implementation plan
- Collect data broadly across basin
- Report regularly at SOLEC

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