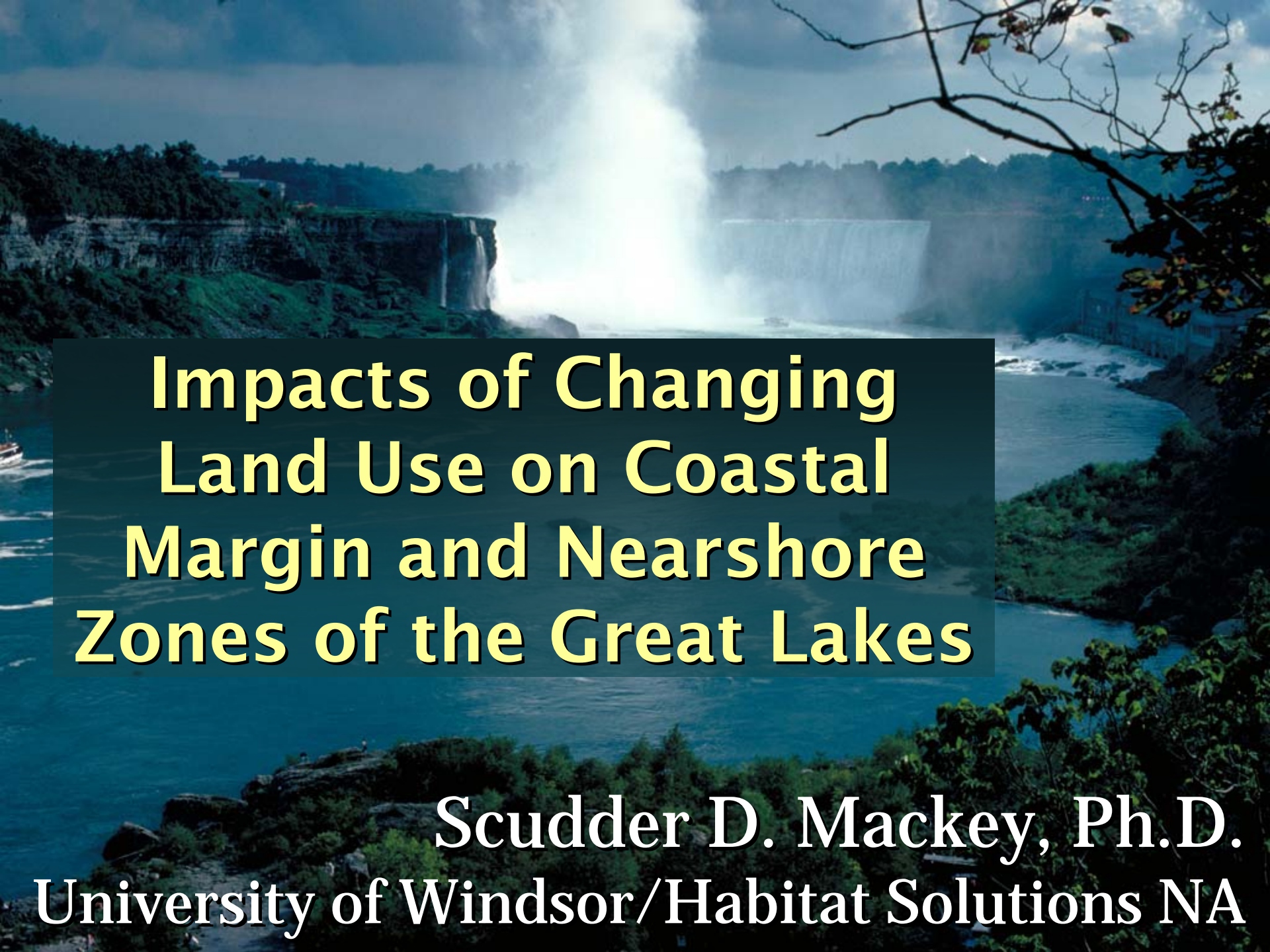


US EPA ARCHIVE DOCUMENT

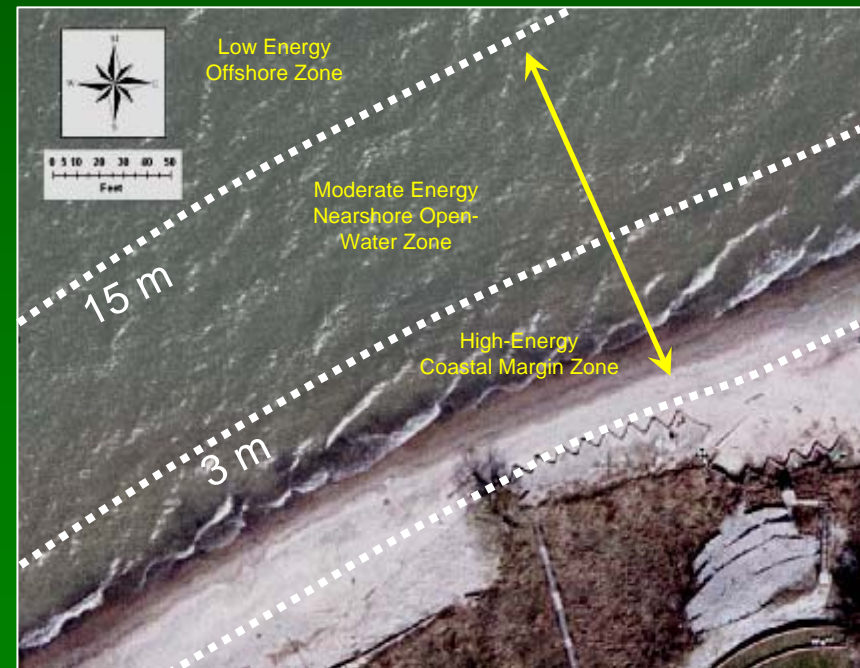
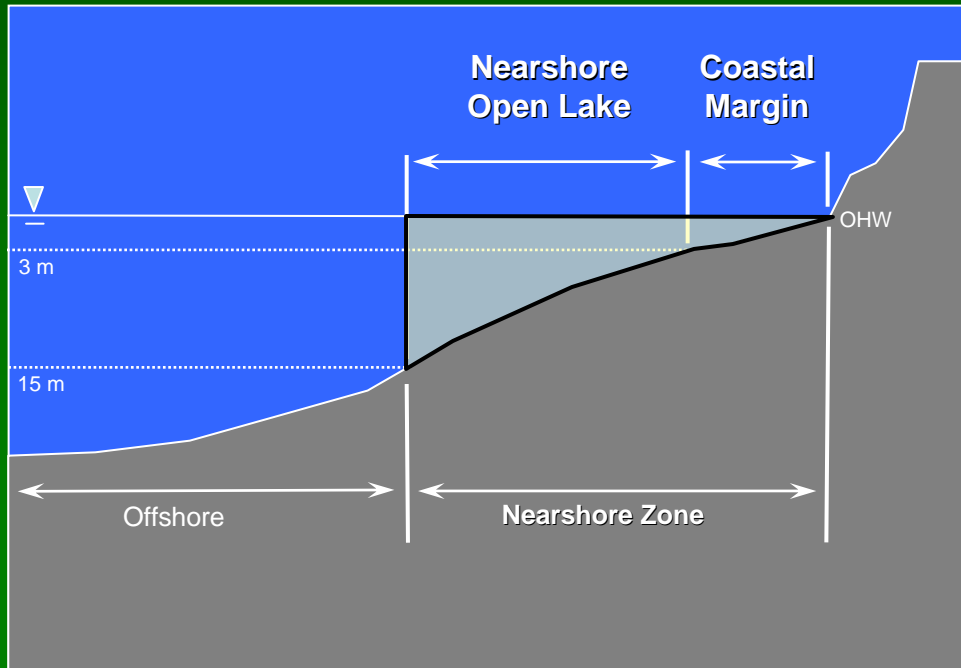
A scenic view of Niagara Falls, showing the water cascading over the rocky cliffs. The sky is blue with some clouds, and the surrounding area is lush with green trees. The text is overlaid on a dark blue rectangular background.

# Impacts of Changing Land Use on Coastal Margin and Nearshore Zones of the Great Lakes

Scudder D. Mackey, Ph.D.  
University of Windsor/Habitat Solutions NA

# What Are Nearshore Zones?

- Coastal margin zone (0 to 3 m)
- Nearshore/open water zone (3 to 15 m)
- Boundaries determined by hydrogeomorphic characteristics and dominant physical processes





# How Are Watersheds Connected to the Great Lakes?

Landscape



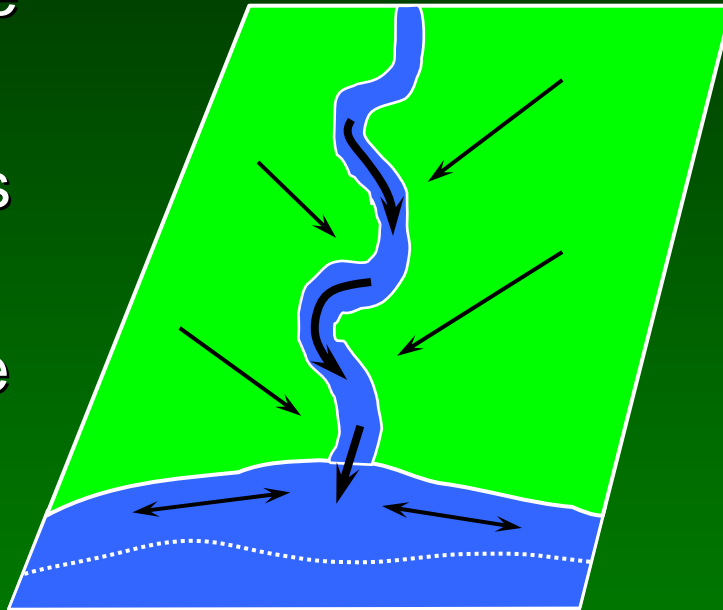
Tributaries



Nearshore

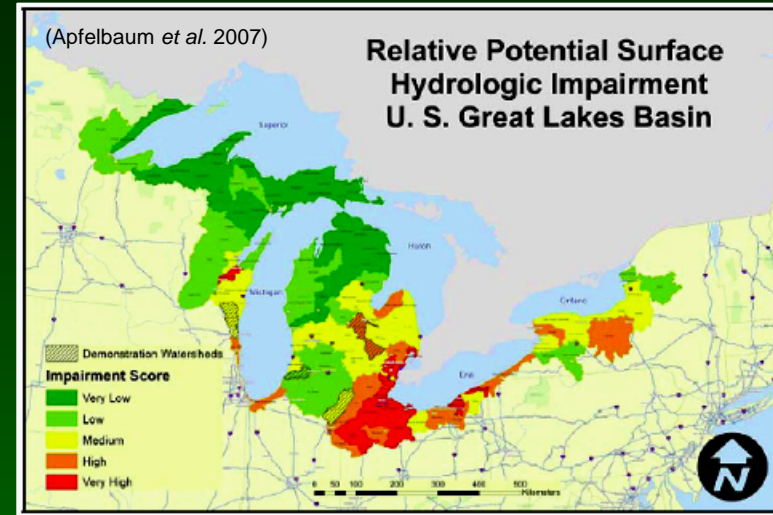


Offshore

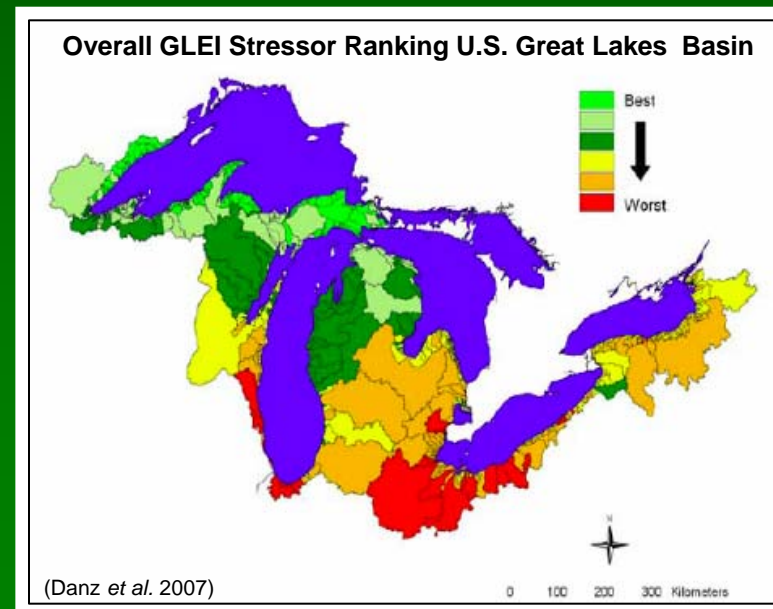


It is through hydrologic coupling that changes in land use are transferred across watersheds in the nearshore zones of the Great Lakes

## Hydrologic Impairment



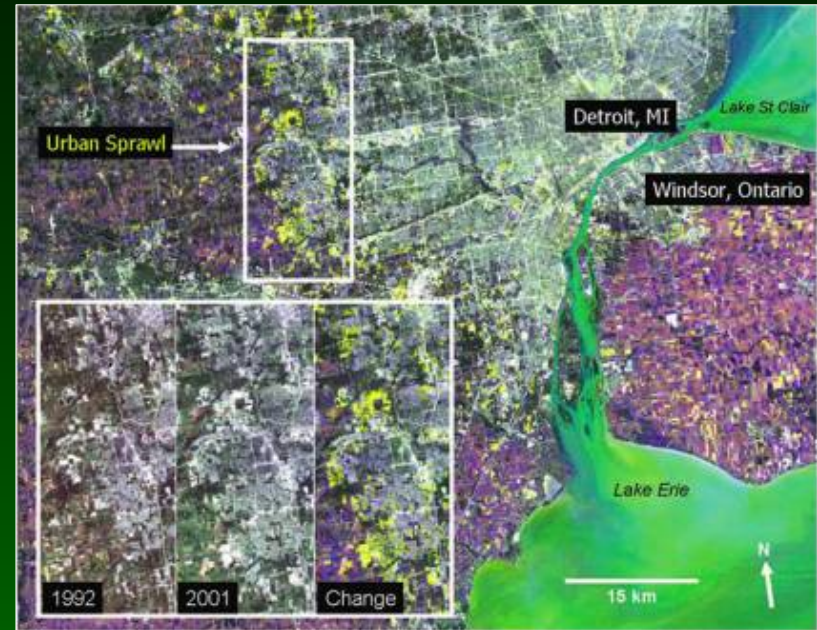
## GLEI Stressors



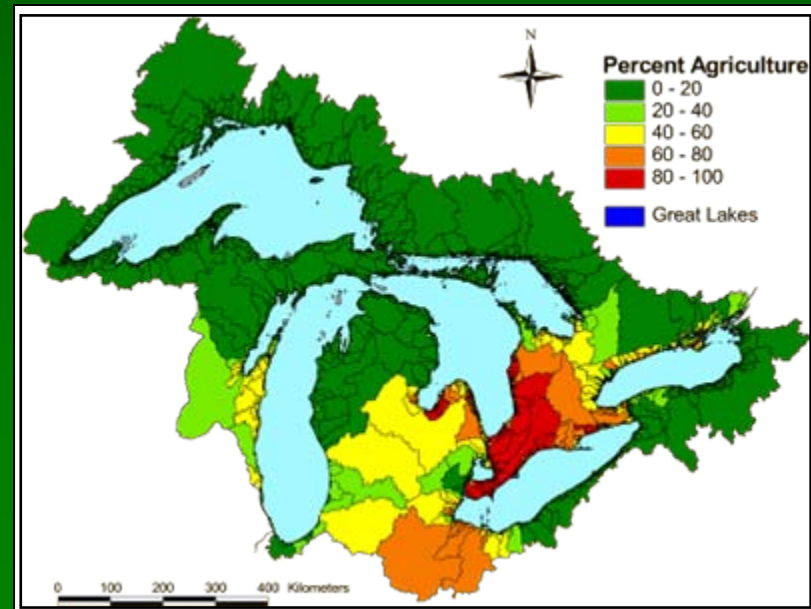
# Changing Land Use/ Land Cover

- Between 1992-2001 ~ 798,755 ha (~2.5%) of the Great Lakes basin experienced changes in land use. More than half of those changes were permanent, e.g. conversion of natural or Ag lands to development
- Changes in urban and suburban land use exceed changes based on population growth

Conversion of natural areas to development is accelerating, even though loss of agricultural land is slowing (2.3% vs 9.8%)



Source: Wolter et al. 2006



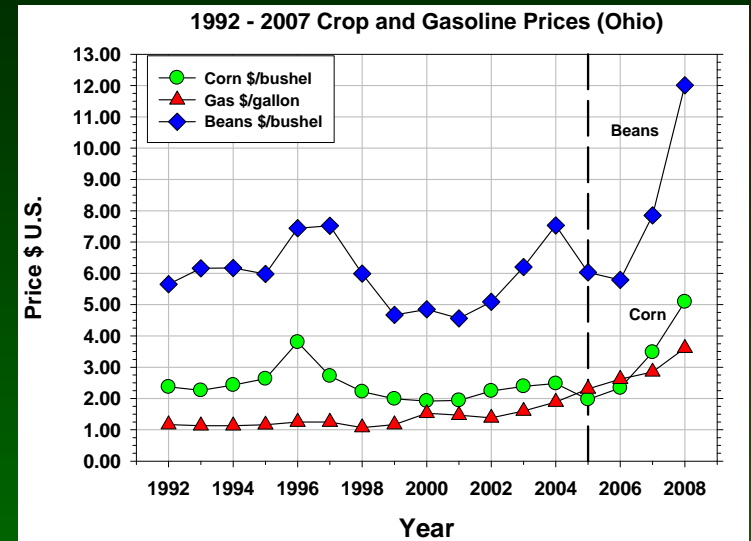
Source: Tom Hollenhorst, NRRI – University of Minnesota

Wolter et al. (2006)

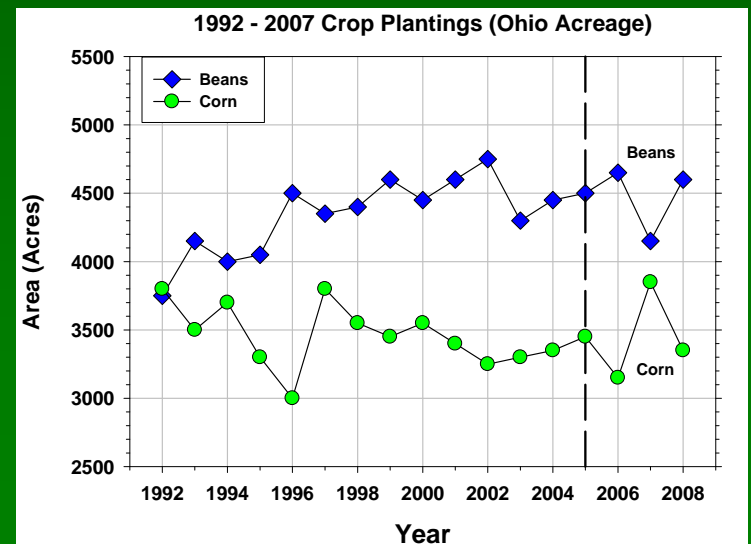
# Response to Biofuels Production

- Since 2005, prices for corn and soybeans have more than *doubled* in the U.S.
- Crop switching to corn and beans means more intensive row crop agriculture - but switching hasn't happened yet...
- Reduction or reversal of historic Ag land losses.

Biofuels create strong economic incentives that could drive future changes in land use



Source: USDA National Agricultural Statistics Service

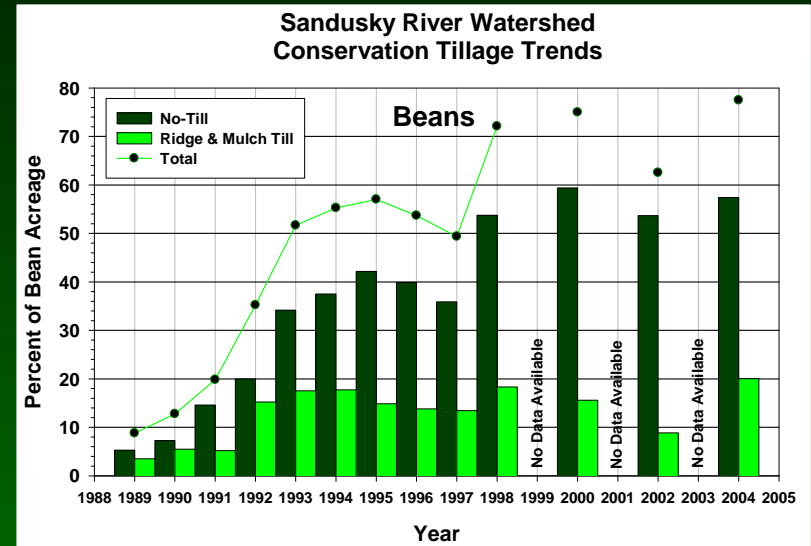


Source: USDA National Agricultural Statistics Service

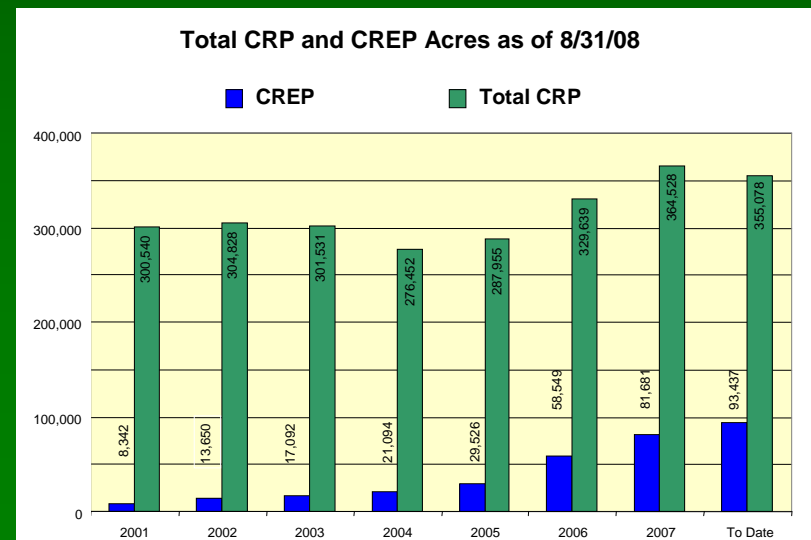
# What we might see... and what to look for

- Loss of buffer zones (BMP backsliding?)
- Conservation lands taken out of CRP and CREP and returned to service
- Increase in conversion of Forest, upland grass and shrub (ESV) lands to agricultural land
- Increase in value of agricultural lands

*Increase in sediment, nutrient, and contaminant loadings into Great Lakes nearshore zones*



Source: Steve Davis, NRCS



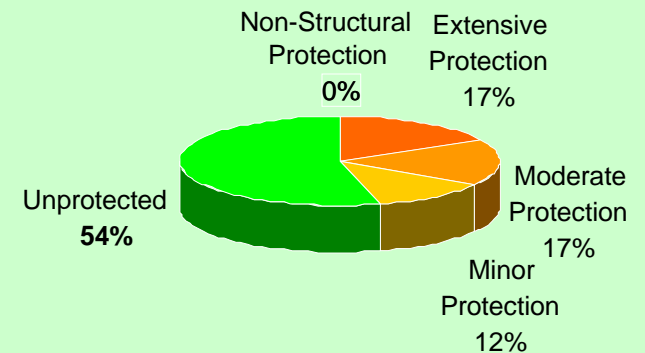
Source: Jeff Mitchell, OFB



# Physical Alterations to the Land-Water Interface



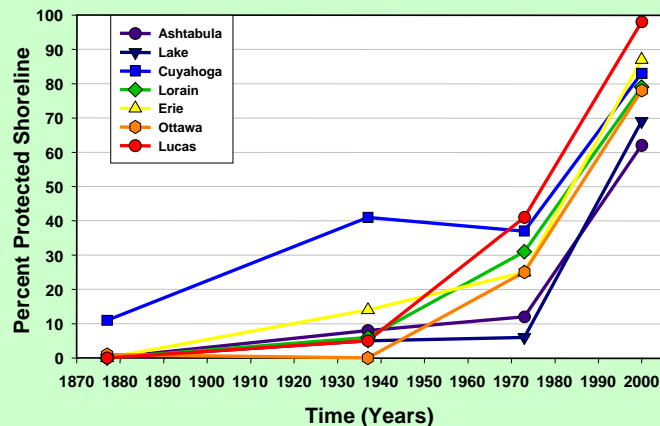
Canadian Shore Protection - Lake Erie



Source: USACE

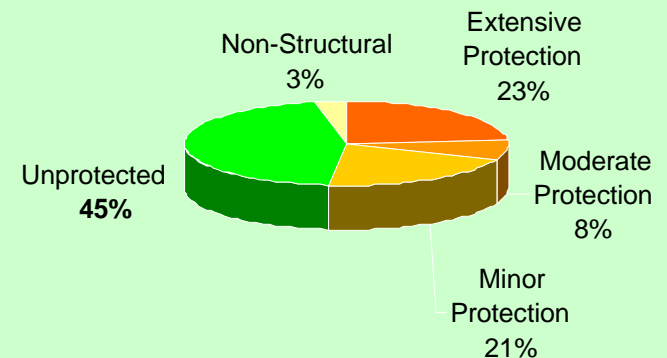
Lake Erie Shore Protection Trends

Ohio Counties from 1870 to 2000



Source: Ohio Division of Geological Survey

US Shore Protection - Lake Erie





# Nearshore Impacts

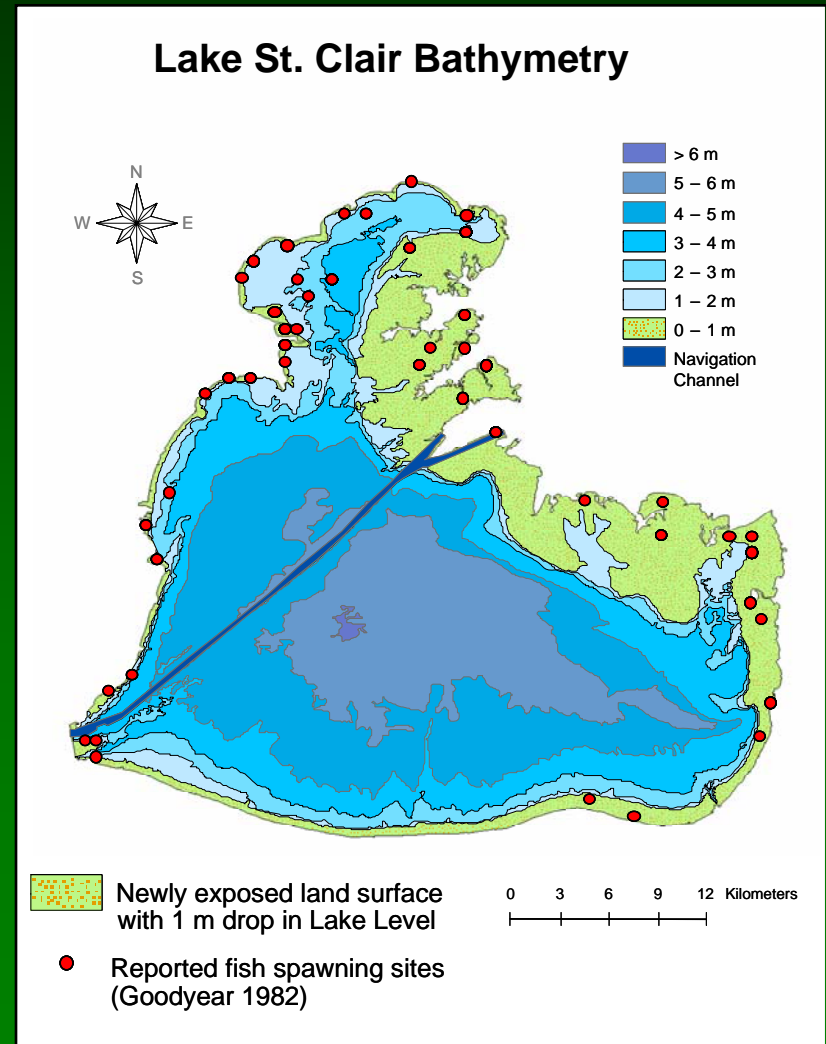
- Loss of protective sand cover
- Coarsening of nearshore substrates (new low-cost home for lithophillic species)
- Hardening of river mouths
- Loss of sand barriers and associated coastal wetlands

Physical alteration of the land-water interface directly impacts coastal processes and alters nearshore habitat structure



# Change Due to Climate Variability

- Land cover/land use
  - Precipitation and flow
  - Contaminant and nutrient loads
- Great Lakes water levels
  - Location of shoreline
  - Storm magnitude, frequency, and direction
- Habitat alteration
  - Ecoregional shifts
  - Thermal regime





# Suggested Discussion Topics/Indicators

- Need for uniform land use/land cover classification system across the basin
- Land use/land cover datasets are out of date – policy and management decisions based on information that is no longer applicable
- More frequent updates are needed to capture rapidly changing environmental conditions
- New and different indicators designed specifically to anticipate potential effects on the Great Lakes
  - Scaling issues
  - Linkages to watersheds
  - Application to regulatory programs
  - ID potential restoration opportunities
  - Data availability/gaps
  - Climate variability



# Acknowledgements

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- Carol Johnston – South Dakota State University
- Stephanie Ross – U.S. EPA

**Thank You!**