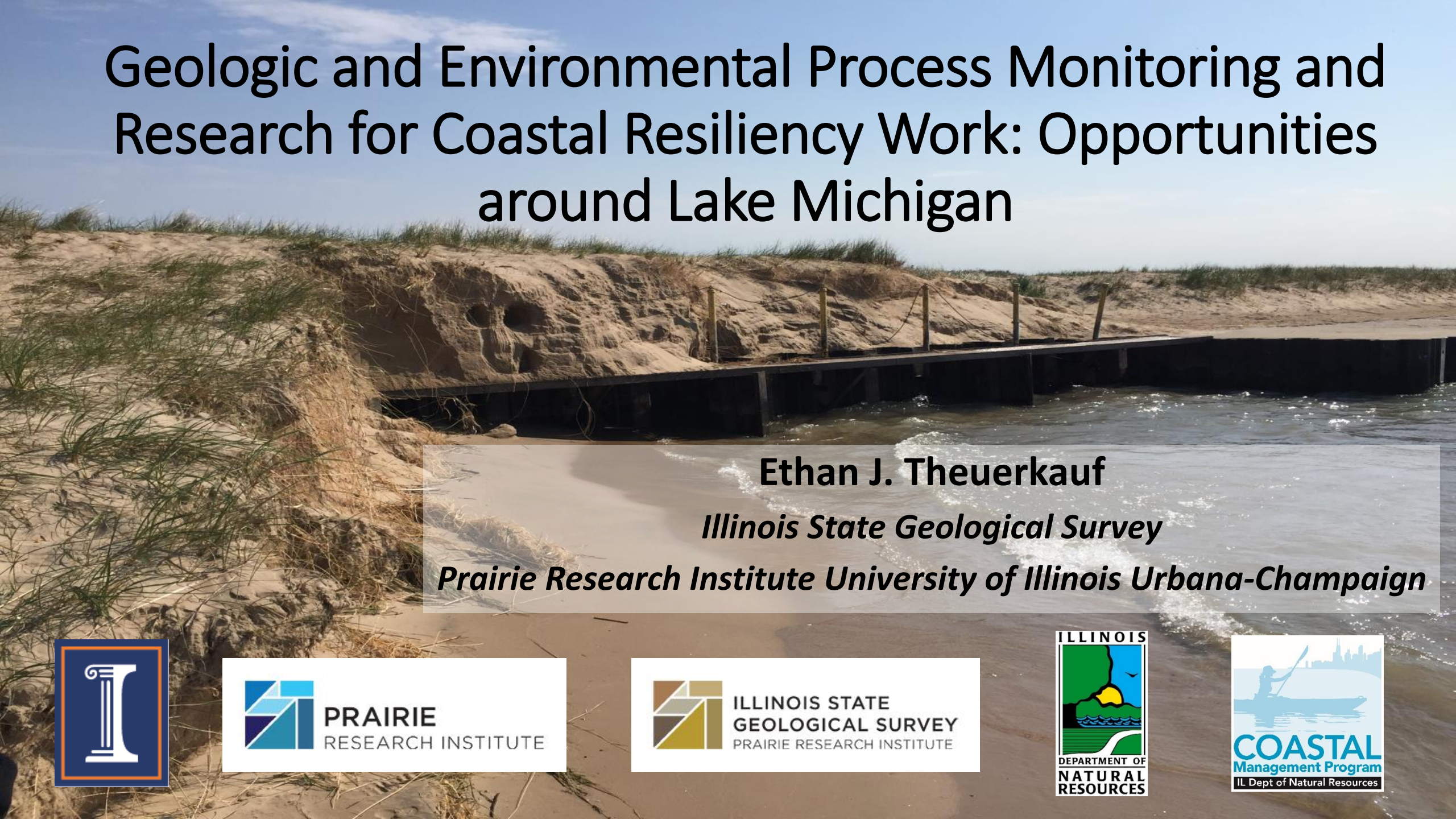
Geologic and Environmental Process Monitoring and Research for Coastal Resiliency Work: Opportunities around Lake Michigan



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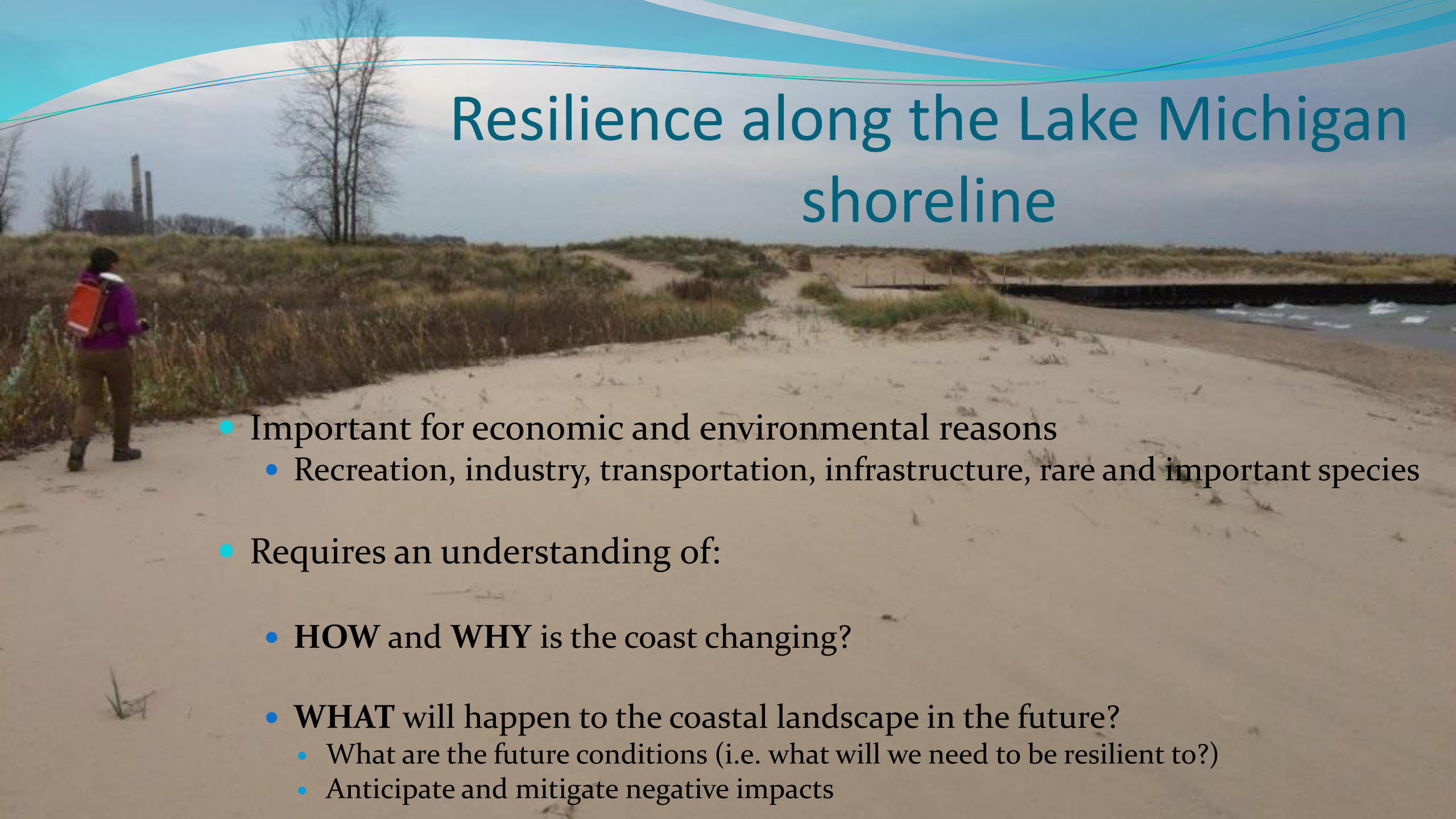
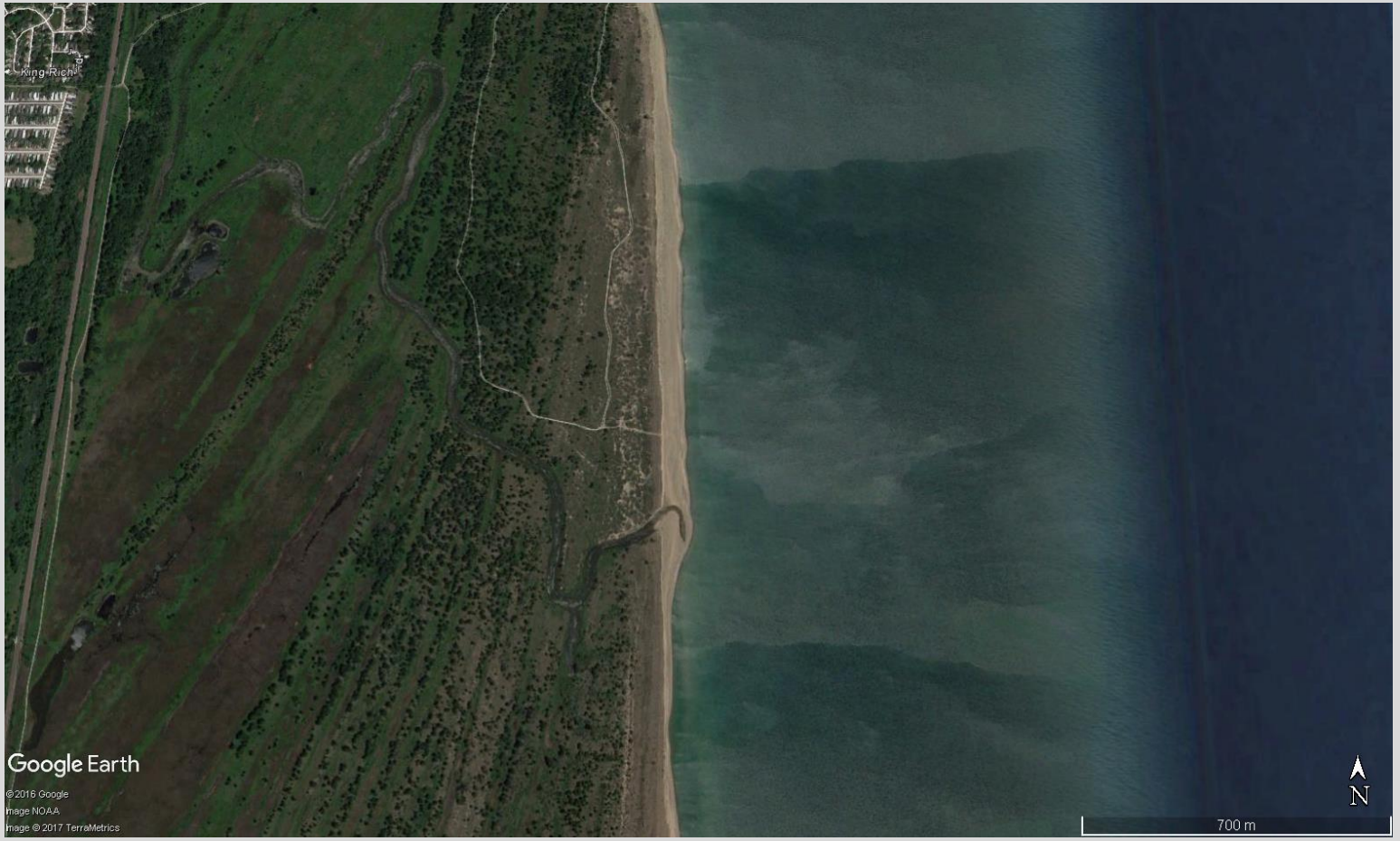
COASTAL Management Program
IL Dept of Natural Resources

Resilience along the Lake Michigan shoreline



- Important for economic and environmental reasons
  - Recreation, industry, transportation, infrastructure, rare and important species
- Requires an understanding of:
  - **HOW** and **WHY** is the coast changing?
  - **WHAT** will happen to the coastal landscape in the future?
    - What are the future conditions (i.e. what will we need to be resilient to?)
    - Anticipate and mitigate negative impacts

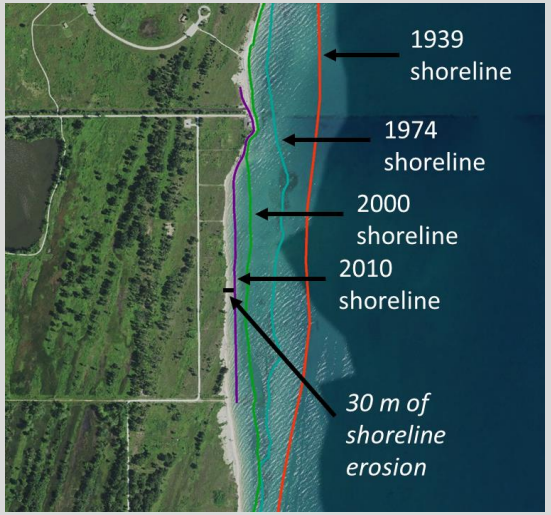
The Coastal Landscape

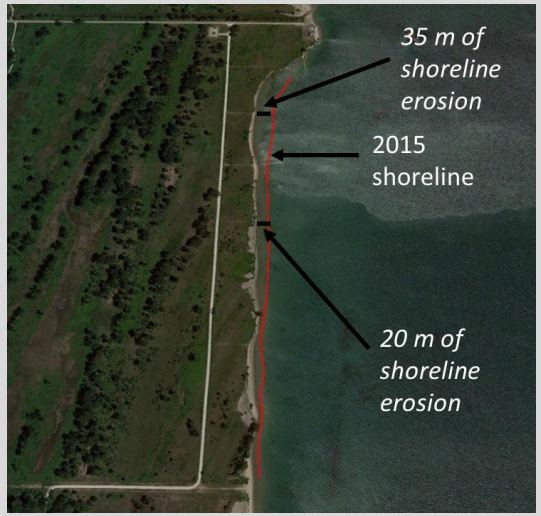


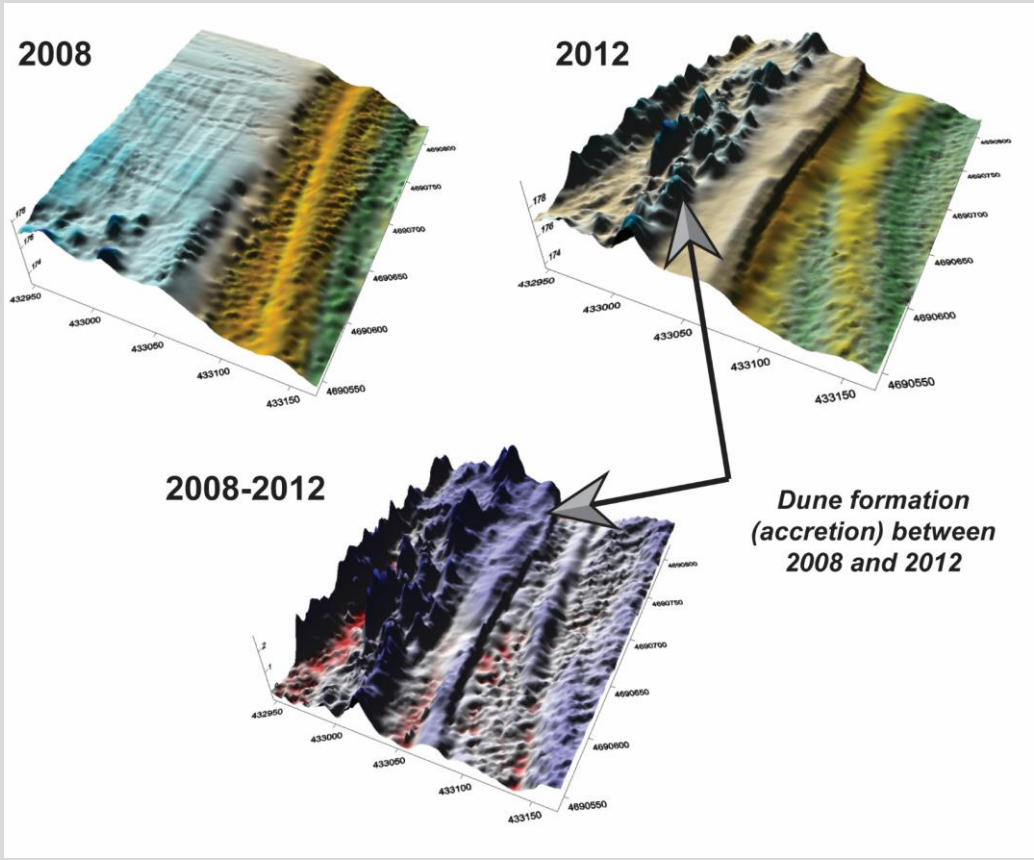
HOW is the coast changing?

- Rates and magnitudes of change
- Spatial and temporal variability of change

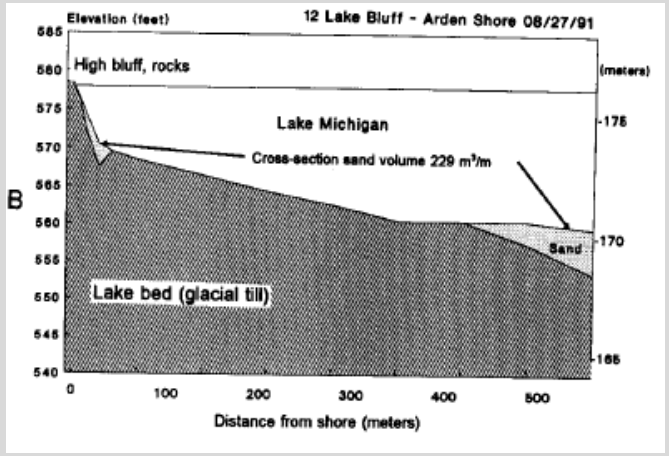
Beach and dune erosion and accretion

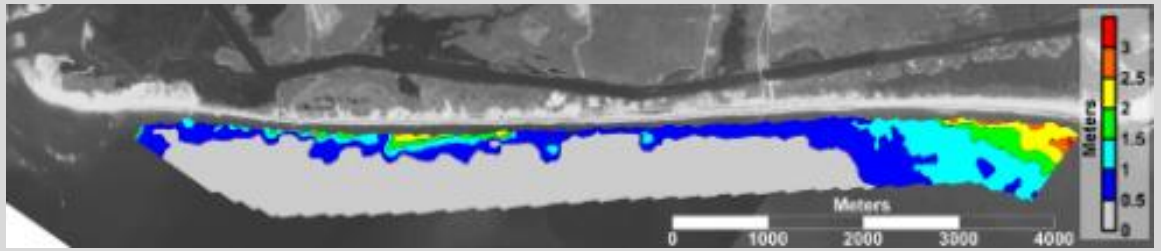




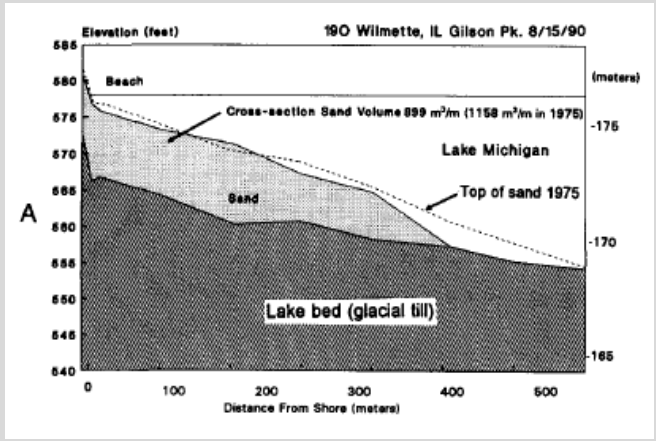


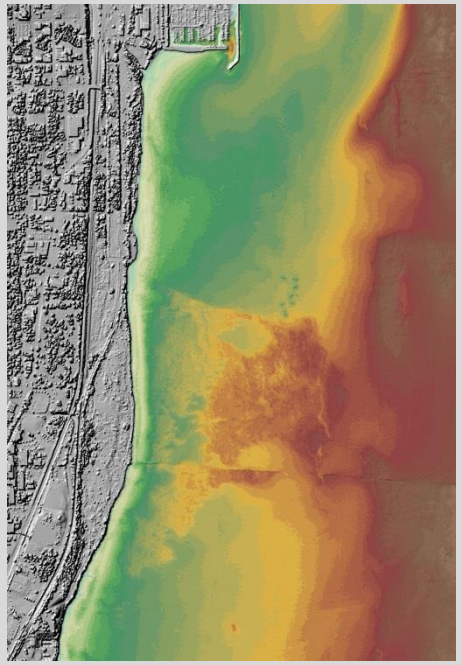
Nearshore sand and lake-bottom changes

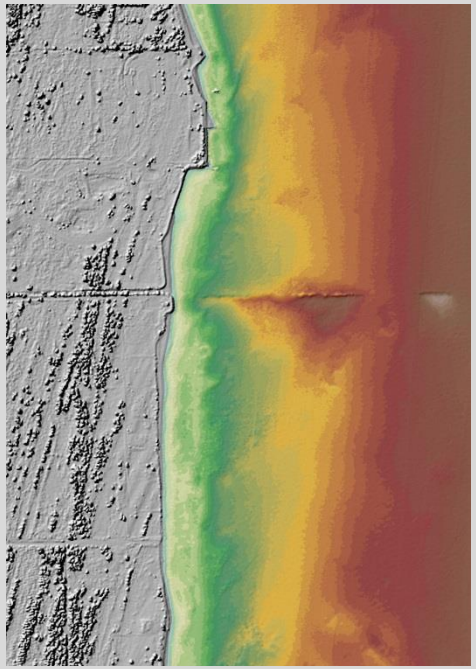




Shabica and Pranschke 1994





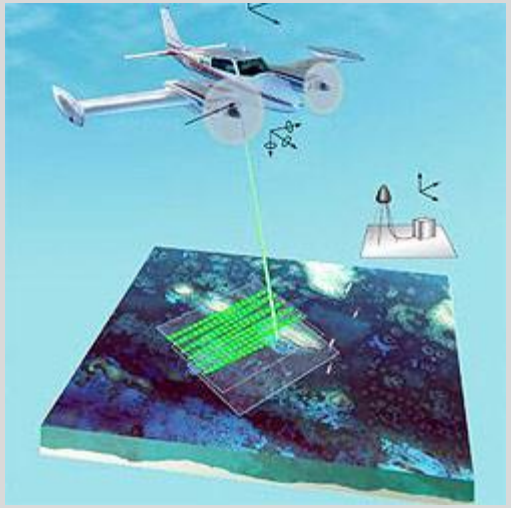


Bluff and ravine erosion

Wetland loss

Monitoring landscape change

- Methods
  - Classic surveying
    - RTK-GPS, rod-and-level
    - Professional or citizens
  - Airborne LIDAR and terrestrial laser scanning
  - Drones (structure-from-motion)
  - Acoustic and electromagnetic methods
  - Photo documentation



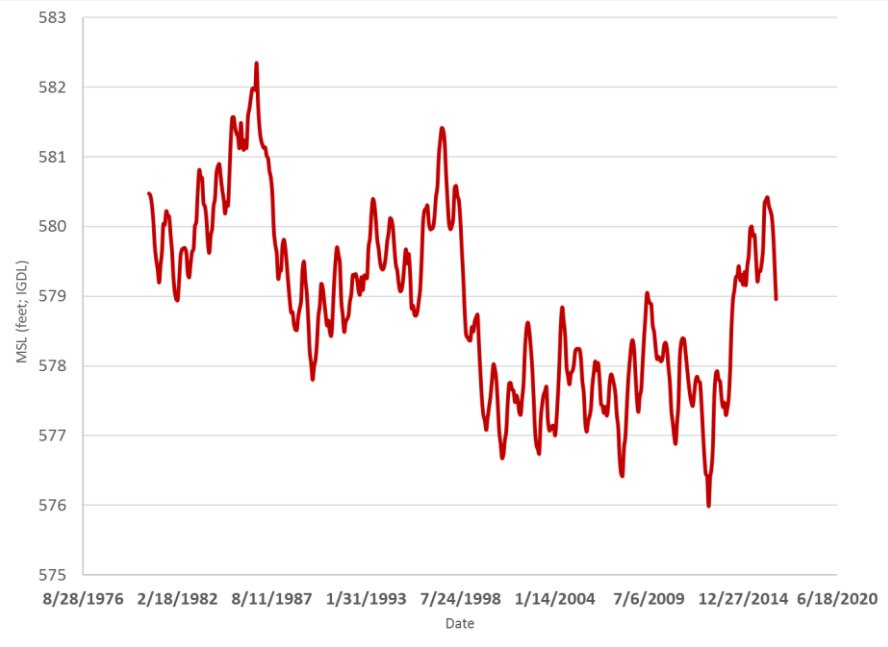
Considerations and questions for monitoring

- Long-term AND short-term monitoring valuable
- What is the level of detail needed?
  - Temporal and spatial variability of processes under consideration
- Understanding how the coast is changing is important not only for building resilience in the future, but also for making cost-efficient and sustainable management decisions right now
  - Present and future benefits for coordinating landscape change monitoring

WHY is the coast changing?

Environmental forces

Fluctuating Lake Levels



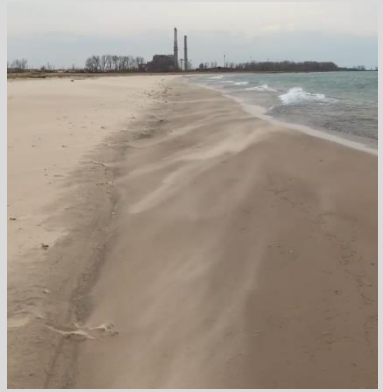
Natural vs. anthropogenic

Picture of development

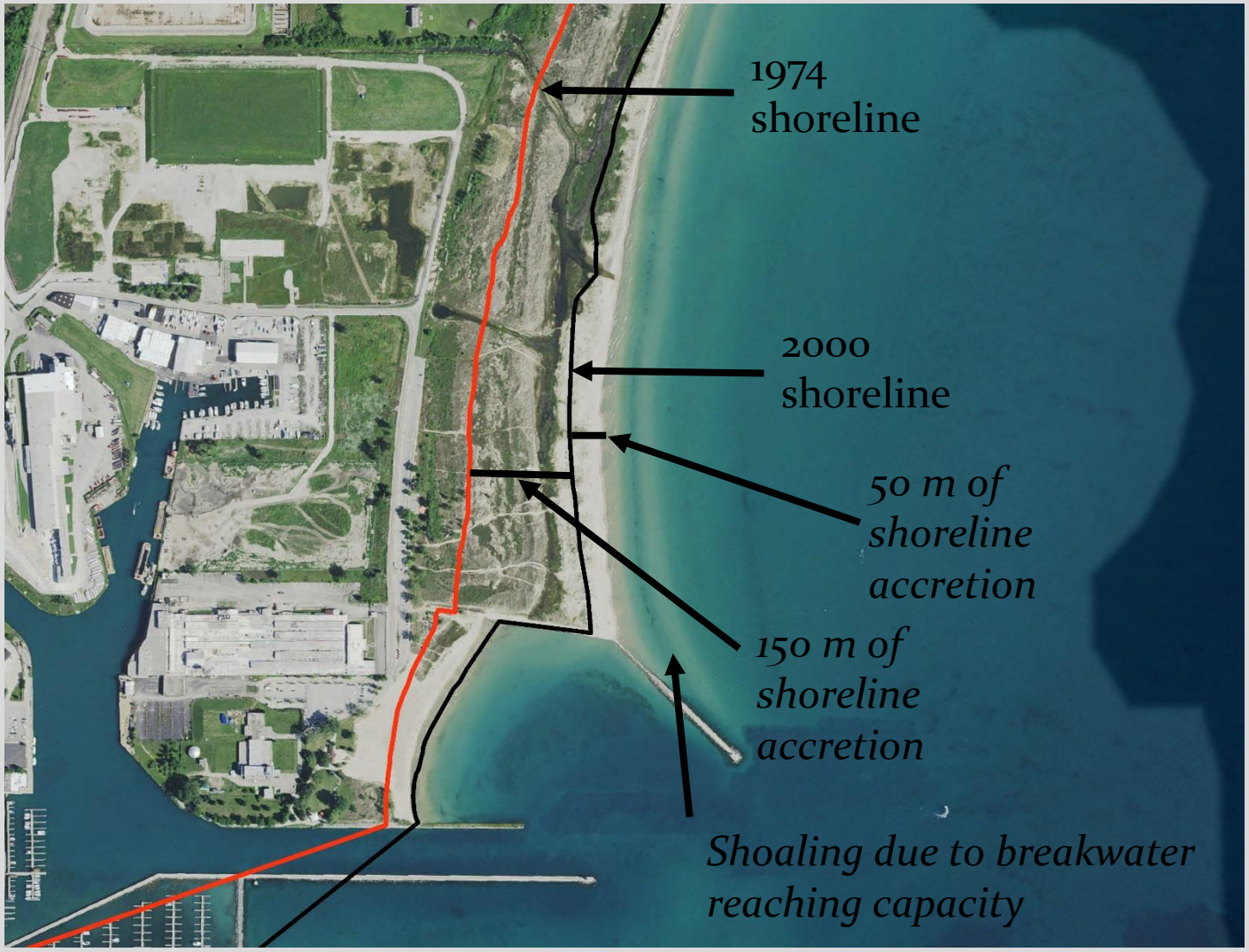
Storm waves and surge (overwash)

Nearshore Ice

Wind



WHY is the coast changing?



Anthropogenic Forces

Environmental process monitoring

- Better coordination on data that already exists
- Need more in situ measurements
  - Validate model data
  - Nearshore vs. offshore measurements
- Better current conditions data = better future conditions scenarios

Moving from monitoring to resiliency

- Connect geologic change monitoring and environmental process monitoring- understand the coastal system dynamics
- Forecast how future environmental conditions will change the coastal landscape
  - Couple recent monitoring data, historical and geological records of change, and future conditions scenarios (e.g. those to be developed in USACE study)
- Models to simulate these processes (e.g. regional sediment transport, coastal evolution)
- Integrate monitoring, research, and models into decision-making process

Opportunities for coordination and collaboration

- Coordinated data collection
  - National and regional data collections (e.g. JALBCTX, 3DEP)
    - What are the shared priorities?
    - Monitoring necessary for whole region, not just a given site
      - These processes do not stop at state lines (e.g. WI-IN-IL sand transport)

- Knowledge and resource sharing
  - Lake Michigan coastal database- e.g. USGS work
  - Shared vessels and equipment
  - Partnerships among states- states helping each other
    - States could provide expertise to each other

Active efforts to coordinate geomorphic monitoring

- Great Lakes Coastal Mapping Summit
  - Purpose: Discuss data needs and explore opportunities for collaborating on coastal mapping acquisition and application
  - Key issues and themes
    - Increase awareness of existing datasets
    - Data portals- many vs. one-stop shop
    - Prepare for future conditions
    - Joint funding opportunities
    - Data gap analysis of topobathy LIDAR data ahead of USACE collection in 2018
      - Where do we NOT need to survey is just as important as where we do need to survey
- Great Lakes Bottom Mapping Workgroup
  - Data generation, u
- Sea Sketch

LMMCC as a vehicle for coordinating monitoring

- Coordinating coastal landscape monitoring in Lake Michigan ties into broader efforts throughout the Great Lakes
  - Determine needs and priorities throughout region; leverage resources
  - Assemble data needed for large-scale studies such as USACE project- helps to focus work on the most vulnerable areas
- Develop monitoring standards and best practices for the region
- Best methods for coordinating monitoring?
  - What makes sense? What can be added to existing efforts?
  - Share data through existing portals or does a new tool need to be created?
  - Mechanisms for sharing resources and knowledge?