Monitoring Geologic and Nearshore Dynamics to Improve Shoreline Sustainability

Introducing the new
Sustainability Work Group of LAMP

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

COASTAL Management Program
IL Dept of Natural Resources

PRAIRIE RESEARCH INSTITUTE

ILLINOIS STATE GEOLOGICAL SURVEY
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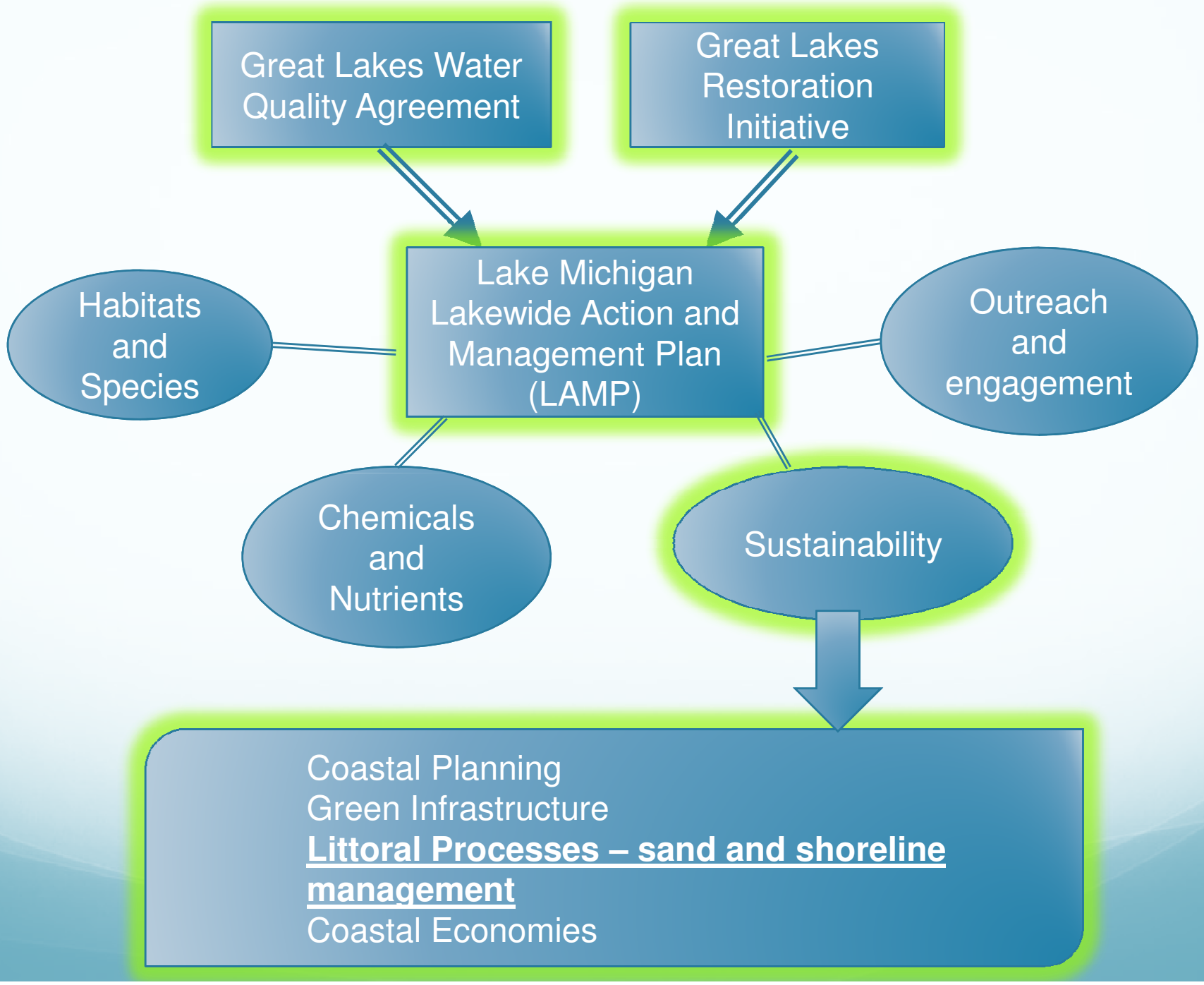

Great Lakes Water Quality Agreement
Great Lakes Restoration Initiative
Lake Michigan Lakewide Action and Management Plan (LAMP)
Habitats and Species
Outreach and engagement
Chemicals and Nutrients
Sustainability
Coastal Planning
Green Infrastructure
Littoral Processes – sand and shoreline management
Coastal Economies

Lake Michigan LAMP Partnership

- Alignment with new Great Lakes Water Quality Agreement
  - New provisions address aquatic invasive species, habitat degradation and the effects of climate change
- Alignment with Great Lakes Restoration Initiative
  - provide information on ecosystem processes, stressors and changing conditions due to emerging problem such as urban growth and climate change.
- Increase relevance and effectiveness of Lakewide Action and Management Plan
  - But WHY and HOW?

GLWQA science commitments

- Undertaking the necessary monitoring and surveillance to anticipate science needs and to address **emerging environmental concerns**;
- Reviewing the science supporting the agreement's objectives to inform **management actions and policy development**;
- Identifying science priorities and using best efforts to ensure that science funding agencies **orient their research programs** in response to research priorities;
- Utilizing comprehensive, science-based ecosystem indicators to assess the state of the Great Lakes, **to anticipate emerging threats and to measure progress;**
- Publicly describing **basin-wide environmental trends** and lake-specific conditions through a State of the Great Lakes report.

Let's get real…

- We are here to find solutions to real-world problems
- Monitoring and Research is critical component to knowing what those problems are, and can direct how we solve them!
- Monitoring and Research should be consciously directed at helping solve problems
- In the context of LAMP, we need solution-driven monitoring and research.
- AND, although we consider our work environment-driven, we must remember and consider the fundamental needs of our economy and communities and harmonize our approaches. This is the definition of Sustainability.

LM Partnership Work Groups

- Habitats and Species
- Chemicals and Nutrients
- Outreach and Engagement
- **Sustainability (Alignment with Coastal Programs)**
  - **Coastal Resilience and Climate Change**
    - Coastal Planning
    - Green Infrastructure
    - **Littoral Processes – sand and shoreline management**
    - Coastal Economies

What is the Problem?

Too much sand

Not enough sand

Why is this important?

- **Affect habitats and species**– nearshore and terrestrial (i.e losing habitats and populations, and changes habitats)
- **Affects recreation** – not a specific goal of GLQWA or GLRI, but important. This is how many people connect to great lakes and why they care!
- **Affects economies** – again not a direct goal of GLQWA, but coastal economy is huge and critical to GL communities
- **Affects water quality** – release of contaminants, beach health

Littoral Processes Sustainability Monitoring

- Monitoring needs (short-term and long-term):
  - Nearshore physical processes (e.g. waves, currents, ice)
  - Beach and bluff shoreline change; dune and upland change
  - Nearshore sand thickness and bathymetric change
  - Weather and climate– conditions, severity, impacts
- Desired outcomes:
  - Strategies to mitigate or adapt to changing conditions
    - Actions (that are coordinated and sustainable)
    - Policies (that promote regional benefits)

Illinois Coastal Geologic Research and Monitoring Program

Solution-oriented data collection and research that fills gaps in our understanding of the beach and nearshore system along the Illinois coast

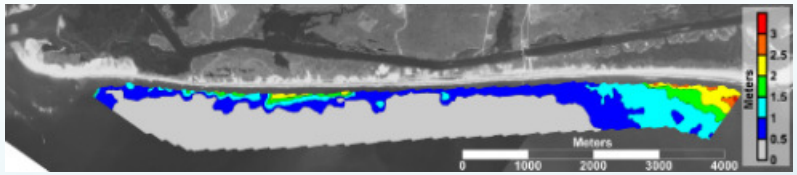
FEEDBACK LOOP between research and coastal management

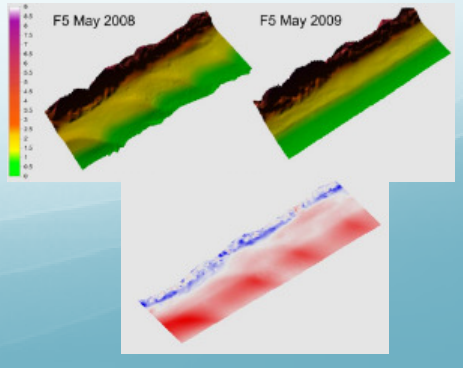
Major barriers to sand management and habitat preservation

- Minimal regional coordination and pro-active management
- Lack of long-term monitoring of coastal processes
- Limited understanding of how physical processes drive patterns of coastal change and sediment transport
- Lack of coastal evolution model for this area
- **We are addressing these barriers through:**
  - Strategic research and monitoring
  - Collaboration with municipalities, academic institutions, and government agencies

Coastal Processes Mapping and Monitoring

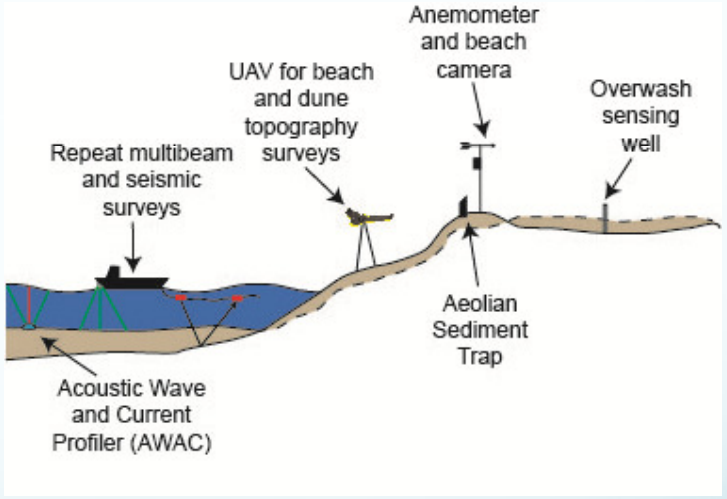
- Active:
  - Sand thickness and distribution- Helicopter Time Domain Electromagnetic (HTEM) surveys
  - Beach and dune topography (GPS surveys)
    - Fall and spring
    - Pre and post storm
  - Photographic monitoring of wave conditions and beach topography





Coastal Processes Mapping and Monitoring

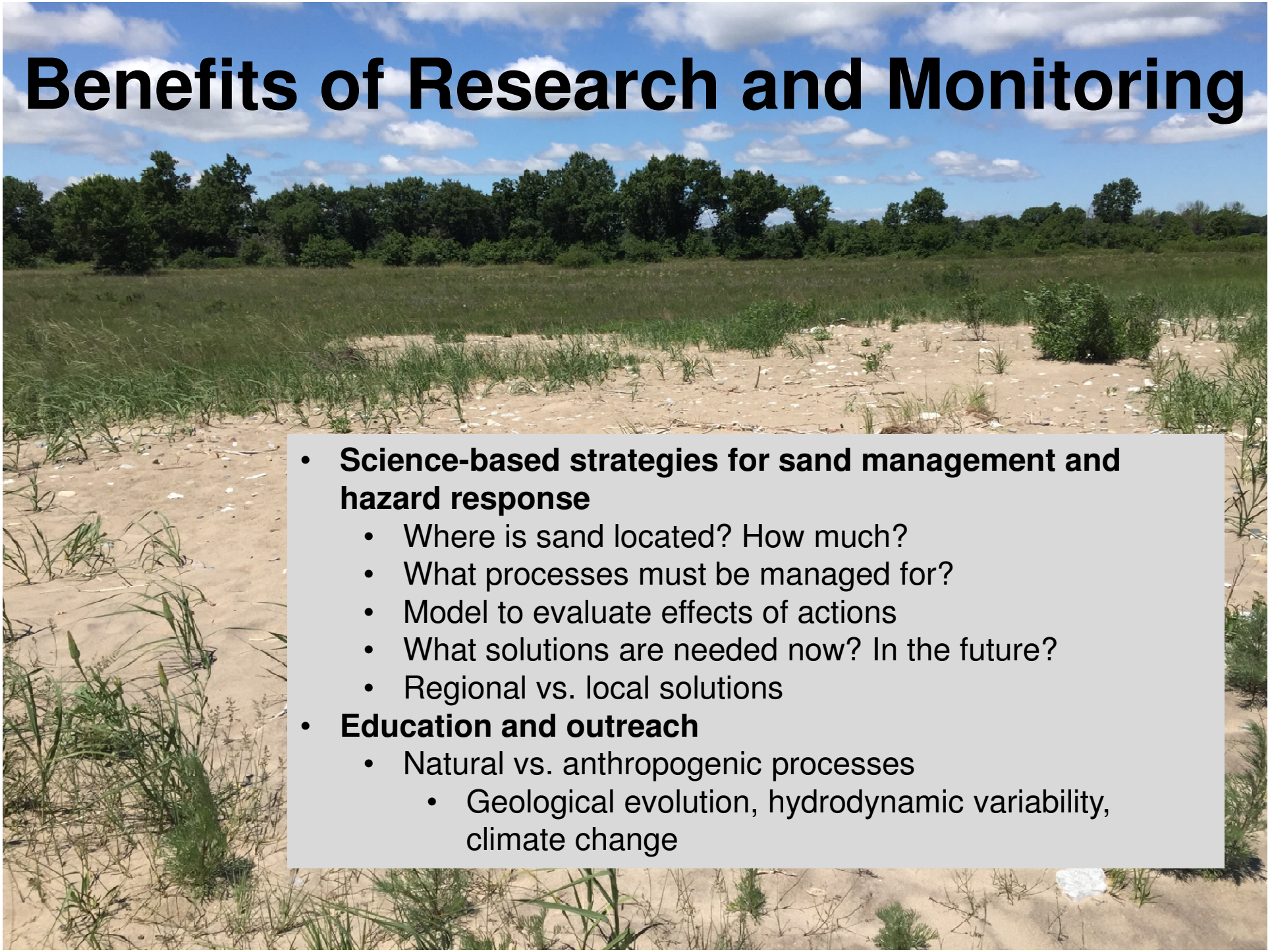
- Proposed:
  - Nearshore waves, currents, lake level, and ice processes
    - Buoys; acoustic wave and current profiler; meteorological station; stereo cameras
  - Sediment transport
    - Acoustic suspended sediment sensors, current data, repeat bathymetric and sub-bottom surveying; stereo cameras; aeolian and overwash transport sensors
  - Bathymetry, sand thickness, and topography change
    - Multibeam and sub-bottom surveys; UAV surveys, citizen science



Coastal Processes Research

- **Utilize monitoring data to connect physical processes to coastal response**
  - Dominant processes
  - Spatial and temporal patterns of change
- **Develop and validate a coastal geomorphic model**
  - Simulates coastal evolution in response to physical drivers (climate, weather) and anthropogenic drivers (sand management actions, engineering)
- **Critically evaluate strategies for managing coastal change**
  - GLRI proposal- habitat loss at Illinois Beach State park
  - USACE/USGS- beach nourishment effectiveness

Benefits of Research and Monitoring



- **Science-based strategies for sand management and hazard response**
  - Where is sand located? How much?
  - What processes must be managed for?
  - Model to evaluate effects of actions
  - What solutions are needed now? In the future?
  - Regional vs. local solutions
- **Education and outreach**
  - Natural vs. anthropogenic processes
    - Geological evolution, hydrodynamic variability, climate change