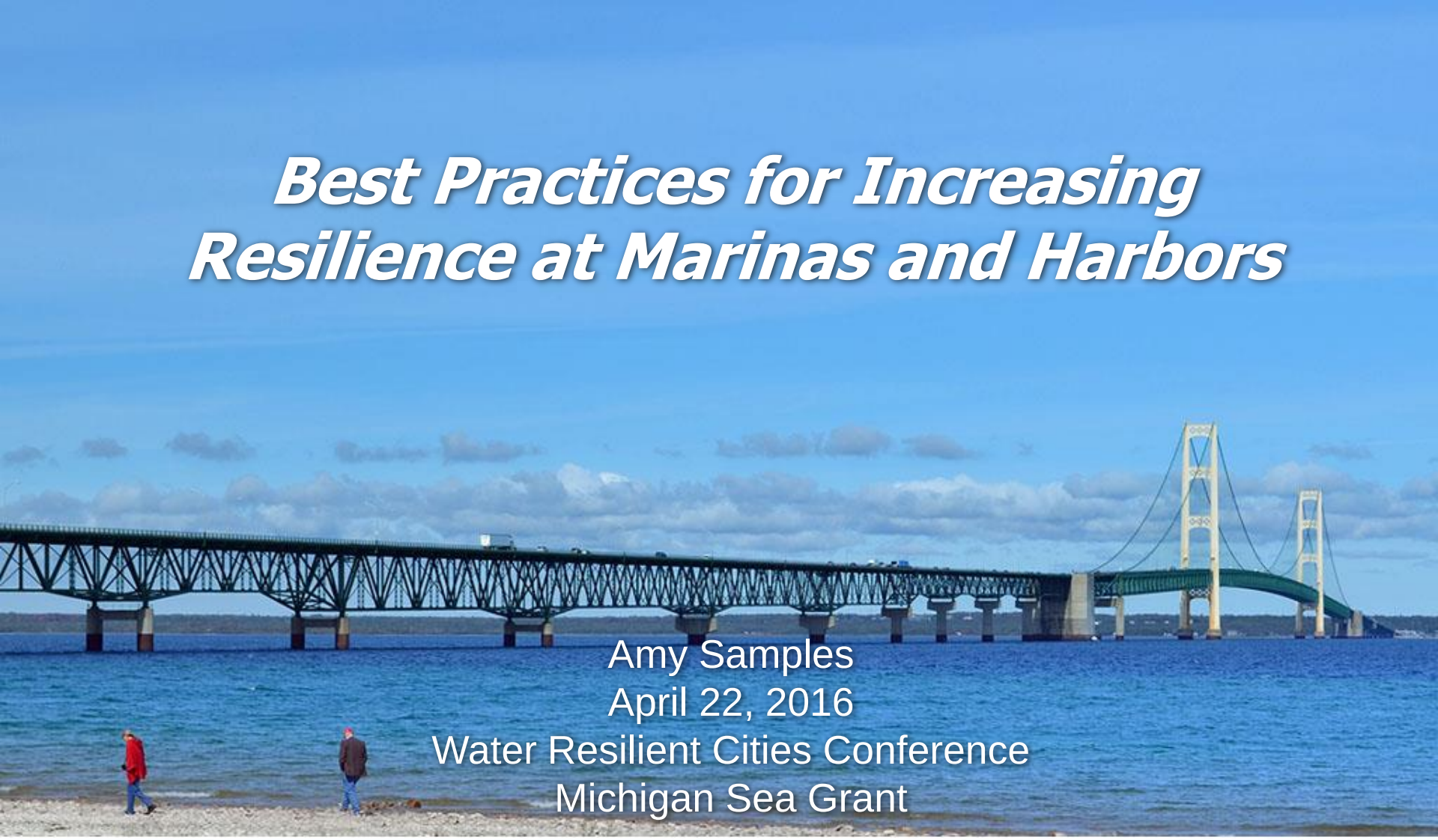
Best Practices for Increasing Resilience at Marinas and Harbors



Amy Samples
April 22, 2016
Water Resilient Cities Conference
Michigan Sea Grant

Sea Grant Michigan
MICHIGAN STATE UNIVERSITY
NOAA
UNIVERSITY OF MICHIGAN

Operators Face Change and Challenges

Environmental Conditions

- Fluctuating water levels
- Increased frequency and intensity of storms
- Changes in precipitation and temperature

Policy and Budget

- Deteriorating infrastructure
- Limited funding for repairs/improvements

Avoiding the Issue

- Information overload!
- Controversy, uncertainty
- Focus on day-to-day operations

2013 Great Lakes Climate Assessment Grant

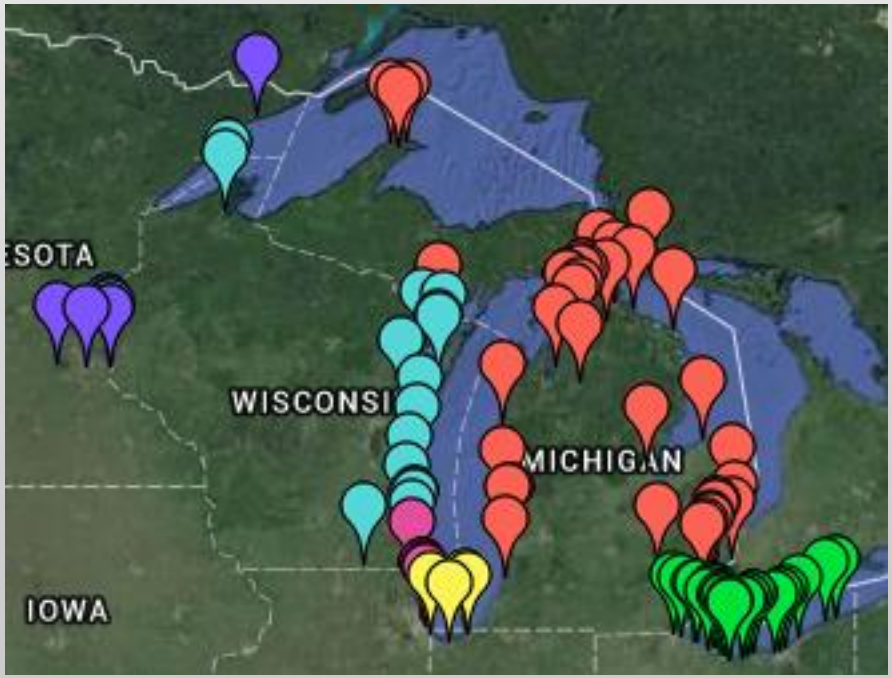
Assist marinas and harbors with sector-specific problem identification, decision making and planning related to climate change adaptation.

GLISA

Approach

- Develop training materials about climate change for marina and harbor operators
  - ✓Existing platform
  - ✓Existing tools and resources
  - ✓Existing partnerships

Great Lakes
Clean Marina Network



GREAT LAKES CLEAN MARINA

www.glcleanmarina.org

Process

- Started from existing needs assessment
- Clarify needs with stakeholders
- Conference presentations
- Content development
- Workshops and webinar
- Beta testing
- Publish module, companion materials

Online Training Tool

- Unit 10: Increasing Resilience
  - Section 1: Potential Risks and Impacts Background
  - Section 2: Infrastructure
  - Section 3: Dredging
  - Section 4: Planning and Financing
  - Unit Review

Section 1: Potential Risks and Impacts Background

- Fluctuating Water Levels
- Increased Storm Frequency and Intensity
- Precipitation and Temperature Changes

Fluctuating Water Levels

Lower Levels

Higher Levels

Undermine stability and strength of structures; increased dredging need; beach access; native vegetation

- Safety and access issues
- Need for additional dredging
- Channel access and bottom strikes

- Create a greater potential for flooding of critical land areas and operational structures

Credit: Gene Clark/UW Sea Grant

Understanding Lake Levels

- Three main factors related to inputs and outputs (i.e., the water budget):
  - *Evaporation* off the lakes
  - *Precipitation* onto land and lakes
  - *Runoff* from the land and rivers into lakes
- Factors influenced by climate:
  - Air and water temp, plus ice cover influence evaporation
  - Increased precipitation predicted

Resources and Tools

- **Great Lakes Water Level Dashboard** (NOAA): View current, historical and projected water levels
- **Great Lakes Hydro-Climate Dashboard** (NOAA): Includes data on drivers behind water level change, like precipitation, evaporation and ice cover data
- **Great Lakes Lake Level Viewer** (NOAA): Visualization tool used to gain a better perspective on changing lake levels
- **Water Level Bulletins and Forecasts** (USACE): Historic, current and predicted water levels
- **CoastWatch: Great Lakes** (NOAA):

  Physical data source

Section 2: Infrastructure

- Evaluate Risks to Infrastructure and Grounds
- Invest in Long-term Adaptations

Image sources: MDNR, Wisconsin Sea Grant, : Bill Brose/Smith Group JJR

Section 3: Dredging

- Identify Jurisdiction for Dredging
- Collect Required Information
- Explore Funding Options

Great Lakes Navigation System

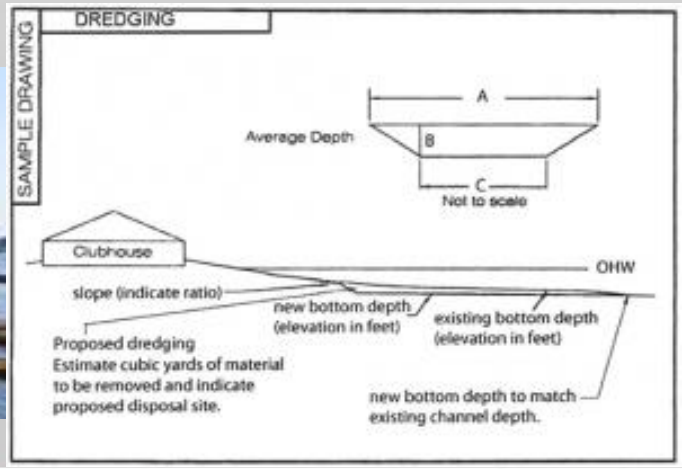
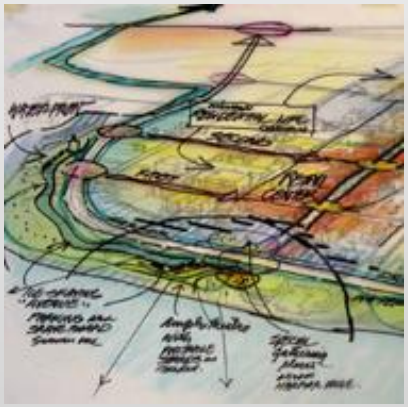


Image sources: USACE, MDNR, Ohio Sea Grant

Section 4: Planning and Financing

- Represent Your Facility in Community Planning
- Create Facility-specific Plans
- Estimate Costs of Adaptation
- Explore Financing Options



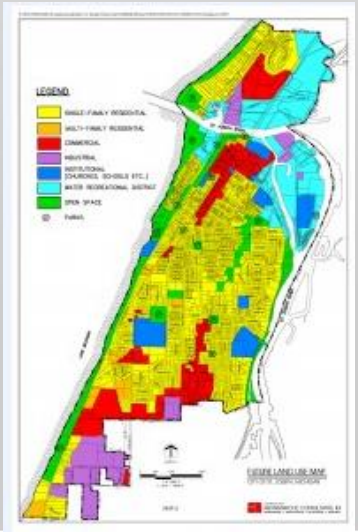


Image sources: Grand Haven Waterfront Plan; 2009 St. Joseph Master Plan

Beta Testing Results

- *Good contribution to issue in **good location***
- *The amount of information given is great, and the **links to external resources** is an amazingly useful feature.*
- *Text describes via both **text and photos** the major issues they should be aware of in a **clear and easily understandable format**.*
- *…should help people that it's **all in one place**.*

A-Ha! #1 - Framing

Climate-related Risks = Operational risk

- Tools and adaptation approaches provided with an introduction and interpretation specifically crafted for marina and harbor operators.

Operational Risk: Storm Damage

Storm damage from Hurricane Sandy at a Lake Erie marina. (Source: Ohio Department of Natural Resources)

Wind-generated waves breach the harbor structure in Canal Park in Duluth, Minnesota. (Source: Gene Clark, Wisconsin Sea Grant)

Operational Risk: Estimate Costs of Adaptation

- **Costs will likely increase:** Storm damage repairs, increased dredging needs, water level variability, etc.

Given a 3-foot drop in water levels costs range from ***$53,000 to $83,000 per marina****, depending on the lake* – International Upper Great Lakes Study

Great Lakes Port & Harbor: Infrastructure Matrix & Dredging Cost Estimate Tool – WI & MN Sea Grant

A-Ha! #2 - Local Decision Makers

- Initial focus on operators… efficacy of climate adaptation efforts is dependent on buy-in from local decision makers.
  - Expanded outreach goals to include municipal planners and local communities

MICHIGAN green COMMUNITIES

Challenges and Lessons Learned: Part 1

- To provide customized outreach effort you must start with trust and access
- Trust in word of mouth and advice from industry peers is significant
  - Work within existing, trusted peer networks

Michigan Boating Industries Association

GREAT LAKES CLEAN MARINA

NWWN National Working Waterfront Network

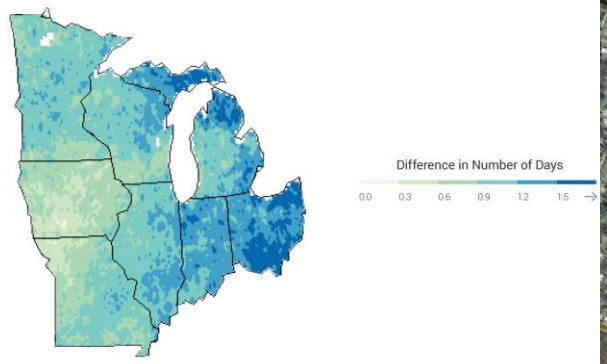
Challenges and Lessons Learned: Part 2

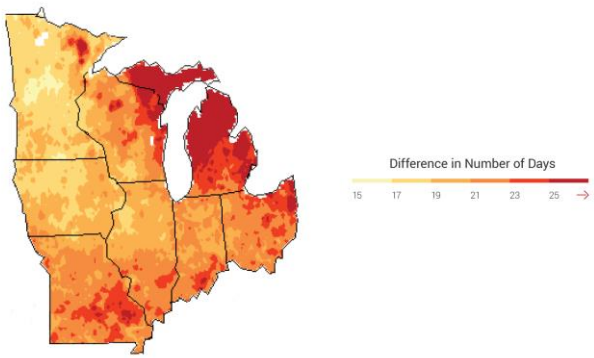
- Focusing the attention of an audience typically dedicated to day-to-day operations on longer-term issues and solutions.
  - Returned to operators in off season for annual conference
  - Operational issues as immediate needs

Challenges and Lessons Learned: Part 3

- Accounting for uncertainty and personal bias against climate science
  - Focused message on building resilience to a range of conditions (while providing information on predicted conditions)

Image sources: National Climate Assessment, US FEMA



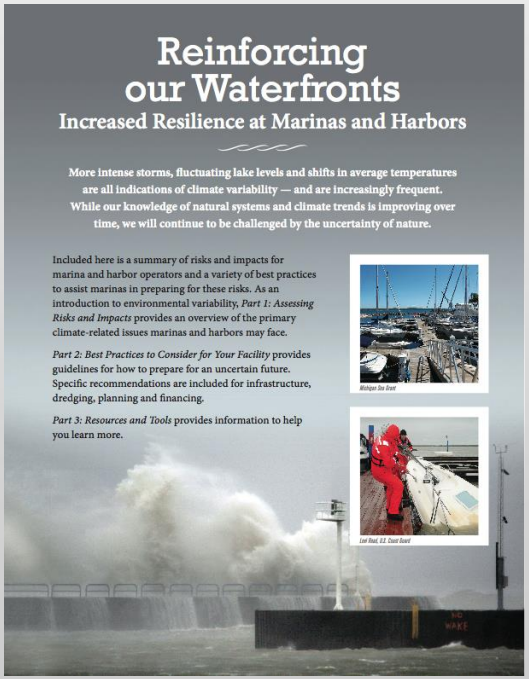


Outcomes for Operators:

- Increased knowledge of climate change impacts;
- Equipped to identify and implement sector-specific responses to variable conditions;
- Gained familiarity with available tools and technology;
- Participated in development of best management practices; and
- Gained insight on messaging to local planners and decision makers.

Into the Future

- Clean Marina Classroom Unit
- Fact sheet series (PDFs)
- Companion webpages
  - *Policy and Planning for Coastal Communities*
  - *Climate Adaptation*
- Project Summary



www.glcleanmarina.org
www.cleanmarinaclassroom.org

Future Applications

- Valuable to customize training materials:
  - more accessible and useful if framed in a stakeholder's familiar context and language;
  - adapted to the constraints (e.g., seasonal appointment) and priorities of the user; and
  - collaboratively developed and refined.
- Potential for replicating this effort for other stakeholder groups

Sustainable Small Harbors Project

- **Purpose:** Identifying a path toward environmental, social and economic sustainability for small recreational harbors

- **Process:** Design charrettes (facilitated community planning sessions); Tools and Tactics guidance

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