

Facing an Uncertain Future: Increasing Resilience at Marinas and Harbors

Amy Samples

November 17, 2015

National Working Waterfronts and Waterways Symposium
Michigan Sea Grant



MICHIGAN STATE
UNIVERSITY



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

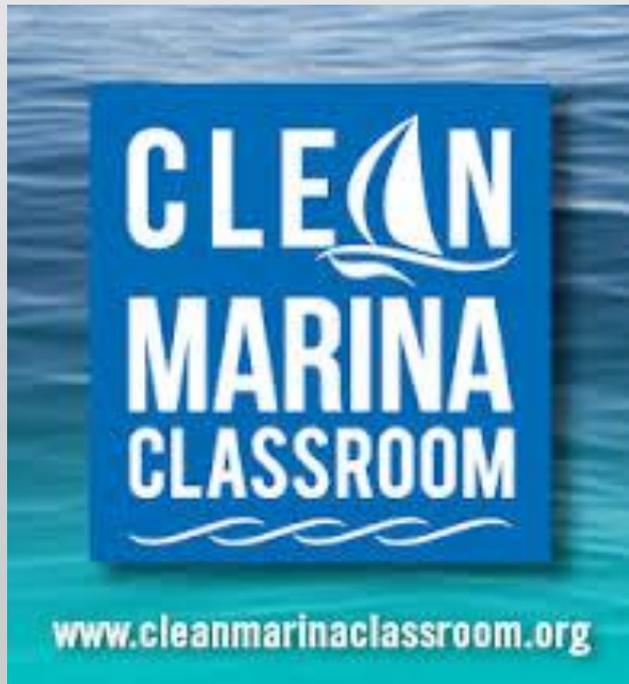
2013 Great Lakes Climate Assessment Grant

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



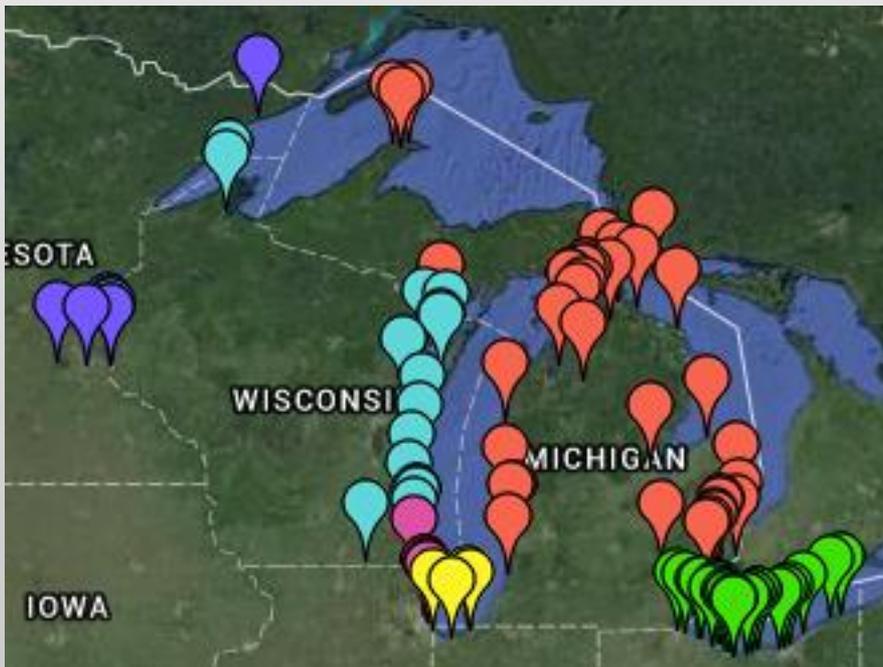
GLISA

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



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

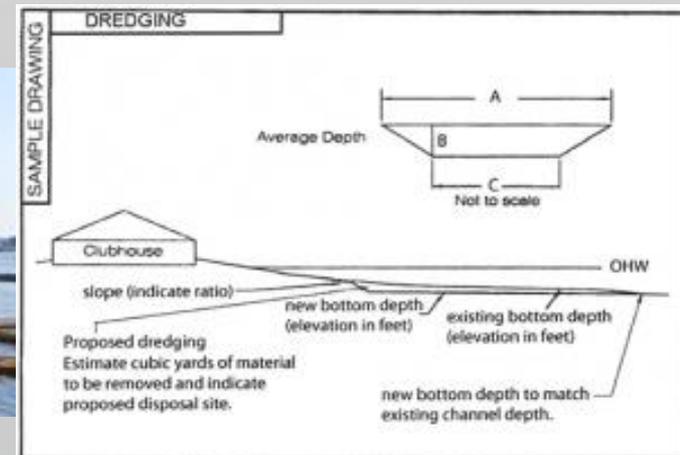


Image sources: USACE, MDNR, Ohio Sea Grant

Section 4: Planning and Financing

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

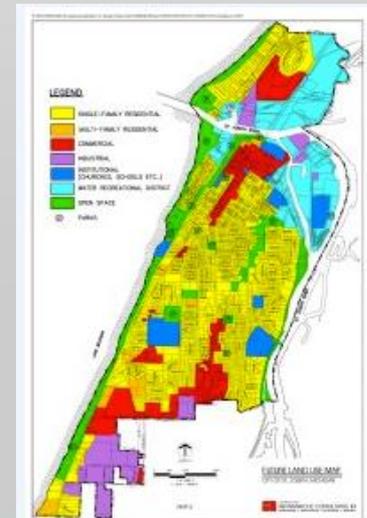
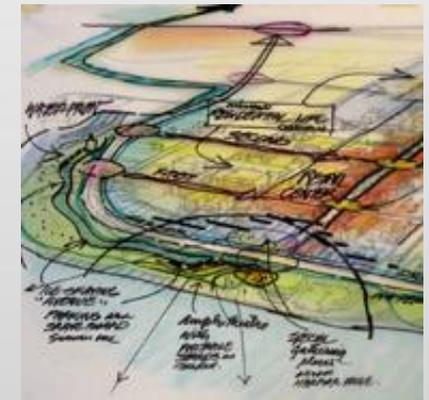


Image sources: Grand Haven Waterfront Plan; 2009 St. Joseph Master Plan

Linkage to the Sustainable Working Waterfronts Toolkit



[Community](#) [Financing](#) [Law & Policy](#) [Economics](#) [Tools in Action](#) [Historic Trends](#)

National
Working Waterfront
Network



Mon November 16, 2015

Information for...

- [Decision & Policy Makers](#)
- [Waterfront Landowners](#)
- [Waterfront Users](#)

Working Waterfronts Newsletter

[Click here](#) to sign up for the National Working Waterfront Network's Newsletter.

Site Tools

- [Toolkit Video Tours](#)
- [Case Studies](#)
- [Oral Histories](#)
- [Working Waterfront Community Center](#)

[Printable Case Study](#)

Case Study

Transforming Marquette, Michigan's Waterfront with Form-Based Code

Location

Marquette, Michigan

Timeframe

2000 - present

Summary

The goal of Marquette, Michigan's waterfront redevelopment was to transform the former industrial waterfront into a walkable, mixed use waterfront zone that was physically connected to the downtown and supported a host of water depended uses. This case study describes how the city used **form-based code** to transform its waterfront to meet community needs and desires, protect existing working waterfront areas, and foster greater protection and **resilience** of its natural resources in a changing economy.

Marquette, MI
from National Working Waterfront Network on Flickr

Region

- Great Lakes

National Working Waterfront Network

Mon November 16, 2015

Information for...

- [Decision & Policy Makers](#)
- [Waterfront Landowners](#)
- [Waterfront Users](#)

Working Waterfronts Newsletter

Click [here](#) to sign up for the National Working Waterfront Network's Newsletter.

Site Tools

- [Toolkit Video Tours](#)
- [Case Studies](#)
- [Oral Histories](#)
- [Working Waterfront Community Center](#)
- [Glossary](#)
- [About Us](#)
- [Site Map](#)

Comprehensive Planning

Section 303 of the [Coastal Zone Management Act](#) cites comprehensive planning as one of 11 specific policy objectives of state coastal management programs. Comprehensive planning allows for coordinated decision-making, reducing conflict among various waterfront users. Plans may result in waterfront access protection, preservation of cultural or maritime heritage, and even enhanced economic development. Engagement of community members and various user groups when crafting these plans may lead to more successful plans as has been the experience of Gloucester, Massachusetts and many other communities. A number of these locales have produced resource materials (accessible from the [Community & Stakeholder Engagement](#) section of the [Resources](#) page) that provide guidance on this important practice. To be effective, however, the plans must be coupled with enforceable land use policies, such as zoning ordinances, building codes, and permits and licenses.

Planning
Local gov
managem
for the ne

- [W](#)
- [p](#)
- [tr](#)
- [H](#)
- [th](#)
- [w](#)
- [a](#)
- [S](#)



Sea Grant Michigan

Search

About | Explore | Education | Research | Publications & Photos | News & Events

Browse: [Home](#) / [Explore](#) / [Coastal Communities](#) / [Policy and Planning for Coastal Communities](#)

Subscribe to the *Upwellings* newsletter

Policy and Planning for Coastal Communities

Community-based planning can help bring a community together to create a shared vision for the waterfront, can protect economic interests and will help build preparedness in the face of natural disaster.

Comprehensive or Master Planning

A **comprehensive plan** (or master plan) allows for coordinated decision-making in community land use. A successful planning process is dependent on the input of community members. Although decision-making authority resides with governmental bodies, waterfront stakeholders can raise issues of concern and offer potential solutions by actively participating in planning processes. To be effective, plans must be coupled with enforceable land use policies, such as zoning ordinances, building codes, and permits and licenses.

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

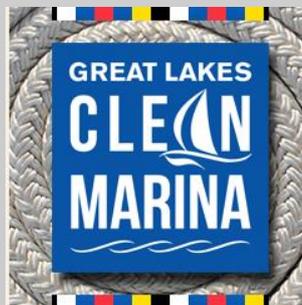
A-Ha! #2 - Local Decision Makers

- ◆ 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



Challenges and Lessons Learned: Part 1

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



Challenges and Lessons Learned: Part 2

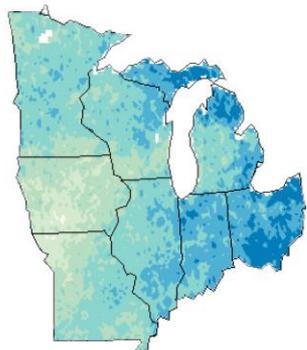
- ◆ Focusing the attention of an audience typically dedicated to day-to-day operations on longer-term issues and solutions.
 - ◆ Returned to operators in off season for annual conference
 - ◆ Operational issues as immediate needs



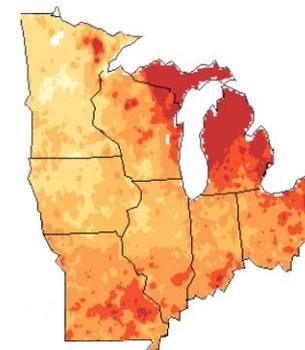
Challenges and Lessons Learned: Part 3

- ◆ 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



Difference in Number of Days
0.0 0.3 0.6 0.9 1.2 1.5 →



Difference in Number of Days
15 17 19 21 23 25 →

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



- Process:
 - Charrettes (facilitated community planning sessions)
 - Six-month engagement process with the research team.
- Outcome: Strategies to improve economic, social and environmental sustainability of Michigan's harbor communities.

A photograph of a sunset over a body of water. The sun is low on the horizon, creating a bright orange and red glow that reflects on the water's surface. The sky transitions from a deep orange near the horizon to a darker blue at the top.

Thank You.

QUESTIONS, COMMENTS OR REMARKS?

Amy Samples
asamples@umich.edu
(734) 647-0766

Mark Breederland
breederl@msu.edu
(231) 922-4628

www.miseagrant.umich.edu