

Goal:

Objective (3E): The key stakeholders in the Great Lakes region will be aware of the climate change issue, will understand the ways climate change may affect their operations and planning processes, will be aware of the current state of climate modeling for the region which is relevant to their needs, will be cognizant of the inherent uncertainties and variability in climate modeling and what that means to them, will be engaged with their local Sea Grant programs in a continuing dialogue about climate change impacts and forecasting improvements, and will be prepared to adapt to a changing climate.

Objectives

- Objective (1B): CLERL and CLER researchers will run several regional model scenarios relating to lake water levels on the existing platform (CHARM and/or ELBRM) to address specific priority concerns identified by stakeholders.
- Objective (5B): CLER researchers will run several model scenarios relating to water levels, sedimentation, and other parameters identified by key stakeholders on the existing platform (CLERM - Maumee basin).
- Objective (1A): CLERL and CLER researchers will gain a better understanding of and appreciation for the forecasting needs of the key stakeholders so that they can identify priority stakeholder forecasting needs which can be met by their models.
- Objective (1C): Where capability to run scenarios important to stakeholders is not within the current modeling capacity, CLERL and CLER researchers will use this project as a means to identify future directions for research in developing their models and the products resulting from them.
- Objective (6F): CLERL and CLER scientists will be actively engaged in developing model scenarios and forecasts to meet stakeholder needs and in communicating the results of their research to the key stakeholders.
- Objective (6A): In year 1, two focus groups composed of key stakeholders from (a) the Toledo Port Authority and a Maumee basin marina, and (b) Toledo stormwater managers and Toledo community planners will work with Ohio Sea Grant staff to identify specific forecasting needs which can be met with current data and modeling capacity. Discussion of how model results could be used by them in adapting to climate change will factor in selecting specific model scenarios to run.
- Objective (5D): In year two, the focus groups will reconvene with scientists and OH Sea Grant staff to communicate model results (web, visualizations, etc.), discuss strategies for adapting to climate change, and discuss strategies for broader dissemination of the case study.
- To characterize public concerns and potential impacts stemming from climate change on shipping, commercial marinas, recreation, storm water management and community planners.
- Objective (6E): OH Sea Grant staff will set up the Toledo case study for use as an example in communicating about climate change to other communities both within and beyond the Great Lakes region.
- Objective (2A-5C): MN and WI Sea Grant staff will work with pre-existing economic data on shipping and sediment management costs to translate climate change scenarios into economic terms.

SARP Grant Logic Model

Activities

Climate Scenario Modeling

- CHARM will initially be executed as a series of three time slices of twenty years.
- Climate projections generated by CHARM will be also used as input to the ELBRM to provide river discharge and temperature as well as sediment load projections for the Maumee River.
- Lake water level projections by CHARM and AHPS will be used in conjunction with detailed bathymetry maps of coastal areas (NOCC, 2007; USACE, 2007) for comparing coastal bathymetry under present condition and future climate scenarios for the entire Great Lakes basin.
- Lake water level and temperature projections by CHARM and AHPS will be used in conjunction with sediment load projections by ELBRM for the Maumee River watershed, detailed bathymetry map of the Toledo harbor and Maumee Bay for better estimating sustainability of the Toledo harbor operation and of the case-study marina in Maumee Bay, under present conditions and future climate scenarios.
- Water level and sediment load projection for the marina will be used in conjunction with a detailed bathymetry to assess the sustainability of (Maumee Bay) marina operations.

Toledo Case Study

- Toledo focus group involving stormwater managers and community planners to assemble concerns regarding runoff, water quality and management efforts.
- Toledo focus group involving the shipping industry, port authority officials and marina trades representatives to assemble their priorities for channel and harbor maintenance, impacts on their activities, and economic concerns.
- 2nd set of Toledo focus groups.

Economic Assessment

- Frontier trade and conventional issues and impacts will be identified utilizing existing research and reports published in the literature. Specific adaptations required to address environmental variation will be reviewed and compiled.
- Great Lakes focus groups will be surveyed to determine what their views are on potential climate change issues and how they would need to modify production, normal activities and facility management and design issues.
- The economic impact of these perceived modifications will be estimated and projected to generate for each type of modification expected.
- The percentages of typical Great Lakes ports, harbors and marina facilities which match those facilities and communities identified as outlined above with similar risks to the specific impacts will be estimated.
- Impacts will be ranked in terms of commonality as well as infirmating likely prioritization.
- Estimates of economic impacts based upon issues identified and associated costs and number of facilities impacted will be prepared.
- Academics will be engaged to promote studies relating to possible solutions to those issues most common and of highest priority.
- The qualitative assessment will be tested for the specific case study of the Duluth/Superior harbor. Specific interest groups, commercial facilities and representative private marinas within the Duluth/Superior harbor will be reviewed for modifications necessary to compare climate change estimates from the CHARM modeling efforts.
- The qualitative assessment will be extrapolated for the specific case study of the Toledo harbor and a Maumee basin marina for the specific scenarios generated from the ELBRM to estimate costs associated with its combination of particular features.
- Costs can then be estimated and abstracted to particular Great Lakes port with common features.

Communicating Uncertainty

- Literature review on assessment of uncertainty.
- Development of a communication plan for communication of uncertainty and climate change.
- Distill key messages and communication strategies which can be used in communicating the concepts of uncertainty and variability to lay audiences.
- Determine the tools which Sea Grant staff need in order to present uncertainty and climate information to their local audience.
- Create tools and provide training to agents.
- Workshop with Cornell researcher Dr. EG Mills on lower food web indicators in Lake Ontario that includes components on uncertainty, communication and global climate change.

Climate Change Communication

- Internal and external websites.
- Assess in the dissemination of a strategic approach to communicating about climate change to key stakeholders.
- Promote incorporation of specific elements of the regional strategy into the relevant segments of each Great Lakes Sea Grant Network program's state strategic plans as these go through the regular planning cycles.
- Develop a suite of specific communications products.
- Facilitate access to communications products about climate change and about scientific uncertainty and variability.

Strategic Planning

- Develop a strategic plan for climate change outreach in the Great Lakes region.

Integration into State Outreach Programs

- Development of factbooks and outreach materials to educate the public on climate change and the effects it may have on PA.
- Workshop for park managers and other stakeholders that will address potential effects of climate change to PA ecosystems and in particular Pictured Rocks State Park.
- Public workshops on ecosystem uncertainty for Lake Ontario audience.
- Protocols for addressing public versus private property rights with regards to a changing shoreline (PA).

Outputs/Products

- Outcome 1: Improved regional scale models of the impacts of climate change in the Great Lakes region that address factors most relevant to the key stakeholder sectors (ports, marinas, stormwater managers and community planners)
 - Sediment load model for the Maumee River
 - Application of ELBRM+CHARM+CLM & ELBRM+CHARM+CCM to forecast change in coastal depth
 - Models predicting climate change effects on the Port of Toledo and surrounding areas will be developed
 - Reports/Scientific Publications
- Outcome 2: An assessment of economic costs of climate change to the key stakeholder sectors (ports and marinas)
 - Modelers will be enabled to incorporate localized data and concerns into models.
 - A written case study will provide guidance regarding climate change influences to other communities in and beyond the Great Lakes region. Concerns and priorities of stakeholders will be documented.
 - Supporting project literature will be established in the Toledo area.
- Outcome 3: Case studies of the impact of climate change to specific sectors in specific communities, including an economic component, which can be used as examples in communicating the reality of climate change impacts.
 - Outcome 3a: regional framework for communicating scientific information about climate change to port and marina organizations, stormwater managers, community planners and community planners which may be used as a model for other sectors and other regions.
 - Regional synthesis of current strategic plans re climate change
 - Regional synthesis of current Sea Grant programs activities/initiatives re climate change
- Outcome 4: Products for communicating scientific uncertainty and variability to decision-makers and managers which are translatable to other regions, other sectors and other issues.
 - Communicating Uncertainty Powerpoint
 - Visualization Software Review
 - Port Washington Lake Level Visualization Case Study
 - Toledo Lake Level Visualization Case Study
 - Duluth-Superior Lake Level Visualization Case Study
 - Products supporting development of enhanced Visualization of complex information
 - Communicating Uncertainty Whitepaper
 - CD of compiled literature on communicating uncertainty
 - Products supporting climate change communication:
 - Public website
 - List of current elements on websites relating to climate change
 - Summary of any current/upcoming programming/ events/initiatives relating to climate change
 - Summary of opportunities to interact with our 3 primary stakeholder groups
 - List of any efforts relating to climate change which are on-going in the region
 - Centralized source for project materials for PA and Sea Grant Outreach specialists
 - Templates will provide investigators with standardized project tools to develop project goals, objectives and activities
 - Reporters interested in the project will be able to access project goals, objectives and activities
 - Project updates will provide summaries to disseminate throughout the region, via existing Sea Grant publications, such as newsletters and state program websites.
- PA Climate Change fact sheets

Outcomes/Impacts

- Global effects of climate change will be translated to the local and regional scales at which planning and management decisions are made.
- Scientific models will be more readily used by decision makers and key stakeholders
- Awareness of potential climate change impacts will increase among leaders, managers and planners
- Key stakeholders will be better able to plan for scenarios of increased climate variability
- Key decisionmakers will be able to generate a will to act and a plan for action in a framework of uncertainty and variability
- Decision making in port and marina operations and in stormwater management linked to climate change issues will become more effective.
- Materials will be translatable to other communities and other regions
- Sea Grant staff and key stakeholders will be better able to convey an understanding of scientific uncertainty inherent in climate modeling
- Audiences will be better informed about climate change in each Great Lakes state.

Data Visualization

- Discover, acquire, and integrate topographic maps and bathymetry in support of the Toledo and Duluth case studies
- Develop maps of shoreline and water level change using ArcGIS software for the harbors of Toledo, Ohio, Duluth, Minnesota, and Port Washington, Wisconsin based on the climate and lake level scenarios.
- Document the methods and issues associated with developing these maps.
- Review visualization tools and their capabilities
- Seek additional funding to complete more sophisticated visualizations

Use case studies in communicating the economic impact of climate change

- Objective (6A): Sea Grant staff will work with experts to develop products (powerpoints, fact sheets, etc) for communicating the concepts of scientific uncertainty and variability including strategies for action in the face of uncertainty. The suite will include some products that will be sufficiently general to apply to other regions, other stakeholders and other issues.
- Objective (6C): Sea Grant staff will develop a suite of specific communications products (web, fact sheets, video, etc) to support efforts to communicate about climate change impacts.

Objective (3A): The Great Lakes Sea Grant Network will develop a coordinated regional strategy for communicating about climate change to the key stakeholders which is grounded in knowledge of these stakeholders' specific information and communication needs and which is vetted with key organizations representing these stakeholders.

Objective (3D): All Sea Grant staff working with the key stakeholders will be aware of the regional strategy for communicating about climate change and will have access to centrally developed products for communicating about climate change and communicating about scientific uncertainty and variability.

Objective (3E): The individual programs which make up the Great Lakes Sea Grant Network will each incorporate specific elements of the regional strategy into the relevant segments of their state strategic plans as these go through the regular planning process.