A BLUEPRINT

for
GREAT LAKES DECISION MAKING

2011-2015

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1. EXECUTIVE SUMMARY

1.1. Introduction and Mission

The Great Lakes Observing System Regional Association (GLOS) is a nonprofit association dedicated to connecting data users with data providers in ways that are supportive of policy and decision making.

1.2. Vision

We envision a fully integrated, bi-national observing system that provides products and services to decision-makers, resource managers and other data users with input from members and partners, to foster understanding and inform decision-making related to the Great Lakes and St. Lawrence River System.

1.3. The Organization

GLOS is one of 11 Regional Associations of the Integrated Ocean Observing System (IOOS), a partnership effort across 17 U.S. Federal agencies led by NOAA, working to enhance our ability to collect, deliver, and use ocean information. IOOS is the U.S. contribution to the Integrated Earth Observation System (IEOS) and Global Ocean Observing System (GOOS) as part of the Global Earth Observing System of Systems (GEOSS).

GLOS is unique among the IOOS Regional Associations due to both the region's freshwater ecosystem and to the fact that the region is bi-national (U.S.-Canada) with several existing treaties and agreements dating from the turn of the 20th century – e.g. , the Boundary Waters Treaty (1909), the Convention on Great Lakes Fisheries (1955), the Great Lakes Water Quality Agreement (1972, 1978, 1987), a Joint Strategic Plan for the Management of Great Lakes Fisheries (1981, 1997), and the Great Lakes-St Lawrence River Basin Sustainable Water Resources Agreement (2005).

The need for an independent data provider in the Great Lakes has been recognized since at least the mid-1970s with the development of the Great Lakes International Surveillance Plan (GLISP) by the International Joint Commission's Great Lakes Regional Office. The need to have a consistent understanding of the health of the Great Lakes using data that are both comparable and compatible is the basis of the bi-national State of the Lakes Ecosystem Conference (SOLEC) process that engages federal, tribal/First Nations, state, provincial, regional and local governments, university-based researchers and non-profit entities. Recently, state and provincial fishery managers who jointly manage international fishery stocks in the Great Lakes have identified the need for aggregated data at the lake, and larger system, level in order to make timely and effective management decisions.

Users of Great Lakes water resources including manufacturers, electric power producers, waterborne transportation providers, commercial and sport fishing operators, recreationists, and others require easy access to the wealth of information available for resource managers and Great Lakes researchers. Given the long history of jointly developing and managing water resources in the Great Lakes region, the Great Lakes Observing System's independence is well-suited to support bi-national resource management efforts requiring integrated and interoperable data.

The Great Lakes Observing System (GLOS) was founded in 2003 by a regional steering committee with financial support from NOAA's Coastal Services Center and secretariat support from the Great Lakes Commission. In 2006, the first Board of Directors was appointed and bylaws were established to provide overarching vision, guidance, and accountability for the GLOS mission. In 2008, the Internal Revenue Service recognized GLOS as a 501(c)(3) nonprofit organization. The coordinated observing network developed by GLOS is designed to provide data in forms and at rates required by

data users and decision makers to support a series of goals reflecting Great Lakes needs and the IOOS societal goals. GLOS serves as an advocate for Great Lakes region interests and needs within the IOOS framework and provide regional data integration efforts that support larger scales of observing coordination through IOOS, GOOS, and GEOSS.

1.4. Services and Products

GLOS provides two primary services to the Great Lakes region: 1) coordinating users and collectors/providers of Great Lakes data at various scales to identify needs for data, information, and products; identify gaps; and avoid duplication.; 2) provide data services to support identified user needs for raw and processed data, modeling, and other data services. GLOS products include applications that integrate model output and historic, event-collected, and real-time into user-friendly outputs.

1.5. The Audience

GLOS primary audiences are data users and data collectors/ providers. There is no one entity that is currently able to coordinate, collate, and integrate data and information across federal, state/provincial, tribal and local boundaries, as well as across the international border. GLOS is tasked with this mission to support the decision making needs of resource managers, decision makers, researchers, and water resource users.

1.6. Financial Considerations

Still relatively young, GLOS will likely rely largely upon federal grant funds over the next five years, 2011-15, however there is a need to diversity funding through development and engagement with all users.

1.7. Subsystem Functions

To accomplish its mission, GLOS uses a structure that constitutes a coordinated observing system that provides data, related products, and services that meet user needs. The following are the sub-systems and their goals:

- Program Planning and Management: Data and information needs of regional resource managers and policy makers are addressed through the coordination, management, and governance of the Great Lakes Observing System;
- Data Management and Integration: GLOS users have ready access to high quality, interoperable data and associated products that meet IOOS criteria;
- Observations: GLOS users benefit from timely, reliable, and sustained observations that meet regional needs and priorities;
- Model and Tool Development: GLOS provides its users with specific products and services that are efficient, accurate, cost effective, and extensible; and
- Outreach and Education: Input from major stakeholders – users, members, partners – is systematically and routinely integrated into program planning and evaluation.

1.8. Focus Areas

The *Blueprint for Great Lakes Decision Making* was developed to complement NOAA's Next Generation Strategic Plan, the IOOS Strategic Plan, EPA's Great Lakes Restoration Initiative Action Plan, and other management strategies that have been formally delineated specifically for the Great Lakes Region. This deliberate action will help GLOS ensure integration into both regional initiatives as well as national and global observing system objectives and to allow for easy reference to and alignment with these efforts. The following four focus areas are based on the seven IOOS Societal

goals as revised and re-focused on Great Lakes issues through development of this *Blueprint*. These focus areas and associated goals will guide GLOS activity over the next five years:

1) Ecosystem Health: Allow more effective protection, restoration, and sustainable use of healthy Great Lakes ecosystems.
2) Public Health and Water Security: Reduce public health risks and improve Great Lakes water security.
3) Maritime Operations: Improve the safety and efficiency of maritime operations in the Great Lakes and St. Lawrence River system.
4) Climate Change and Natural Hazards: Improve understanding and the development of adaptation strategies related to the impacts of climate change on Great Lakes communities and allow more effective mitigation of the effects of natural hazards.

2. ORGANIZATION BACKGROUND

2.1. Great Lakes Context

The Great Lakes region is home to over 40 million US and Canadian citizens, many first nations, eight states and two provinces. The region has a long history of partnership and collaboration related to water resources management, both within the United States and across the border with Canada. Initially these efforts were designed to ensure equitable development of share resources. However, more recently they began to promote common protection and restoration efforts. As these initiatives matured, it became apparent that effective environmental management required ready access to real-time and historical data on the climate, meteorology, chemistry, geology, biology and related phenomena that impact the Great Lakes.

The Great Lakes Observing System (GLOS) was founded in 2003 by a regional steering committee with financial support from NOAA's Coastal Services Center and secretariat support from the Great Lakes Commission. In 2006, the first Board of Directors was appointed and bylaws were established to provide overarching vision, guidance, and accountability for the GLOS mission. In 2008, the Internal Revenue Service recognized GLOS as a 501(c)(3) nonprofit organization. The coordinated observing network developed by GLOS is designed to provide data in forms and at rates required by data users and decision makers to support a series of goals reflecting Great Lakes needs and the IOOS societal goals. GLOS serves as an advocate for Great Lakes region interests and needs within the IOOS framework and provide regional data integration efforts that support larger scales of observing coordination through IOOS, GOOS, and GEOSS.

2.2. National and Global Observing Systems Context

GLOS is one of 11 Regional Associations of the Integrated Ocean Observing System (IOOS), a partnership effort across 17 U.S. Federal agencies led by NOAA, working to enhance our ability to collect, deliver, and use ocean information. IOOS is the U.S. contribution to the Integrated Earth Observation System (IEOS) and Global Ocean Observing System (GOOS) as part of the Global Earth Observing System of Systems (GEOSS). The coordinated observing network developed by GLOS is designed to provide data in forms and at rates required by data users and decision makers to address a series of goals reflecting Great Lakes needs and the IOOS societal goals. This network contributes regional data integration efforts to support larger scales of observing coordination such as IOOS, GOOS, and GEOSS.

Within the Great Lakes region, GLOS is serving as the institutional mechanism for a Canadian-American GEO Great Lakes testbed on bi-national data interoperability. GLOS is a Participating Organization within GEO and, on behalf of the testbed, will register the region's assets and services within GEOSS.

2.3. Governance

The GLOS Board of Directors is appointed according to procedures established in the bylaws. The Board appoints the Executive Director who, in turn, appoints all other staff. On the advice of the Executive Director, the Board also appoints a Technical Advisory Panel, selected virtue of their knowledge, skills or experience to provide technical, scientific and policy advice to the Board of Directors and Executive Director.

2.4. General Operating Principles

- GLOS supports existing data providers and users.
- GLOS bases all activities on identified regional or national priorities.
- GLOS is dedicated to providing data and information in formats that are both easy to access and to understand.
- GLOS uses technology and services that avoid duplicating existing efforts to collect, serve and/or store data.
- GLOS leverages the expertise and experience of partner organizations and programs to ensure the most efficient and effective use of GLOS resources.
- GLOS works with regional, national, and global partners to ensure that regional data standardization is consistent with the NOAA IOOS Data Integration Framework (DIF) and Group on Earth Observation standards.
- GLOS is a distributed system. Data collected by GLOS instrumentation, generated by GLOS models/tools, or provided to GLOS for stewardship under agreement by third parties is managed by GLOS DMAC staff, while data from other agencies and organizations is managed by staff from the agency/organization responsible for collecting or generating those data.
- GLOS is committed to implementing open source solutions in all practicable cases when developing tools, products, and services.
- GLOS uses quality management systems and other processes to ensure an open and transparent environment within which are developed reliable information solutions using the best available technology.

2.5. Organizational Structure

GLOS is organized to facilitate communication and coordination among its subsystems, and to provide flexibility and easy access for a wide variety of individuals to be engaged and participate in GLOS activities at various commitment levels.

FIGURE 1: Organizational Structure

3. ORGANZATION SUBSYSTEMS

Each subsystem is responsible for working toward achieving the maturity goals established in the IOOS Regional Maturity Index. To do this, each subsystem will develop annual objectives as part of the GLOS Strategic Planning process and will refine, implement, and measure progress towards achieving these objectives during annual work plan development.

3.1. Data Management and Communications

The protocols and processes by which data are retrieved, standardized, stored, and delivered are known as Data Management and Communications (DMAC). The group of GLOS staff, members and partners responsible for planning, directing, and implementing activities related to data management and communications is known as the DMAC Subsystem.

Goal: GLOS users have ready access to high quality, interoperable data and associated products that meet IOOS criteria.

This subsystem coordinates and facilitates the distribution of data and information to and from other GLOS subsystems, to and from other observing systems, and to end users at all levels. The IOOS Data Integration Framework (DIF) is the guide for the standards and processes adopted by the DMAC subsystem. GLOS receives and delivers data in a variety of ways, with the goal of developing easy to access data delivery/decision support products meeting specific user needs. DMAC subsystem collaborates with other GLOS Subsystems to engage users and develop customized products that will provide them with the data and information they need in a format that is both easy to access and user friendly.

Objectives:

2011: Identify baseline information for measuring progress; initiate integration of existing priority data sets into GLOS DMAC system; and identify priority opportunities for data standards, quality management system, and protocol development.

2012: All priority data sets are being integrated into DMAC system; plans are in place for emerging priority data sets; and/or needed activities are initiated for data standard or tool development.

2013: All priority data sets are readily accessible, support relevant tool development, and meet QA/QC and reliability standards.

2014: Emerging or new data sets are integrated into DMAC system and priority standards/protocol development is completed.

2015: All priority data sets are readily accessible, support relevant tool development, and meet QA/QC and reliability standards and next steps for data management and integration activities have been identified.

Measures:
- Number of data sets integrated into GLOS DMAC and using IOOS standards; 2010 baseline: 9 (wind (speed, direction, gusts), waves (height, direction, period), surface water temperature, air temperature, currents)
- Percent availability and/or reliability of data from GLOS instruments and/or remote sensing algorithms; 2010 baseline: to be determined

Data management services: GLOS provides IOOS and other international standards-based (e.g., GEO) data management services that provide a single location where observed real time/near real time physical data are available.

3.2. Observations and Data Collection

The group of GLOS staff, members and partners responsible for planning, directing, and implementing activities related to observations is known as the Observations (OBS) subsystem. The OBS subsystem will coordinate the observing activities for GLOS, representing a variety of observation platforms, observing agencies and organizations, and geographic regions. In addition to developing the observations component of the GLOS Strategic Plan, the OBS subsystem will be responsible for working with partners and other GLOS subsystems to develop data collection protocols (e.g., QA/QC), identify and meet observing needs, and facilitate the development of decision-support models, products and related services.

Goal: GLOS users benefit from timely, reliable, and sustained observations that meet regional needs and priorities.

The OBS subsystem is intended to help identify and fill observing gaps in the region, and support and enhance existing observing activities. The OBS subsystem is not intended to replicate or replace existing monitoring and observation activities being conducted by federal, state/provincial, and local government agencies, academic institutions, or other similar initiatives. The objective is to provide a platform and process for distributing the information collected by these observers. Resources and financial support for the capacity of the OBS subsystem should be sustained for long-term, consistent, and reliable contribution to the full observing capacity of the Great Lakes region.

Objectives:

2011: Necessary resources and plans are in place for ongoing operation and maintenance of existing GLOS assets and continued management of the GLOS Observing Subsystem in accordance with IOOS standards and protocols.

2012: New observing and data gathering activities are initiated to address high priority strategies related to filling observing gaps and related development/testing of new technologies.

2013: All observing activities are in progress, meeting quality systems requirements, and emerging priorities are identified for system-wide OBS planning.

2014: New observing activities are initiated to address high priorities for short-term strategies identified in user engagement and needs assessments, Near-term Design, inventory assessment or other gap analysis activities.

2015: All observing activities are meeting strategic priorities and standards/protocols for data contribution and quality assurance and new priorities are identified for next Strategic Plan cycle.

Measures:
- Percent of data from GLOS instruments/remote sensing algorithms integrated into GLOS DMAC system and/or contributed to a National data provider; 2010 baseline: 3 buoys
- Percent of observations collected from multiple observers to meet regionally identified (GLOS, GLRI, GLWQA, GLFC processes) priorities; 2010 baseline: 0
- Number of observation types deployed, maintained, or decommissioned; 2010 baseline: to be determined

Observation Services: GLOS operates a nearshore network of coastal buoys that provide physical data, e.g., wind (speed, direction, gusts), waves (height, period, direction), water surface temperature and in the water column at 2m intervals, as well as select bio-chemical data, such as phosphorus, *chlorophyll a*. Additional sensors will be added as the GLOS system is further developed.

3.3. Modeling and Analysis
The group of GLOS staff, members and project partners responsible for planning, directing, and implementing activities related to modeling and decision-support tool development is referred to as the Modeling and Analysis subsystem.

Goal: GLOS provides its users with products and services that are responsive to their needs, efficient, accurate, cost effective and extensible.

The Modeling and Analysis subsystem will coordinate the development and use of predictive and assessment models and similar tools to meet priority needs for resource managers and other decision makers. In addition to developing the Modeling and Analysis component of the GLOS Strategic Plan, the subsystem will collaborate with other GLOS subsystems to identify regional needs, meet priority needs for decision-support models, and lead the development of related products and services.

Objectives:
2011: Continue to refine and enhance existing tools as needed and identify emerging opportunities for model and tool development.

2012: Existing tool updates are completed and ongoing operations and maintenance continues. Planning is initiated for new tools in tandem with Outreach to address modeling and tool development needs.

2013: New model and tool development is initiated based on user needs and prototype is made available for review by target audience. Training and promotion is carried out for existing tools.

2014: Updates are completed for new tools and existing tools have demonstrated use.

2015: All decision support tools and/or services are reliable operational, meeting identified user needs, and are adopted for use.

Measures:
- Percent increase in user satisfaction with products and services over time; 2010 baseline:
- Number of new or improved methodologies, products, and services developed and sustained; 2010 baseline: 3
- Number of methodologies, products, and services adopted by other partners; 2010 baseline: 0

Iterative tool development: Tools include but are not limited to data visualization, data delivery, models and/or modeled output, measures that facilitate delivery of data and information provided by other observers or any combination of these elements that address a specific, identified need.

3.4. Outreach and Education
The group of GLOS staff, members and partners responsible for planning, directing, and implementing activities related to user outreach is known as the Outreach (OUT) Subsystem.

Goal: Input from identified major stakeholders – users, members, partners – is systematically and routinely integrated into program planning and evaluation.

The OUT Subsystem will coordinate the user engagement, needs assessment, and GLOS promotion, education and training. In addition to developing the outreach component of the GLOS Strategic Plan, the OUT Subsystem will be responsible for collaborating with other GLOS subsystems to identify regional needs and facilitate the development of decision-support models, products and related services.

Objectives:
2011: Priority targets for membership, existing tool evaluation, and ongoing user needs assessments are identified; project planning includes schedules and strategies for outreach activities; and promotion and engagement activities are initiated.

2012: Recommendations for user solutions have been identified and project planning is initiated to address priority product/tool development activities.

2013: Outreach activities are being implemented on schedule; are meeting goals for recruitment and engagement; and ongoing strategies for needs assessment, evaluation, promotion and training are being updated and adapted as needed.

2014: User solutions have been evaluated by user groups, feedback is incorporated into tool development, appropriate training and promotional strategies are initiated, and emerging priorities are identified.

2015: Membership target have been met, user needs are being addressed, and new membership goals and user priorities are identified for next Strategic Plan cycle.

Measures:
- Percent of major stakeholders or users indicate the solutions, products, and services provided by GLOS "meet" or "exceed" expectations; 2010 baseline: to be determined
- Number of partners engaged in GLOS projects and events; 2010 baseline: to be determined.

Services: GLOS identifies and serves the needs of Great Lakes data users – decision makers, resource managers and researchers – through needs assessment and the iterative development of specific information, models and tools that support regional decision making.

4. PROGRAM MANAGEMENT AND PLANNING

Program management and planning is responsible for coordinating the other GLOS subsystems through comprehensive strategic, annual, and project planning. GLOS has developed complementary maturity goals, measures, and annual objectives for the Program Management and Planning Subsystem to ensure the development of management and planning processes adapt and mature along with the other organization subsystems.

Goal: Data and information needs of regional resource managers and policy makers are addressed through the coordination, management and governance of the Great Lakes Observing System.

Objectives:

2011: Resources and capacity are in place to provide project management services to the GLOS consortium for the development and implementation of the *Blueprint* Management and Planning Process (MAPP) in accordance with IOOS principals and guidelines.

2012: All projects initiated with 2011 or later funding are implementing GLOS MAPP guidelines as part of project implementation and have established project schedules.

2013: GLOS has established role in related partner initiatives such as the Near-Term Design, GEOSS Great Lakes Testbed, IWRSS, and Exchange Network; projects are on schedule; and staff are developing recommendations for appropriate project adaptation.

2014: Projects, products and services initiated with 2011 or later funding are meeting or exceeding performance expectations and are evaluated for next steps.

2015: Existing projects, products and services have demonstrated connections to the priority management and policy issues validated by GLOS stakeholders and user groups and new or emerging priorities are identified.

Measures:
- Number of identified regional priorities with project plans in place, being implemented, and on schedule; 2010 baseline: to be determined.
- Percent of projects meeting or exceeding performance expectations; 2010 baseline: to be determined.
- Annual percentage of projects addressing identified regional needs as validated by stakeholders; 2010 baseline: 100%.
- Number of GLOS members: 2010 baseline: 24

4.1. Membership

GLOS coordinates the network of people, processes, and technology that come together to create a regional Great Lakes observing system. GLOS organization and staff capabilities are designed to address data and information needs for management and decision-making. GLOS success is linked to the commitment and progress made by the network it facilitates. Building a strong and active membership is critical to ensuring that GLOS activities are relevant, proactive and successful in addressing the observing and information integration needs of the Great Lakes region.

Formal policies on membership eligibility, requirements, and voting privileges are outlined in the GLOS bylaws. Although formal, active membership is the preferred status for all partners membership recruitment is flexible requiring cultivation and stewardship.

Recruitment

The target groups for membership include US and Canadian resource managers and decision-makers from various levels of government, researchers, NGOs, and private businesses and industries that would contribute to and/or use GLOS data, products and services. Through development of annual work plans, staff will review current membership and specific priority targets for the annual membership appeal. These targets may be identified by the Executive Director, the Board, other staff or members as meeting important gaps in stakeholder representation. Also, through an administrative database, GLOS is able to track partner participation and identify active partners who are candidates for recruitment.

Once targets have been identified for membership, a written or verbal appeal will be made and tracked in the administrative database. This recruitment approach is integrated into the communications and project management work of GLOS staff so that membership appeals are successful. Strategies for this approach include:

- Linking membership recruitment and recognition to communication goals and objectives.
- Communicating the benefits and incentives for membership.
- Providing mechanisms for easy and reliable partner participation.
- Linking membership recruitment and recognition to fundraising strategies.

Membership recruitment and engagement success will be determined by tracking attendance, participation, and membership enrollment, as well as through membership satisfaction surveys.

4.2. The GLOS Management and Planning Process
One critical element needed to advance GLOS organizational maturity is a transparent planning process for developing GLOS priorities and allocating resources. The member, partner and user-engagement process used to develop priorities is described below. The process for allocating resources to specific projects addressing those priorities is outlined here. GLOS has adopted a planning process that corresponds with the IOOS funding cycle in order to prepare for proposals to IOOS and other potential funders, develop annual work plans, and evaluate programs to identify future funding priorities.

Program management and planning is primarily the responsibility of the Executive Director with the support of the Technical Advisory Panel, GLOS staff and the Board of Directors. GLOS uses an adaptive management style planning process, the GLOS **Management and Planning Process** (MAPP), to prioritize projects filling critical data and information gaps through enhanced observations, predictive modeling, data integration services and data delivery tools. The planning process has four phases: 1) determining priorities, 2) developing strategies, 3) implementation, and 4) evaluation and adaptation. This planning process is used at two levels of program planning, in strategic planning to develop long-term programs and in specific project planning for short-term projects. With the *Information Blueprint* as guidance, project scopes of work identify and address management issues related to the GLOS goal areas and have measures in place to monitor and evaluate project progress. Supplementary materials, e.g., power point presentations, documentation guidelines, templates, or training opportunities will be made available to ensure staff, partners and members have a good understanding of this planning process.

Phase 1: Determining Priorities

This phase is critical to ensuring that GLOS projects, products, and services meet specific user needs. During this phase, program or project planning partners will identify the management or decision issue to be addressed as well as the targeted user groups(s) who use the information solution developed as a result of the project. To best address the needs of targeted users, it is important for projects to demonstrate that a needs assessment has been or will be completed to clarify the decision-making process; identify the specific information challenges, gaps, and needs the solution will address; and establish a baseline for evaluating the effectiveness of the solution.

Figure 2. Management and Planning Process

Phase 2: Develop Strategies

Once the specific management issue, target user group(s), and specific information issues have been identified it is then appropriate to develop SMART objectives and related strategies for addressing the information issue. SMART objectives are: specific, measurable, achievable, realistic and time bound. As part of work plan development, SMART objectives should be developed to identify progress metrics to determine if the project has been successful in addressing a particular information need. In addition, programs and projects should identify the strategies, or specific actions that will be carried out in order to achieve the objectives developed. These should correlate to the quality management requirements, timeline, and budget developed as part of the project's scope of work, work plan or contract.

GLOS programs and projects should advance GLOS' mission in the identified goal areas. To achieve this, projects should employ metrics that will demonstrate effectiveness and efficiencies in observing system information management that support decision making and resource management. Examples include:

- Improved efficiencies in time and/or money spent in decision-making or management process.
- Documented/demonstrated use of data sets, products or, services in decision making.
- Improved understanding of existing conditions, management issues, or decision issues.
- Number of data gaps addressed or integration needs and other services provided.

Phase 3: Implementation

During implementation, project managers are responsible for carrying out the specific strategies, actions, and tasks identified in the scope of work. For larger, multiple-year projects, this would be a time to develop a more specific work plan and timeline to help manage tasks. As part of regular reporting, project managers will be required to track and provide updates on project progress.
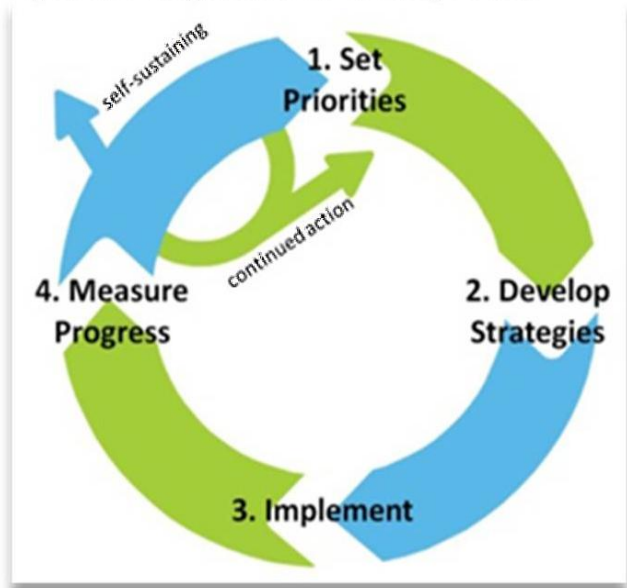
Phase 4: Evaluation and Adaptation

Informal evaluation is carried out throughout the project process during annual work plan development, reporting periods, and through continued cycles of strategic planning. Projects and their related strategies will be evaluated to determine if they are relevant to the strategic goal areas established by GLOS and meet the objectives established earlier in the planning process. The Technical Advisory Panel will review and evaluate projects based on a variety of criteria that will be made available to project partners prior to project planning. These criteria will focus around the following topics:

- ➢ Quality Management
  - *Are the data/information accurate?*
  - *Does it meet QA/QC requirements and protocols?*
  - *How is best integrated into our data management infrastructure?*
  - *What, if any, additional actions are needed for information dissemination?*

- ➢ Result Analysis
  - *What do the project results tell us?*
  - *What is result feedback? Are reviews positive?*
  - *What are future considerations/recommendations?*

- ➢ Performance Evaluation
  - *Did the team integrate results feedback?*
  - *Did this project meet its strategic goals? Why or why not?*
  - *Are project results technically and scientifically sound?*

All subsystems and projects are required to provide quarterly or semi-annual progress reports; staff will work with project managers to adapt plans as needed. Any changes and related updates to task timelines should be documented as part of annual work plan development. More formal evaluations will generally take place three times during the project period. Initially, during the project solicitation process, project proposals will be reviewed and selected for implementation based on criteria specified in the solicitation request, at the mid-way point and at the end of the project funding period and/or as part of initiating a consecutive strategic planning cycle. Projects will be evaluated based on the criteria outlined above. As a result of this evaluation a determination will be made for the appropriate next steps which could include: concluding the project, transferring to a partner, or further development or operationalizing through GLOS subsystems.

4.3. Process Implementation

To initiate the Management and Planning Process, GLOS will first evaluate and update the *Information Blueprint* based on project evaluations, member, partner and user feedback, results of prior planning initiatives, and emerging regional and national priorities. Updating of the *Information Blueprint* will be completed by GLOS staff with input and review from GLOS members and approval by the Board of Directors. The *Information Blueprint* will be updated 5-year cycle corresponding to the IOOS funding cycle for Regional Associations. Updates will be completed to allow time for any competitive processes to take place.

In some cases, priority strategies and related programs and activities for implementation will be clearly identified with appropriate partners and available funding sources as a result of previous initiatives. When this is the case, GLOS will incorporate these activities into regular budget planning

for the applicable planning period. In other cases, there will be multiple options or ideas for how to implement individual strategies. In these cases, GLOS will develop a Letter of Intent (LOI), pre-proposal, or Request for Proposal (RFP) solicitation that outlines priorities, expected outcomes, outputs and deliverables for projects based on the *Information Blueprint* and in accordance with MAPP. The type of solicitation used will depend on the amount, timing and availability of funds. GLOS will then invite members and partners to submit project proposals that would address priorities and evaluate the proposals based on criteria:

- Relevance to the *Information Blueprint*
- Ability to meet identified need(s).
- Timeliness/ urgency
- Use of "best available" science & technology
- Correlation to other projects

When LOIs or pre-proposals are used, projects will be evaluated, selected, and prioritized for funding sources as available or for inclusion in a larger proposal, such as NOAA-IOOS funding opportunities. When RFPs are used, projects will be evaluated and those selected will be directly awarded available resources through a contract with GLOS. The Executive Director will coordinate review of proposals with the Technical Advisory Panel which will, in turn, make recommendations for project support to the Board of Directors. The Board will make the final funding decisions.

GLOS will implement priority projects using competitive solicitations whenever possible. However, GLOS recognizes that funders and emerging priorities do not always accommodate the time and effort required to conduct thorough evaluation of letters of intent, pre-proposals or full proposals. In addition, there are baseline operational functions which GLOS is committed to supporting that cannot be easily competed due to the nature of the service.

5. FOCUS AREAS
Programmatic planning focuses on four Great Lakes management issue areas that were identified by members, partners and users as being integral to Great Lakes needs and that also correspond to IOOS Societal Goals as tailored to the Great Lakes region. Programming will be driven by the GLOS goals and objectives, stakeholder data and information needs, and the ability to add value to related products and services. The Management and Planning Process will ensure that GLOS focus areas evolve as Great Lakes user needs evolve.

To advance Focus Area goals, staff determined objectives during the strategic planning process through stakeholder engagement and based on priorities identified by the Board of Directors and members through ongoing planning and engagement. The objectives provide guidance for GLOS members and partners on the priorities for project development over the 5 year cycle. Strategies and related projects will be developed, selected, refined, evaluated, and updated as part of IOOS proposal development, project solicitations, annual work plan development, and reporting periods. Individual projects funded by GLOS will also be responsible for developing project level goals and objectives that link to *A Blueprint for Great Lakes Decision Making*.

5.1. Ecosystem Health
Goal: Allow more effective protection, restoration and sustainable use of healthy Great Lakes and coastal ecosystems.

Priorities:
Over the next five years, GLOS will support and implement the objectives and strategies identified as priorities through the Great Lakes Regional Collaboration (GLRC). GLOS will build on progress of its current projects such as data needs assessments for user groups including Areas of Concern (AOCs), Lakewide Management Plan (LaMP), and fisheries managers. In addition, GLOS will continue to implement enhanced tributary monitoring activities in priority AOCs. GLOS systems are available to provide distribution of State of the Great Lakes Ecosystem Conference (SOLEC) data and assessment information. Initially, GLOS will work with SOLEC organizers and individual SOLEC indicator teams to identify and post pilot data sets that can demonstrate and establish the utility of GLOS systems for filling SOLEC information distribution needs and/or implementing individual SOLEC indicators. Individual projects will support the following ecosystem health objectives.

Objectives:
1. Coordinate GLOS assets – fixed platform/moorings, mobile observations and remote sensing, and data management systems – with lake-based, regional and/or bi-national monitoring and observing activities, such as through the Coordinating Science Monitoring Initiative and SOLEC indicator assessments;
2. Identify and improve accessibility to priority data sets that support restoration and ecosystem management activities;
3. Provide observational, modeling and other decision-making support for contaminated sediment remediation and other pollution control/elimination projects in designated Areas of Concern;
4. Provide observational, modeling and other decision-making support to address invasive species;
5. Provide observational, modeling and other decision-making support for habitat and wildlife restoration activities in designated Areas of Concern; and
6. Provide observational, modeling and other decision-making support to address nearshore health and projects managing non-point sources of pollution especially in priority watersheds such as the Fox River/Green Bay, Genesee River, Maumee River, St. Louis River, and Saginaw River.

5.2. Maritime Operations
Goal: Improve the safety and efficiency of maritime operations and navigation in the Great Lakes.

Priorities:
Over the next five years, GLOS will work with federal, state/provincial and local agencies, and commercial and academic partners to identify opportunities for improved data delivery and information communication to meet the various needs of the maritime community. GLOS will build on progress of its current projects with the St. Lawrence recreational boating community, hydrodynamic modeling projects, and efforts to support and enhance existing information needs among the Great Lakes maritime community. Efforts will focus on addressing needs for commercial, workboat and recreational captains. Individual projects will support the following Maritime Operations objectives.

Objectives:
1. Provide observational, modeling and other decision-making support to science vessel, workboat and commercial navigation that enhances hazard avoidance;

2. Provide observational, modeling and other decision-making support to science vessel, workboat and commercial navigation that enhances operational efficiency;
3. Provide observational, modeling and other decision-making support to science vessel, workboat and commercial navigation that enhances emergency response; and
4. Identify and develop opportunities to leverage existing and new industries for enhanced observations and information dissemination.

5.3. Public Health and Water Security
Goal: Reduce public health risks and support Great Lakes water security

Priorities:
Over the next five years, GLOS will work with local, state/provincial and federal partners to identify opportunities to develop and enhance emergency response and/or hazard warning/forecasting systems that support safe and sustainable public water quality. GLOS will support ongoing efforts to advance information integration and delivery for beach managers across the Great Lakes region. GLOS will build on needs assessment activities and the Huron Erie Connecting Waterways Forecasting System project to engage source water managers across the region and identify information needs and priority projects for meeting those needs, potentially working to address issues related to emerging contaminants. Individual projects will support the following Public Health and Water Security objectives.

Objectives:
1. Provide observational, modeling and other decision-making support for decision-making related to drinking/source water quality management;
2. Provide observational, modeling and other decision-making support for human health-based regulations, such as water quality parameters; and
3. Provide observational, modeling and other decision-making support for management of beach water quality and swimming safety.

5.4. Climate Change and Natural Hazards
Goal: Improve understanding and the development of adaptation strategies related to the impacts of climate change on Great Lakes communities and allow more effective mitigation of the effects of natural hazards.

Priorities:
GLOS is engaged with the Adaptive Management working group, part of the International Joint Commission's International Upper Great Lakes Study. The Adaptive Management working group is working with the various interests that will be impacted by changing water levels to identify their vulnerabilities and to establish long-term monitoring and modeling support for the decision makers who will have to determine the best approach to climate adaptation for specific interests in specific locations. Over the next five years, GLOS will support implementation of recommendations from the International Upper Great Lakes Study.

Objectives:
Supporting the implementation of climate adaptation strategies is an overarching goal that also sustains objectives related to the other GLOS focus areas. The Great Lakes-St Lawrence River region faces many challenges as changes in climate require the development of adaptation strategies to support ecosystem health, safe and efficient maritime operations, protection of public health and

support for water security. Individual projects will support the following climate change and natural hazard objectives.

1. Provide observational, modeling and other decision-making support for flooding, non-point source pollution and stormwater management;
2. Provide observational, modeling and other decision-making support for shoreline management; and
3. Provide observational, modeling and other decision-making support to address shortages of Great Lakes water.

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Executive Director
Jennifer Read, Ph.D.
jread@glos.us; 734.332.6101