



# Great Lakes Blue Accounting: Empowering Decisions to Realize Regional Water Values

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A report to the Council of Great Lakes Governors, in response  
to the governors' 2013 resolution on water monitoring

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## Executive Summary

### The value proposition

The Great Lakes water system promises abundant value to a range of end users, but this value can only be realized when the community perceives and appreciates it. *Realizing the value and competitive advantage in the Great Lakes water system requires a Great Lakes Blue Accounting Process: a new collaborative, issue-based process that is anchored in a common agenda, development of common strategies, and optimized investments in information infrastructure.*

### Recommendations

In June 2013 the Great Lakes governors and the premier of Ontario called for a comprehensive approach to monitoring Great Lakes water resources. In response, a Great Lakes Commission-led taskgroup (building on thoughtful efforts of an advisory workgroup) here proposes adoption of the Great Lakes Blue Accounting Process, a strategy that will enable the Great Lakes community to:

- create a consensus-based set of desired goals for Great Lakes water resources management;
- identify a logical set of strategic actions that will achieve the goals;
- identify key process metrics for evaluating the effectiveness of the actions;
- determine how much and what types of data and information are necessary to support the selected process metrics; and
- optimize investments in regional information infrastructure.

Enacting the Great Lakes Blue Accounting Process requires four key elements:

#### **A common agenda (including Desired Outcomes) and a suite of common information strategies for tracking regional water assets**

The Blue Accounting Process is anchored by nine overarching desired uses of and values associated with the Great Lakes water system (Desired Outcomes). These were discerned from existing regional vision documents and workgroup discussions, and comprise three major categories: ecosystem outcomes, human use outcomes, and societal value outcomes.

A shared information strategy should be produced for each Desired Outcome. Each strategy will include four components: 1) a suite of strategic management actions aligned to achieve the Desired Outcome; 2) key process metrics for evaluating the overall effectiveness of the management actions; 3) description of the data and information that is necessary to inform the process metrics; and 4) analysis, synthesis and reporting to document effectiveness, identify gaps and deficiencies, and develop additional or modified management actions.

#### **Regional information and mapping systems tailored to support the above strategies**

Implementing the process requires tailoring several key regional information infrastructures.

The Great Lakes Information Management and Delivery System (GL-IMDS) is a software tool comprised of six complimentary information modules, developed to support and guide the suite of collaborative business processes needed to accomplish a selected resource management outcome. The GL-IMDS provides an ideal information management approach that could be adopted to support development of the outcome-based business strategies that will comprise the Blue Accounting Process. The Great Lakes Aquatic Habitat Framework (GLAHF) was designed to provide the needed common mapping framework for assembling and manipulating data and information about the Great Lakes water system. A common spatial data framework will support coordinated survey designs, enable crosswalk among various datasets, facilitate extrapolation (e.g., from sampled to un-sampled areas), and permit interpretation and summary at various scales, ultimately enabling meaningful storytelling. The GLAHF also provides a nested set of sub-regional map units, allowing information access and summary at multiple, meaningful scales. Finally, interest in the process will drive harmonization, and optimized effectiveness, of the primary regional data and information portals (e.g., GLIN, GLOS, Exchange Network).

### **Common organizing principles and collaborative governance**

Establishing collaborative governance for water information is perhaps the most important element of the Great Lakes Blue Accounting Process, helping the region to work efficiently toward a common agenda. Proposed governance is comprised of a regional steering committee, a series of collaboratives formed around interest in particular Desired Outcomes and a facilitating backbone secretariat.

### **Pilot information strategies for two Desired Outcomes**

The Great Lakes Blue Accounting Process will take shape, and garner interest, when a series of information strategies are implemented to address selected Desired Outcomes. Development of pilot strategies for several outcomes would demonstrate proof-of-concept and also allow learning-by-doing. Pilot efforts would begin with establishment of multisector collaboratives, who then would develop joint strategies, establish key process metrics, create meaningful information supplies and provide initial status reports.

## **Implementation**

Clear start-up steps for implementation of the Blue Accounting Process include: 1) tailoring the information and mapping systems; 2) gathering regional information providers to better harmonize infrastructure; 3) hosting a governance summit to establish principles, structure and a common agenda; and 4) tackling selected pilot strategies. While Blue Accounting is indeed a new approach to framing Great Lakes water information, its foundation must remain based in existing programs and institutions. Start-up investments will be required in the first several years. However, over the long term, each information strategy will need to be mostly self-funded by interests deriving value from that strategy.

## Preface

This report presents a new idea: the Great Lakes Blue Accounting Process. The term “blue” refers to the immense value of water envisioned in current discussions of a future “blue economy.” The term “accounting” refers to both aligning water decisions with desired outcomes for the Great Lakes water system and tracking water units as they move through natural and human systems. The Great Lakes Blue Accounting Process is not business as usual; it will require some shifting and some growth. But it is not an entirely new thing, either; it is meant to help align, complement and augment the region’s many existing environmental monitoring programs.

## The Value Proposition for the Great Lakes Water System

*Realizing the value and competitive advantage in the Great Lakes water system requires a Great Lakes Blue Accounting Process: a new collaborative, issue-based process that is anchored in a common agenda, development of common strategies and optimized investments in information infrastructure.*

The Great Lakes water system promises abundant value to a range of end users, but this value can only be realized when the community perceives and appreciates it. The Blue Accounting Process will allow users to see and track the latent value in the region’s water, empowering them to make effective decisions and investments. The Process shifts the water information paradigm from *monitoring water system conditions under the assumption that a healthy environment will support strong economic and social outcomes* to *explicitly linking and tracking water-related management investments and actions, desired societal outcomes and values, and subsequent management decisions and reinvestments*. This shift in accounting and understanding action-response relationships is critical to realizing the tremendous value inherent in the region’s vast water resources.

The Great Lakes region is at a critical economic and social juncture. Future prosperity hinges upon effectively leveraging and sustaining our primary asset – the world’s largest freshwater storage system. The region’s rich economic and social history was built upon carefree development of water resources. We are now moving into a phase in which smart decisions and investments are necessary if we want to best use and sustain this asset.

Leveraging and sustaining the region’s water resources requires an adaptive, issue-based process that links water-related management decisions and investments, in both public and private sectors, to desired environmental, economic and social outcomes. The Great Lakes community collects considerable information about water resources and environmental conditions, but we do not understand how water resources investments link to ecological, economic or societal outcomes. We need a more holistic and connected process to avoid missing substantial opportunities to improve economic efficiency, realize competitive advantage, assure water security and enhance quality of life. So there is work to do.

## What is the Great Lakes Blue Accounting Process?

In June 2013 the Great Lakes governors and the premier of Ontario called for a comprehensive approach to monitoring Great Lakes water resources.<sup>1</sup> A Great Lakes Commission-led taskgroup responded to this charge by stepping back from the immediate question of monitoring to first identify the overarching, desired uses and values of the Great Lakes water system. Next we developed a strategy for establishing critical metrics and a logical monitoring approach for tracking the effectiveness of current and future programs and investments in the Great Lakes. The Great Lakes Blue Accounting Process is a strategy that will enable the Great Lakes community to:

- create a consensus-based set of desired goals for Great Lakes water resources management;
- identify a logical set of strategic actions, including existing and new programs and activities, that will achieve the goals;
- develop process metrics for evaluating the effectiveness of the strategic actions;
- determine the types of data and information necessary to support the selected process metrics; and
- optimize investments in regional information infrastructure.

The Blue Accounting Process adds to existing environmental monitoring and analysis efforts by:

- proposing a new collaborative, business-inspired approach to regional-scale water resources accounting, with steps for initial implementation;
- explicitly integrating water quality and water quantity concepts, with water quantity as the foundation;
- consciously expanding the focus beyond environment to include economy and social values; and
- establishing a common agenda for water management, anchored on a core set of Desired Outcomes for the regional water system.

The Blue Accounting Process's common agenda and associated strategies can complement and help align existing, binational efforts such as: the Great Lakes and St. Lawrence River Water Resources Compact and Agreement; elements of the Great Lakes Water Quality Agreement (2012), including the Nearshore Framework, Lakewide Management plans, and Coordinated Science and Monitoring Initiative; Great Lakes indicator programs conducted by the International Joint Commission; and the State of the Lakes Ecosystem conferences and reports, collaboratively produced by U.S. EPA and Environment Canada.

This report provides background and specific recommendations for creating and implementing the Process.

## Recommendations for Creating the Great Lakes Blue Accounting Process

The Great Lakes Blue Accounting Process is comprised of four key elements.

- A common agenda (including recommended outcomes) and a suite of common information strategies for regional water assets
- Regional information and mapping systems to support the above strategies
- Common organizing principles and collaborative governance
- Pilot information strategies for selected Desired Outcomes

Implementation will include both immediate information-building activities and higher-level program restructuring, and will be achieved primarily by realigning aspects of existing information programs. Modest strategic investment will be needed to start up and then shepherd the process through time.

The approach we recommend will create the conditions critical to success. These conditions include 1) a common agenda, 2) shared measurement systems, 3) complimentary activities, 4) continuous communications, and 5) a neutral backbone organization. These five elements are recognized by social scientists as a means of accomplishing regional-scale, multi-party, complex-systems program development.<sup>ii</sup>

### Common Regional Agenda and Information Strategies

#### Define scope of the Great Lakes water system

The first step in the implementation process is to define the scope of the Great Lakes water system, which is geographically immense and enormously complex. For purposes of the Blue Accounting Process, the system includes 1) a hydrologic dimension (the Great Lakes, inland lakes, wetlands, streams, and rivers lying within the basin watershed boundary and associated groundwater) and 2) a human dimension (the human uses of water, the values we associate with water, and the decisions we make that affect water).

These historically separate elements must be viewed holistically as one system. Shallow groundwater and surface water comprise a single, interconnected, hydrologic and ecological system. Rivers connect headwaters to the Great Lakes and fundamentally impact nearshore areas. Water quality is dependent on water quantity dynamics. Human uses are an integral part of the hydrologic landscape. The way we value water resources ultimately drives their use and conservation.

Holistic consideration of the Great Lakes water system may seem daunting. The Blue Accounting Process is designed to be a workable plan that can be tackled one issue at a time and often one sub-region at a time. Summary findings can then be rolled up across sub-regions to describe a larger region or the entire basin.

## Adopt core Desired Outcomes for the water system

Monitoring and accounting of the Great Lakes water system should directly support management decisions, investments and programs that seek to achieve specific societal outcomes. The Blue Accounting Process relies on agreed-upon, overarching desired uses of and values associated with the Great Lakes water system (Desired Outcomes). For purposes of the Blue Accounting Process, nine Desired Outcomes are recommended in Table 1.

**Table 1.** Nine recommended Desired Outcomes for the Great Lakes water system. These anchor all aspects of the Blue Accounting Process.

<b>Healthy Aquatic Ecosystems</b>	
1.	<b>Functional nearshore and coastal processes.</b> Human activities at the land-water interface, particularly in coastal areas, protect or promote healthy ecosystem processes.
2.	<b>Healthy, diverse and connected habitats.</b> Waters sustain or create high-quality and interconnected habitats capable of supporting self-sustaining biota and maintaining the integrity of the food chain and other ecological functions.
3.	<b>Healthy and abundant wildlife.</b> Populations of fish and other water-dependent wildlife are diverse, abundant, self-sustained, and safe for human consumption.
<b>Sustainable Human Uses</b>	
4.	<b>Safe and sustainable domestic water supply.</b> Potable water supplies (for drinking and washing) are sustainable and safe for use.
5.	<b>Flourishing and sustainable natural resource-based economies.</b> Economic activities based on water-dependent natural resources (such as agriculture, aquaculture, nurseries, forestry and commercial fishing) are productive, sustainable and generate value for the region.
6.	<b>Flourishing and sustainable water-withdrawing economies.</b> Economic activities that withdraw, consume or alter water (such as manufacturing and energy production) are productive, sustainable and generate value for the region.
7.	<b>Flourishing and sustainable non-consuming water-based economies.</b> Economic activities that depend on water, but do not directly withdraw, consume or alter water (such as recreation, tourism and shipping) are productive, sustainable and generate value for the region.
<b>Social Values and Quality of Life</b>	
8.	<b>Awareness of water value.</b> Citizens of the Great Lakes Basin recognize the connection between their quality of life and a sustainable Great Lakes water system.
9.	<b>Stewardship of, and investment in, water resources.</b> Citizens of the Great Lakes Basin exercise stewardship of the Great Lakes water system and grant a social license for investments in shared system priorities.

Most of the nine Desired Outcomes were extracted from stated or implied outcomes in previous regional visioning and planning efforts (Table 2). These well-recognized outcomes generally fall into three major categories: ecosystem outcomes, human use outcomes and societal value outcomes. We found, however, that human use and societal value outcomes were weakly developed in existing documents. So we made a concerted effort to explicitly identify these outcomes and build them into the Blue Accounting Process.

**Table 2.** Visioning and planning documents reviewed to identify Desired Outcomes.

<b>Management Programs Reviewed to Identify Potential Outcomes</b>
Great Lakes - St. Lawrence River Basin Water Resources Compact (2008)
Great Lakes Water Quality Agreement (2012 Protocol)
Great Lakes Regional Collaboration Strategy (2005)
Canada-Ontario Agreement (2007)
U.S. Clean Water Act (1972), as amended
Joint Strategic Plan for the Management of Great Lakes Fisheries (rev. 1997)
Other CGLG Resolutions (June 2013)
Ontario Great Lakes Strategy (2012)
Michigan Water Strategy (2014)
Great Lakes Vision 100-Year Plan (Skidmore, Owings & Merrill)

Economic outcomes were deemed particularly critical to successfully realizing value from the Great Lakes water system. To simplify treatment of the myriad economies, we classified regional economic activities into three functional categories:

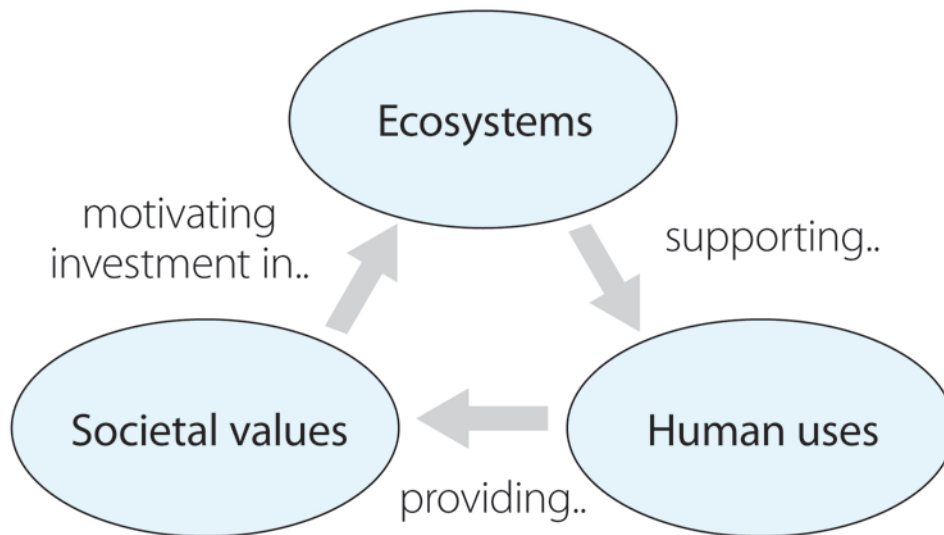
- *economic activities that harvest water-dependent natural resources*, such as agriculture, forestry or commercial fishing;
- *economic activities that use water directly*, such as manufacturing or energy production; and
- *economic activities that depend on, but do not withdraw, water*; such as recreation, tourism or commercial shipping.

The nine Desired Outcomes together express the scope of values that can be derived from sustainable use of the Great Lakes water system and anchor all aspects of the Great Lakes Blue Accounting Process. The three main categories are interdependent: ecosystems support human uses, from which societal values are derived, that motivate care for ecosystems (Figure 1). The region's monitoring activities and information networks can and should be better aligned to provide essential information for measuring progress toward achieving these nine outcomes.



**Figure 1.** Interdependence among the three main categories of Desired Outcomes for the Great Lakes water system.

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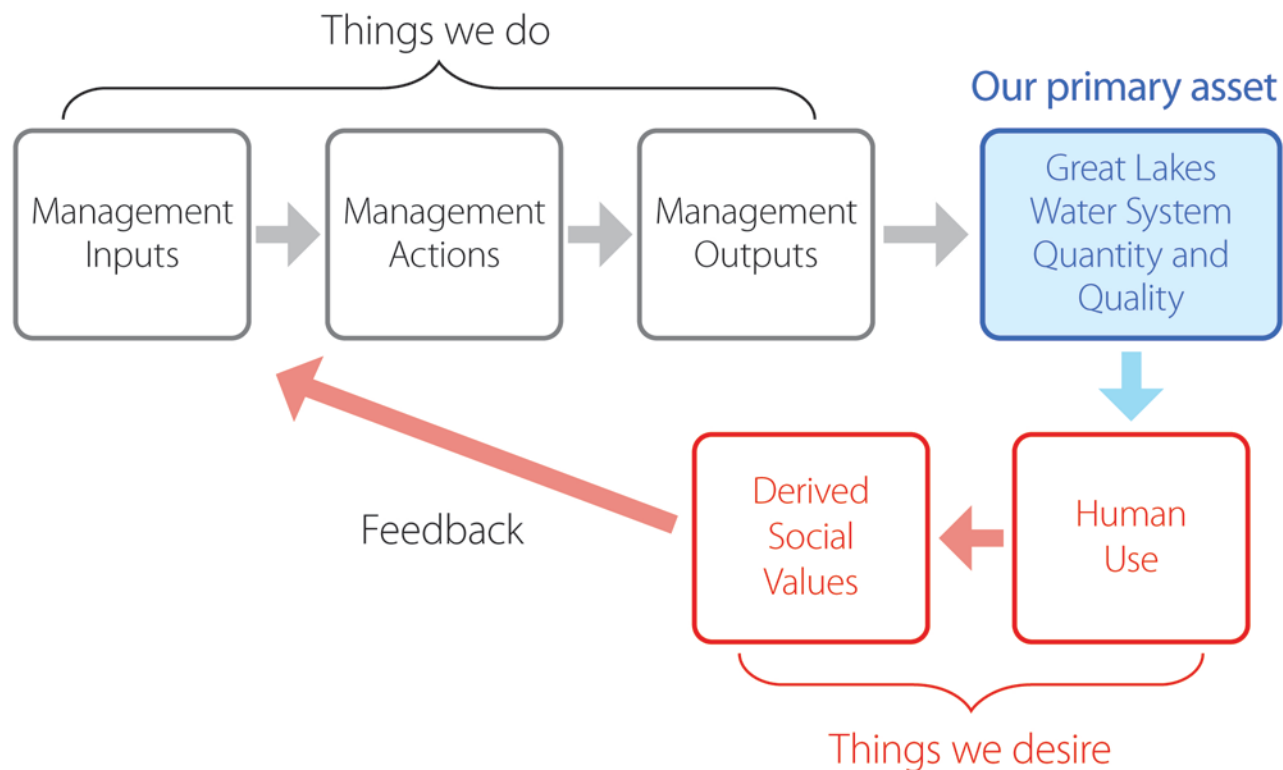
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**For each Desired Outcome, adopt a shared information strategy that incorporates: strategic design, process metrics, information supply, and adaptive evaluation and reporting.**

The Blue Accounting Process will result in a shared information strategy for achieving each Desired Outcome that incorporates four components: (1) a suite of strategic management actions aligned to achieve the Desired Outcome; (2) key process metrics for evaluating the overall effectiveness of the management actions; (3) description of the data and information necessary to inform the process metrics; and (4) analysis, synthesis and reporting to document effectiveness, identify gaps and deficiencies, and develop additional or modified management actions.

The first component is an explicit description of the management actions necessary to achieve the target Desired Outcome. The description must link the management actions to specific elements of the water system (quantity and quality) and identify both the necessary inputs (e.g., resources, data and information required to implement the management actions) and the expected outputs (e.g., the measurable results of the management actions). The strategy must describe how the management actions will affect the water system to achieve the Desired Outcomes. For purposes of the Blue Accounting Process, we refer to this component as the “workflow cycle” (Figure 2).

**Figure 2.** The generalized workflow cycle for the Blue Accounting Process: linking “things we do” to the Great Lakes water system, then to “things we desire from the water system,” with feedback to influencing the “things we do.”



A fairly detailed workflow cycle must be designed for the set of major management actions needed to achieve the Desired Outcome. A detailed workflow cycle facilitates understanding about how specific activities lead to outcomes. Some desired outcomes are relatively straightforward and can be achieved with relatively few management actions, while others (e.g., those covering economies) are more complex. (Initial brainstorming on workflow cycle details for each of the nine Desired Outcomes was developed by the project workgroup. These will be useful during start-up and are available through the Great Lakes Commission.)

The second component of the strategy is to select key process metrics that can be used for tracking and evaluating whether management actions effectively achieve the Desired Outcomes. Relatively few metrics are required for each Desired Outcome, and the number chosen will balance comprehensiveness with simplicity. *These metrics are the essence of the Blue Accounting Process because they describe how our decisions and investments are linked to Desired Outcomes via explicit interaction with the Great Lakes water system.*

The third component of the shared strategy is to discover, access and summarize the data and information that is needed to support development and tracking of the selected metrics. Again, only a limited amount of data and information will be necessary to support the selected metrics.

The fourth component involves the development and integration of adaptive feedback processes to report on progress toward achieving the Desired Outcome and inform subsequent management actions. Key process metrics will be summarized, and the overall performance of the strategy reviewed periodically to examine status of achieving the Desired Outcome and for adaptive improvements.

The second, third and fourth components together form a solid monitoring strategy for each selected Desired Outcome. As individual monitoring strategies evolve, they will frame a “comprehensive monitoring program” for the Great Lakes water system, as called for in the CGLG resolution.

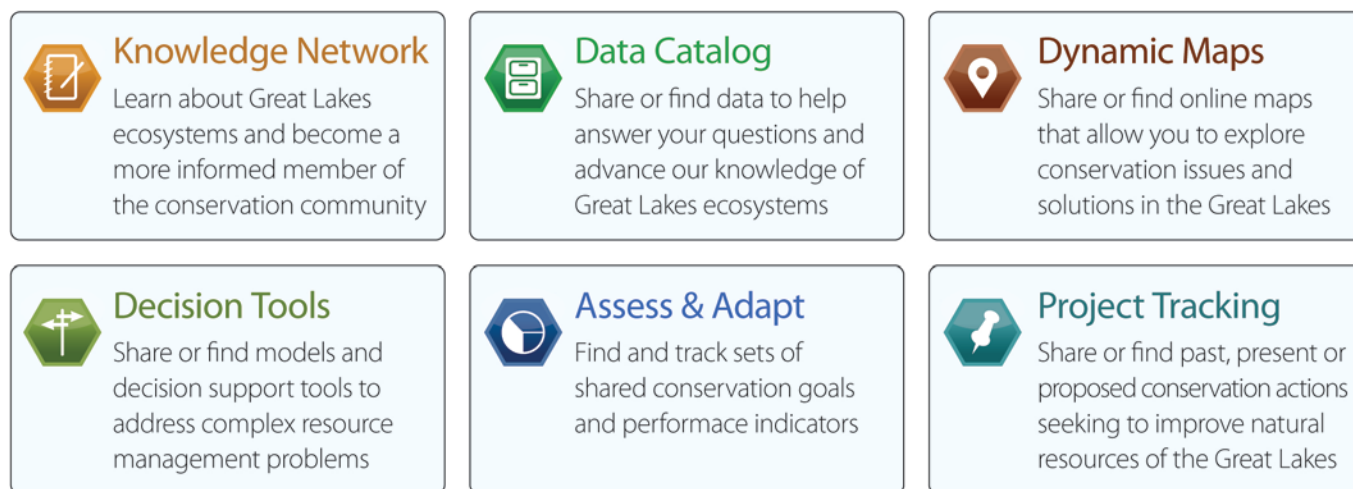
## Regional Information and Mapping Systems

### **Identify and compile needed socio-economic information**

Perhaps the most significant new effort needed for the Blue Accounting Process is the identification and development of necessary data and information related to socio-economic Desired Outcomes. Developing the appropriate workflow cycle and associated process metrics will be challenging, as these types of data, especially economic data, are currently not available on a watershed basis. However, governments routinely collect economic and labor data and statistics, and there is increasing capacity to remotely access, assess, manipulate and synthesize these data. As a result it should be feasible to develop initial, relevant economic information to inform these Desired Outcomes. Similarly, we anticipate that existing societal surveys can be modified, or novel ways of accessing and assessing social network data (e.g., Twitter, Instagram or crowdsourcing) could be used to enable the collection of applicable societal level data to inform the Desired Outcomes regarding Social Values and Quality of Life.

### **Adopt and tailor a software system to support the shared business strategy process**

The Great Lakes Information Management and Delivery System (GL-IMDS) is a software tool developed to support and guide the suite of collaborative business processes needed to accomplish a selected resource management outcome.<sup>iii</sup> It was developed by the Nature Conservancy’s Great Lakes Program and the U.S. Fish and Wildlife Service’s Upper Midwest and Great Lakes Landscape Conservation Cooperative, with the intent of supporting basin-scale, collaborative conservation and resource management efforts. As shown in Figure 3, the GL-IMDS incorporates a series of information modules that provide easy access to the right information and tools needed to drive an effective workflow cycle.

**Figure 3.** Information modules that comprise the Great Lakes Information Management and Delivery System.

The GL-IMDS provides an ideal information management approach that could be adapted to support development of the outcome-based information strategies that will comprise the Blue Accounting Process. Information-rich modules can be developed to support workflow processes for each of the nine Desired Outcomes.

### Adopt and tailor a common spatial information framework

The Blue Accounting Process requires a common mapping framework for assembling and manipulating data and information about the Great Lakes water system. A common spatial data framework will support coordinated survey designs, enable crosswalk among various datasets, facilitate extrapolation (e.g., from sampled to un-sampled areas), and permit interpretation and summary at various scales (enabling meaningful storytelling).

The Great Lakes Aquatic Habitat Framework (GLAHF)<sup>iv</sup> was developed for this specific purpose and is the ideal spatial framework for the Blue Accounting Process. GLAHF is a mature, regionally comprehensive platform for water-related data and information that provides a seamless spatial structure for Great Lakes water data across the entire basin. GLAHF was designed by the University of Michigan and the Great Lakes Fishery Trust primarily for ecological data and information, but can be tailored to provide meaningful human/societal overlays that will empower the Blue Accounting Process across all Desired Outcomes. Importantly, the development of GLAHF was guided by a collaborative, binational steering committee made up of the top regional experts on water-related geographic information systems from more than 15 agencies and universities across the Great Lakes region.

Incorporating GLAHF as an element of the Blue Accounting Process can be accomplished in two steps.

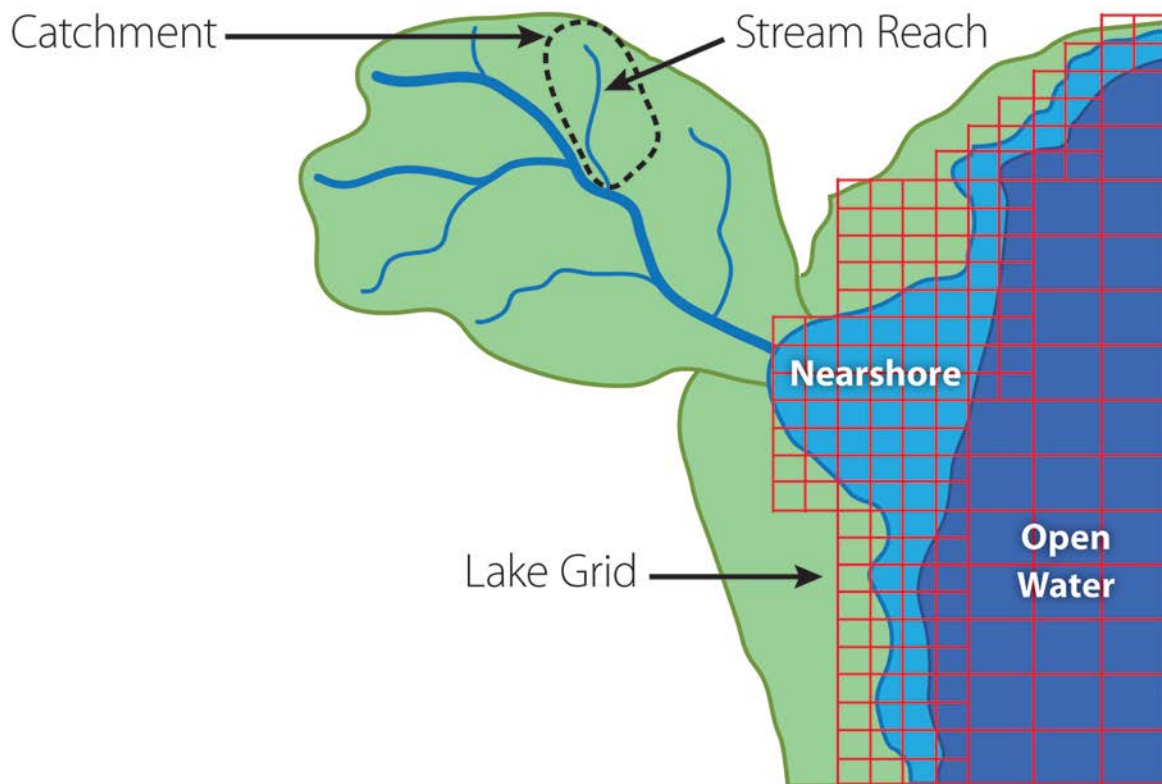
#### 1. Establish nested, sub-regional map units

GLAHF provides nested spatial scales to work with: the smallest map units, the basin as a whole, and intermediate map units. Map units are empty vessels, lines or polygons, to which data can be linked and that can be used for planning and information summary. For purposes of the Blue Accounting Process, the smallest map units would be

stream reaches/associated drainage catchments and nearshore/offshore lake grids (Figure 4). Each water-related datum, no matter what the subject matter, would be linked to one of these smallest map units.

The smallest map units would be nested within intermediate-scale map units (e.g., sub-regions). Sub-regions are ecologically and societally meaningful areas that enable users to understand the ecosystem, the human uses, the community within the region and the available data (i.e., to “tell the story about a place”). Examples of familiar sub-regions include the greater Chicago area (a socio-economic unit) and western Lake Erie and its tributaries (a hydrologic and ecological unit). Several sets of intermediate sub-regions might be nested between the reach/grid scale (the smallest map units) and the basin scale (the largest map unit) to allow simple zooming in/out as desired for various applications.

**Figure 4.** Illustration of the core, smallest map units—stream reaches/associated drainage catchments and nearshore/offshore lake grids—that structure the Great Lakes Aquatic Habitat Framework (GLAHF).



## 2. Integrate other basin-scale GIS tools

Many basin-scale, water-related GIS tools have been developed in recent years that may add value to the Blue Accounting Process framework. For example, both Canadian and U.S. governments have watershed-based hydrologic models that are used to estimate water budgets, streamflows, stream temperatures, stream nutrients and stream fish communities for all Great Lakes tributary reaches (N~200,000). These tools and modeling frameworks

should be reviewed to determine how they can be harmonized across the international border and incorporated into the GLAHF framework.

### Harmonize roles for the primary regional data portals

The Great Lakes region is served by numerous programs that collect, organize, manage and provide access to data and information (e.g., U.S. and Canadian federal agencies, state and provincial agencies, regional entities such as the Great Lakes Information Network and the Great Lakes Observing System, and federal-state collaborations such as the Exchange Network). However, existing programs often overlap and are not efficiently aligned. The Blue Accounting Process defines the “really big picture” for regional water management and establishes a strategic process for clarifying complementary roles and aligning existing efforts to achieve the overarching goals.

Efficient implementation of the Blue Accounting Process will require that representatives of the region’s key data and information management programs and portals be convened at one or two workshops to envision and design a collaborative and efficient structure for regional data and information management. The design would be coordinated with the GLAHF and GL-IMDS efforts described above.

## Common Organizing Principles and Collaborative Governance

Establishing collaborative governance for water information is perhaps the most important element of the Great Lakes Blue Accounting Process. The region’s current approaches to information governance do not provide a cohesive and effective information environment. They are specific to individual sectors or actors, and are often competitive, inflexible and driven by available data rather than designed to answer specific questions.

A more collaborative approach will enable the region to work efficiently toward a common agenda. Groups and individuals involved in this effort must adopt and adhere to a collaborative culture. Principles of collaboration for the Great Lakes Blue Accounting Process include an expectation that participants listen to, and work to understand, one another. Participants in multisector committees, teams and workgroups will come to the process with diverse interests and motivations. The resulting benefits and costs of the Process will be shared across a broad representation of public (government and academia) and private actors. Collaborative solutions must emerge from the group process – they are neither predetermined nor a negotiated compromise of entrenched positions. Creating a shared vision through a culture of trust takes an investment of time and patience.

Collaborative governance for the Blue Accounting Process should be structured to include:

- A regional-level, collaborative Steering Committee composed of multisector leaders from regional agencies and organizations. The Steering Committee would be charged with: a) overseeing the development and operation of the Great Lakes Blue Accounting Process and associated infrastructure; b) establishing the Collaboratives and holding them accountable to their operating and reporting duties; c) communicating and coordinating among all parties to reduce duplication and fill gaps related to monitoring of the Great Lakes water system; d) ensuring provision of dedicated and balanced resources for Blue Accounting activities across all parties; and e) serving as the liaison between the process and users.

The Steering Committee would be part of, or operate within, an existing regional institution. A kick-off summit to establish a process of governance, common principles and an overarching agenda ideally would occur within the first year of implementation.

- A smaller Technical Team to thoughtfully guide the Steering Committee through the technical aspects of its charge. This team would report to, and support, the Steering Committee, and be comprised of technical experts and program leads representing the multiple subject matter areas relevant to the information strategies and Desired Outcomes.
- A series of Collaboratives, each formed around a Desired Outcome or one of its primary components. A Collaborative is a multisector group of agency or organization staff representing a balance of program visions and authorities, and technical skills. Their charge would be to design and develop information strategies for individual Desired Outcomes. They would discover, access and summarize data and information in support of the key process metrics; identify key system gaps; develop budgets for pilot modules; set common protocols (QA/QC, data management, information development and delivery); and provide regular status reports as requested by the Steering Committee.
- A Secretariat to convene and facilitate many aspects of collaboration and reporting within the Blue Accounting Process. This entity would serve as the “neutral backbone” for the Process and provide cohesiveness and continuity that will be critical during development, implementation and operation of the Process. The Secretariat function may be provided by or included within an existing entity with an aligned mission and skill set.

## Pilot Information Strategies for Two Desired Outcomes

The Great Lakes Blue Accounting Process will take shape as a series of information strategies are developed and implemented to address selected Desired Outcomes, or their primary components.

We recommend the targeted development of pilot information strategies for two or three selected Desired Outcomes. These pilots would provide an opportunity to demonstrate the concept and learn while doing. The first pilot would formalize an effort already underway to illustrate the Blue Accounting Process in the context of an ecological Desired Outcome. A collaborative of four organizations<sup>v</sup> is using GL-IMDS to address a common priority issue: Aquatic Habitat Connectivity within the Great Lakes Region. These four groups are developing an information strategy that is conceptually and tactically similar to the Blue Accounting Process to create opportunities for improved aquatic habitat connectivity within the region. This issue is a natural component of the *Healthy, diverse and connected habitats* Desired Outcome and would provide an ideal starting point for the first pilot module.

In addition to the habitat connectivity component of *Healthy, diverse and connected habitats*, we suggest tackling *Safe and Sustainable Domestic Water Supply* (Domestic Water Supply) and *Flourishing and Sustainable Non-consuming, Water-based Economies*:

- *Safe and Sustainable Domestic Water Supply* is a good pilot topic because it is fairly straightforward and critical to the economy, and because the region’s water supply infrastructure is at risk. Despite the region’s apparent success at delivering a water supply to users, we do not have broad access to basinwide information on costs and efficiencies, or local supply failures. Further, highlighting and tracking the maintenance status of water and sewerage treatment and supply infrastructure across the basin would clarify the risk and potential challenges to the mid- and longer-term security of this valuable water use.

- *Flourishing and Sustainable Non-consuming, Water-based Economies* is a good pilot topic because it is an indicator of the community-level, perceived value of the Great Lakes resource, and there is a significant gap between the importance of many aspects of this economic activity and what we know about its connection to the region's prosperity. Further, we understand that socio-economic values are the least advanced of all values, and tackling this Desired Outcome will lay solid groundwork for the development of these topics.

## Sample Pilot Module – Domestic Water Supply

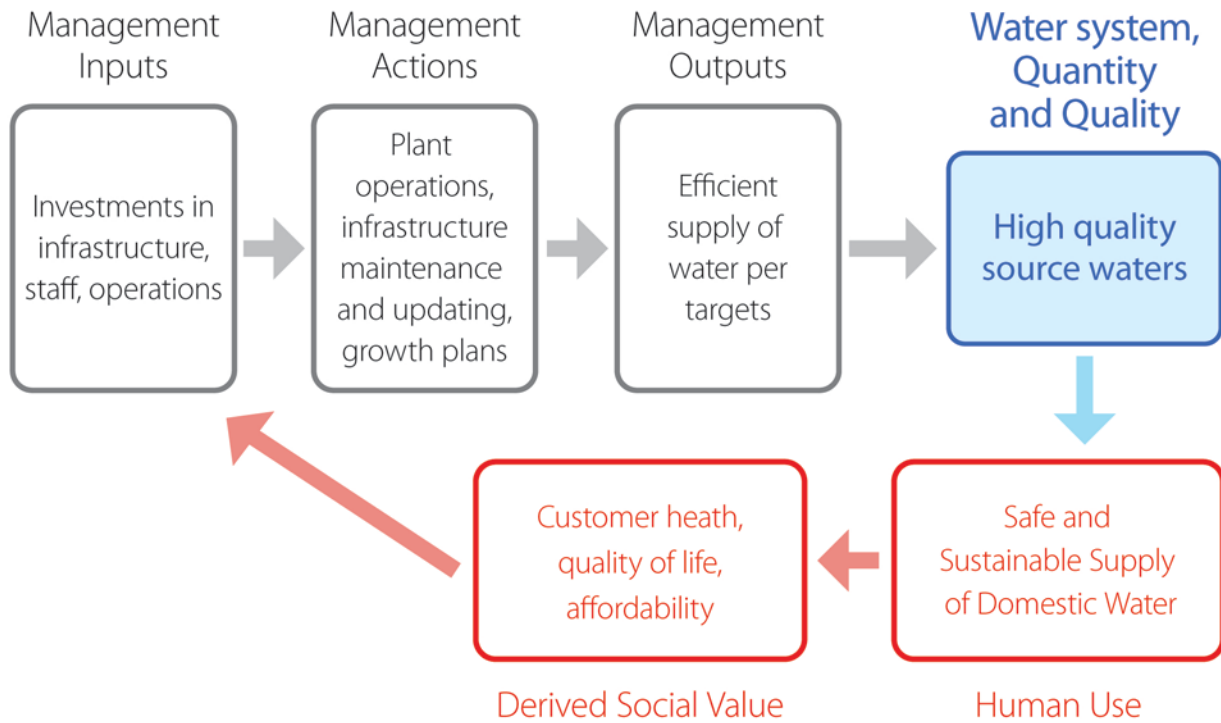
Building a pilot information strategy for Domestic Water Supply would involve a series of steps. The following illustrates one way in which that could be achieved:

- Step 1.** The Steering Committee would determine whether Drinking Water Supply could be tackled via a single information strategy or whether several information strategies need to be developed. For example, Drinking Water Supply could require information strategies for both quantity and quality of source water, and infrastructure to treat and deliver water. For this illustration we assumed a single information strategy for this Desired Outcome.
- Step 2.** The Steering Committee would establish a multisector workgroup – a Drinking Water Supply Collaborative. The Collaborative would have primary responsibility for developing, implementing and operating the information strategy. Membership in the Collaborative could include program managers and technical experts from private and public water suppliers; municipal and state/provincial government operators; business, accounting, engineering and water consultants; or academics.
- Step 3.** The Steering Committee would charge a small core team of two or three individuals for a relatively short (e.g., two-year) start-up assignment. This team would complete the pilot module for Drinking Water Supply within the initial timeframe under the direction of the Collaborative. Members of the core team would have project management and technical expertise; and would provide leadership and focus to the effort.
- Step 4.** The Collaborative would develop and implement an information strategy for Drinking Water Supply that is common across regional players. This strategy would involve formalizing a Workflow Cycle diagram that describes strategic management actions and the logical flow of how the actions affect the Great Lakes water system (considering both quantity and quality) to produce the desired outcome of Drinking Water Supply and its associated derived social values (Figure 5).

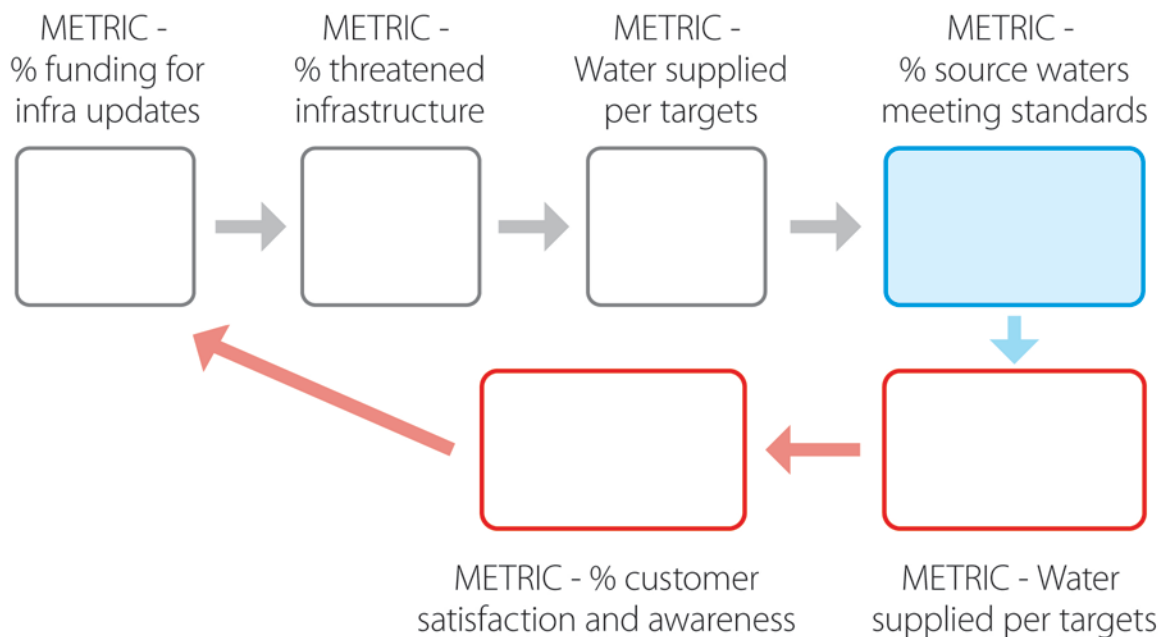
As part of the information strategy, the Collaborative would select a small set of key metrics that “track the story” of the entire work process. The objective would be to track a critical set of metrics that do a reasonable job describing progress toward the Domestic Water Supply outcome, but not to track all aspects of the work process in great detail (Figure 6).



**Figure 5.** Example of a work process diagram for Domestic Water Supply.



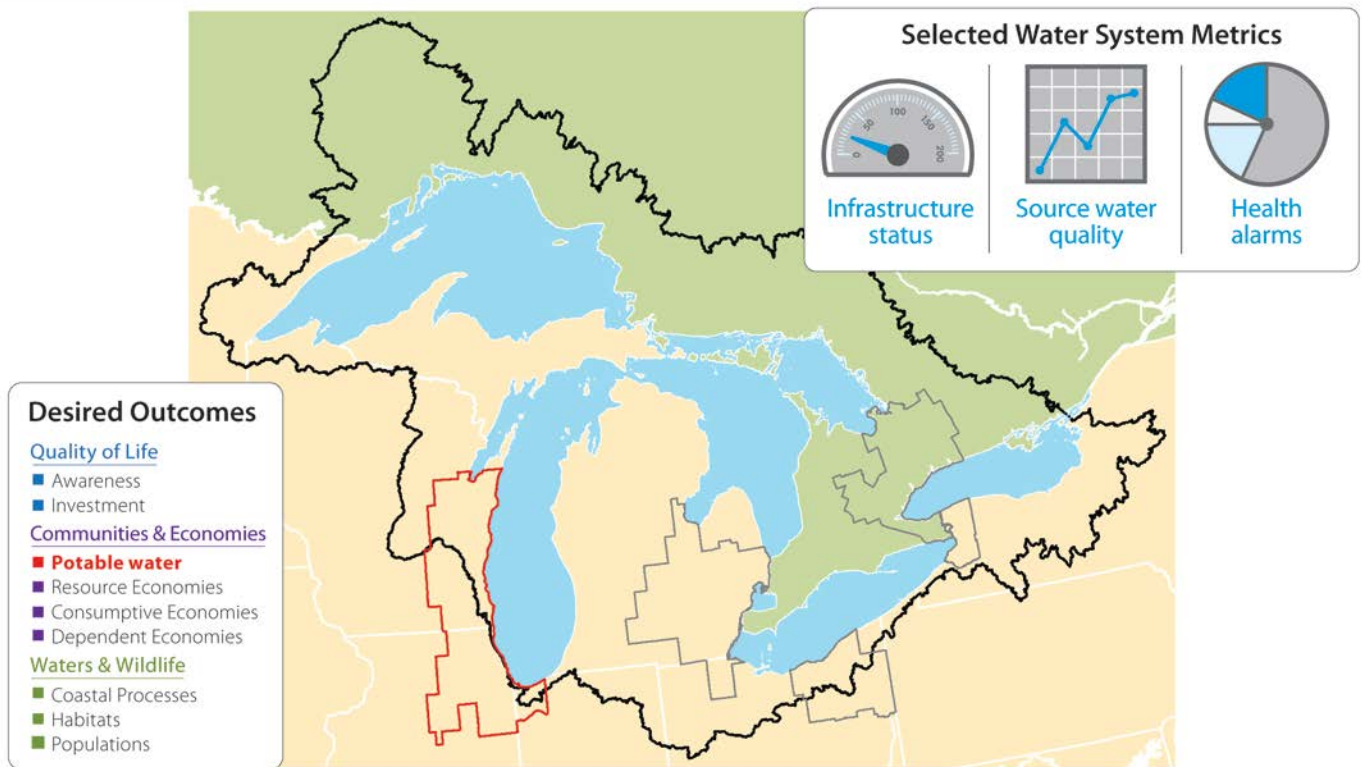
**Figure 6.** Example set of key process metrics for tracking status of the work process for Domestic Water Supply.



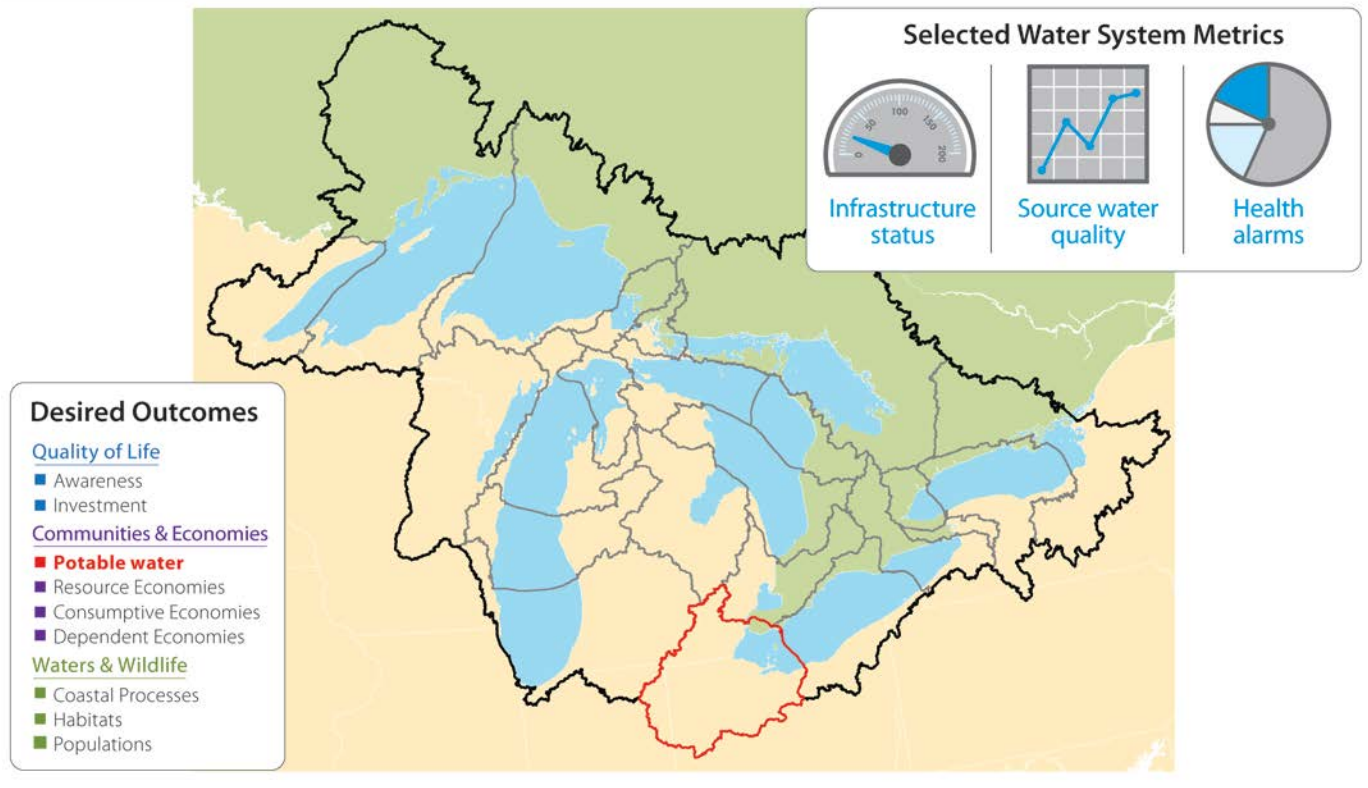
**Step 5.** The Collaborative would use the GL-IMDS and the GLAHF to build an application for Domestic Water Supply that provides access to, and summarizes, information to support the key process metrics for Domestic Water Supply. This application would provide the first (rough) baseline status report for the process required to achieve Domestic Water Supply and the associated derived social values.

Using GLAHF would ensure that the information is viewable by sub-region and for the basin as a whole. Meaningful information about Domestic Water Supply could be viewable by major metropolitan area (Figure 7) or, if source water is the object, by hydrologic unit (Figure 8).

**Figure 7.** Conceptual dashboard for Domestic Water Supply by metropolitan area.



**Figure 8.** Conceptual dashboard for Domestic Water Supply by hydrologic unit.



## Implementation and Resourcing

Resources needed to start up and run the program at full capacity are estimated at ~\$1 M per year (Table 3). If needed, however, start-up could be incremental. Resources should flow from a variety of involved public and private sources. Multisector partners will also need to contribute employee time, expertise and other in-kind services to all program levels (most notably the issue-based Collaboratives). Start-up funds will be needed in years 1-2, and then as each additional issue strategy is developed. Long-term funding sources will be unique to each issue and will be largely self-generated by the community finding value in the strategy.

**Table 3.** Estimated finances needed to implement the Great Lakes Blue Accounting Process.

Program Element		Year 1	Year 2	beyond
Mapping and information platforms	Tailor GLAHF and IMDS platforms; harmonize existing information portals	\$ 30 K ops \$300 K (3 FTE)	\$ 30 K ops \$100 K (1 FTE)	\$10 K ops \$100 K (1 FTE)
Governance	Steering Committee, Secretariat, and core team meetings and expenses, including initial summit	\$ 10 K ops \$ 80 K (.7 FTE)	\$ 10 K ops \$ 80 K (.7 FTE)	\$ 10 K ops \$ 80 K (.7 FTE)
New Pilot Modules	Two core teams (3 FTEs for each) and two Collaboratives to build two applications by Year 2	\$ 20 K ops \$600 K (6 FTE)	\$ 20 K ops \$600 K (6 FTE)	Continue in two-year increments
Total \$		\$1.04 M	\$840 K	\$820 K

## Conclusion

The Great Lakes Blue Accounting Process is a transformative strategy that provides an overarching framework (goals, strategies and tools) for realizing full water values across the region. Implementing the Blue Accounting Process involves identifying and re-aligning critical elements of existing information programs; and formalizing an issue-driven, collaborative approach to investing in information to achieve desired outcomes. This process is a critical step in preparing the region to address both opportunities and risks: future economic growth, recruitment of new industries and talent to the region, climate change, and continued interest from outside the region in tapping into Great Lakes waters.

## Appendix: The Collaborative, Multisector Workgroup

The CGLG resolution instructed that future monitoring needs to have a collaborative basis, modeled within this planning effort by using a collaborative, multisector workgroup to help guide recommendations.

We gathered a workgroup with broad expertise, representing: governments from Canada and the United States (from federal to local scales); the three binational lakes commissions; industries including foods, power and shipping; expertise in hydrology, water quality indicators, water accounting, gathering local perspectives/stories and binational governance (Table 4). The workgroup met twice in person, for two-day sessions where we collectively worked through each segment of our report, and members participated on smaller task teams. Neither our report nor its recommendations are endorsed by the various workgroup members or their employers; however the collective wisdom of the group provided the foundation for our report. We appreciate the earnest investment of all workgroup members in our brainstorming process.

Funding for these efforts was supported by The Joyce Foundation.

**Table 4.** Membership of the Water Monitoring and Accounting Workgroup.

Name	Agency/Company/University
Jon Allan	Michigan Office of the Great Lakes
John Bratton	NOAA, Great Lakes Environmental Research Laboratory
Kathryn Buckner	Council of Great Lakes Industries
Jan Ciborowski	University of Windsor
James Clift	Michigan Environmental Council
John Dettmers	Great Lakes Fishery Commission
Tim Eder	Great Lakes Commission
Steve Fisher	American Great Lakes Ports Association
Lisa Fogarty	USGS, Michigan Water Science Center
Dave Hamilton	The Nature Conservancy
Beth Hinchey-Malloy	USEPA, Great Lakes National Program Office
Christine Manninen	Great Lakes Commission
Jacque Hoornweg	Ontario Power Generation
Frank Kenny	Ontario Ministry of Natural Resources
Wendy Leger	Environment Canada
Frank Lupi	Michigan State University, Department of Agricultural, Food, and Resource Economics
Dale Phenicie	Council of Great Lakes Industries

Randy Puckett	Campbell's Soup Supply Co.
Jennifer Read	University of Michigan Water Center & Great Lakes Observing System
Ben Ruddell	Arizona State University, Department of Engineering & Global Institute of Sustainability
Paul Seelbach	Great Lakes Commission
Janet Silbernagel	University of Wisconsin, Nelson Institute for Environmental Studies
Debora VanNijnatten	Wilfred Laurier University, Department of Political Science
Li Wang	International Joint Commission
Peter Zuzek	WF Baird and Associates Coastal Engineers Ltd.

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<sup>i</sup> Council of Great Lakes Governors. Resolution on water monitoring. June 1, 2013, Mackinac Island, Michigan.

<sup>ii</sup> Kania, J., and M. Kramer. 2011. Collective Impact. Stanford Social Innovation Review.

<sup>iii</sup> Great Lakes Information Management and Delivery System. Accessed February 2104. <http://imds.greenlitestaging.com/>

<sup>iv</sup> Great Lakes Aquatic Habitat Framework. Accessed February 2014. <http://ifrgis.snre.umich.edu/projects/GLAHF/glahf.shtml>

<sup>v</sup> The four groups are the Great Lakes Basin Fish Habitat Partnership, Upper Midwest and Great Lakes Landscape Conservation Collaborative, Great Lakes Fishery Commission, and The Nature Conservancy.