



## NASCIO 2008 Recognition Awards Nomination

### Michigan

**Title of Nomination: Michigan Surface Water Information Management System (MiSWIMS)**

**Category: Cross-Boundary Collaboration and Partnerships**

#### **Nomination Information**

*Project Manager:* Jason Smith  
Job Title: Project Manager  
Agency: Water Division  
Department: Environmental Quality  
Address: Constitution Hall  
525 West Allegan Street  
P.O. Box 30473  
City: Lansing  
State: MI  
Zip: 48909-7973  
Phone: 517-373-2758  
Email: [SMITHJ18@mi.gov](mailto:SMITHJ18@mi.gov)

*Project Manager:* James Breck  
Job Title: Project Manager  
Agency: Institute for Fisheries Research  
Department: Natural Resources  
Address: 212 Museums Annex Building  
1109 N University Avenue  
City: Ann Arbor  
State: MI  
Zip: 48109-1084  
Phone: 734-663-3554 ex 110  
Email: [BRECKJ@mi.gov](mailto:BRECKJ@mi.gov)

#### **Nominator Information**

Person Nominating: Eric Swanson  
Title: Director, Center for Shared Solutions  
Michigan Department of Information Technology  
Address: GW Romney Building, Floor 10th  
111 S. Capitol Ave.  
City: Lansing  
State: MI  
Zip: 48933  
Phone: 517-373-7910  
Email: swansone@michigan.gov

## **B. Michigan's Cross-Boundary (XB) MiSWIMS: Executive Summary**

At the heart of Michigan's Information Technology Strategic Plan is the course and vision to share services and enhance collaboration with partners both inside and outside of state government. From 2002 to 2007, Michigan was heavily focused on consolidation and standardization. The future brings opportunities for sharing services and breaking down traditional boundaries.

The Michigan Department of Information Technology has formed the Center for Shared Solutions to lead the way in creating partnerships and sharing solutions inside and outside state government. A stellar example of a XB shared solution can be found in the Michigan Surface Water Information Management System (MiSWIMS), located at <http://www.mcgi.state.mi.us/miswims>, which clearly demonstrates mature transferable XB processes and system and data architecture to all tiers of government—state, federal, and local.

In 1998, **Michigan voters approved a \$675 million bond**, the Clean Michigan Initiative (CMI), to clean-up, protect, and enhance water quality, natural resources, and infrastructure. Legislation for the Clean Water Fund, which was established under the CMI bond, stated that the highest priority for the Fund would be the monitoring strategy; therefore, **\$45 million was set aside to implement a surface water quality monitoring plan** established by the Michigan Department of Environment Quality (DEQ). Under this plan, the Michigan DEQ and Department of Natural Resources (DNR) came together in a collaborative effort with the **U.S. Geological Service (USGS), U.S. Environmental Protection Agency (EPA), and the U.S. Department of Agriculture Forest Service** on advancing the National Hydrography Dataset (NHD) to manage and administer the various programs that monitor water resources throughout Michigan.

The state of Michigan, otherwise known as **the Great Lake State**, is home to more than 11,000 inland lakes and more than 36,000 miles of streams. No matter where you are in the state, you are within six miles of water or within 85 miles of a Great Lakes. Protecting this resource is not only critical to insure the health and welfare of Michigan's citizens, but also for protecting the **largest fresh water resource in the U.S. Mainland**. Users of Michigan's water asset contribute \$12 billion and 200,000 associated jobs annually to its economy.

The state once faced many **challenges** in the day-to-day oversight and monitoring of water quality. **Multiple databases** were maintained and information was **not readily available** to public. State staff spent **numerous hours a week** simply answering calls from the public on water quality. The development of MiSWIMS **democratized Michigan's vast collection of water information**. This has **resulted in great efficiencies** that can be witnessed in both time and money saved by the state and its citizens. Since the application's September 2007 release, it is estimated that the state has **saved nearly \$100,000** in staff time alone by granting public access to water quality data through MiSWIMS.

**Collaborative Process/Innovative Web 2.0 Mash-up**—Building such a massive database is **beyond the reach of any one agency**, but a **partnership of organizations** that pool funding, resources and design requirements makes it possible. **Shared benefits** achieved by applying evolving technology provide citizens and policy makers across the nation the ability to make many new discoveries about the quality of the **U.S. Mainland's largest fresh water supply**.

### C. Business Problem and Solution

Water is one of Michigan's most important and distinguishing economic resources. Wildlife depend on fresh and abundant water supplies for their sustenance and habitat. Business, industry and agriculture all require high quality water for sustainable economic development and tourism is directly supported by the streams, rivers and lakes which vacationers enjoy. Michigan contains 3 million acres of wetlands, 1,305 square miles of inland water, 38,575 square miles of Great Lakes water, 11,037 inland lakes, 36,000 miles of rivers and streams, and 12,000 miles of cold water trout streams—the **largest fresh water resource in the U.S. Mainland**. Consequently, Michigan's water quality is of **national importance**.

- Michigan ranks 5th in the nation in numbers of licensed resident and nonresident anglers who contribute \$2 billion annually to the economy.
- Michigan ranks 3rd in the nation in the number of registered boats; recreational boating contributes \$2 billion annually to the economy.
- With 22 million visitors annually, state parks and recreation areas play an important role in Michigan's tourism industry, contributing \$580 million to the economy.
- Michigan's nearly one million registered boaters spend \$873 million on trips.
- Michigan ranks 3rd in the nation in licensed hunters (more than 750,000) who contribute \$1 billion annually to the economy. Some 3.2 million non-consumptive users contribute \$1.5 billion to the economy.
- **Recreational users of Michigan's assets contribute \$12 billion and 200,000 associated jobs annually to the economy.**

Comprehensive water quality monitoring is necessary to improve natural resource management, maintain sustainable ecosystems, and protect public health. An effective program must support objective water quality decision-making at all levels of government, as well as engage the public about water quality conditions and changes. In response to this need, the DEQ completed the "A Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters" in January 1997. This strategy describes the necessary monitoring activities for a comprehensive assessment of water quality in Michigan's surface waters and has guided Michigan's monitoring program implementation.

Since 1998, \$3 million per year has been invested in surface water quality monitoring providing a substantial increase in the amount of data being generated. The state developed many internal databases to store and maintain this data, however, these databases were not integrated such that information among media (e.g. water, sediment, fish and wildlife issues, etc.) could be easily compared. In addition, little data was readily available to the public. Agency staff often spent up to 24 hours a week responding to water quality inquiries. Thus, the state committed to the development of a Web 2.0 mash-up that would allow decision makers, analysts, and the public to view, query, and analyze water quality information in a user-friendly format. The following objectives were established, ultimately leading to the development of MiSWIMS:

- Support water quality monitoring study design, data analysis, and reporting;
- Improve ability to make attainment/nonattainment decisions;
- Assess temporal and spatial trends in water quality;

- Ensure more effective use of water quality data to support various program decisions and evaluate program effectiveness;
- Promote public access and use of water quality data and information.

To initiate the process, DEQ staff met with stakeholders (internal and external) in October 2003 to discuss issues, examples and possible approaches for enhancing the state's delivery of available environmental data. Representatives from DNR and DIT were brought in during March 2004 to discuss availability and sharing of data and to ensure that the resulting technical solution would empower decision makers and the public. Finally, in November 2004, input from federal, local, and academic experts helped ensure that the resulting system design met the advanced goals and objectives of the Michigan's water quality program.

As a result, MiSWIMS integrates multi-media real time in a **web 2.0 mash-up architected to the national NHD data model**. Its development involved reconciling and resolving numerous issues including: vision and leadership; business cases and shared value; strategies and policies; information management; standards; people, resource and funding allocation; integrating processes; and consensus on appropriate technical architecture. In addition, through the collaboration with the USGS, EPA, and the USDA Forest Service MiSWIMS serves as an exemplary model that demonstrates that both the XB processes and system and data architecture are transferable to all tiers of government—state, federal, and local. It includes:

- Environmental monitoring data on the water and sediment chemistry, aquatic macroinvertebrate community, and physical habitat in various Michigan surface waters;
- Bacteriological data collected by the DEQ and local county health departments for various surface waters and public bathing beaches, including information about beach closings and water quality standard exceedances;
- Fish contaminant data collected by the DEQ for various Michigan surface waters;
- U.S. Geological Survey (USGS) flow gauge station information for Michigan;
- High and low flow data from the DEQ Land and Water Management Division's High Flow Discharge Information database;
- Information for all permitted discharges of wastewater into Michigan surface waters and groundwater;
- Information about non-point source water quality protection grants that have been awarded by the DEQ to local units of government and non-profit entities in Michigan;
- The location and other information about domestic septage land application sites in Michigan;
- General information regarding lakes, streams, and rivers collected and summarized by the DNR, including lake name, surface area, maximum depth, perimeter, and fetch (longest unobstructed distance across the lake);
- The drainage area, discharge, nutrient concentration, summer water temperature, valley character, channel character and key fish species of river and stream valley segments, which are the ecologically similar units into which Michigan's rivers and streams have been divided;
- Designated trout streams as determined by the DNR;

- Natural rivers as designated under the Natural River Act, which is designed to preserve and enhance a river's aesthetics, free-flowing condition, recreational value, boating use, historic status, water conservation, floodplain, and fisheries and wildlife habitat;
- DNR Fisheries Division reports about state waterways
- The number of fish stocked in a waterway by date and species; and
- A list of game fish species found in waterways by the DNR Fisheries Division.

#### **D. Significance of the Project**

##### **POLICY ALIGNMENT**

As stated earlier, Michigan voters approved a \$675 million bond in 1998, the Clean Michigan Initiative (CMI), to clean-up, protect, and enhance water quality, natural resources, and infrastructure and has since invested \$3 million per year in surface water quality monitoring.

At the heart of Michigan’s Information Technology Strategic Plan is the course and vision to share services and enhance collaboration with partners both inside and outside of state government. This course is explicitly detailed in Goal 2—“Service: Deliver efficient and effective technology services and shared solutions to the agencies” and Goal 5—“Cross-boundary Solutions: Foster partnerships across and beyond state government”. The most important benefit from establishing MiSWIMS as a XB collaborative effort is the **political return**. MiSWIMS has enabled multiple state, federal, academic, local agencies the ability to simplify and enhance the job of staff that manage our natural resources. Key issues facing the state and nation, such as, homeland security, smart growth initiatives, and water management do not respect government jurisdiction—nor should the data. MiSWIMS has provided a literal “cross-roads” of information. Public policymakers need the best information available to them from the point of policy creation to implementation.

##### **BENEFICIARIES**

**Improve Access to Government:** State, local, federal, academic institutions along with business and private citizens have questions, problems, or concerns regarding the subject of water. They do not want to have to match their specific question (or a part of their question) to a specific department or tier of government bureaucracy on a web portal. In the past, customers would get bounced around from division to division for pieces of the answers to their questions. Today, MiSWIMS delivers a complete picture of Michigan’s water quality and monitoring story from one site and a few clicks. "MiSWIM is a great web-mapping implementation." - William H Pollock. "I am very impressed with the new MiSWIM system, particularly in its technical design." - Glenn O'Neil, Institute of Water Research, Michigan State University.

##### **OPERATIONAL AND PROCESS IMPROVEMENTS**

**Supports Improved Decision-Making:** Now, water quality management staff can, in a matter of seconds, integrate biological, social and economic factors into a comprehensive strategy aimed at protecting and enhancing sustainability, diversity, and productivity of our natural resources. Furthermore, water quality processes operate over a wide range of spatial and temporal scales, and their behavior at any given location is greatly affected by surrounding systems. Decisions often rely on these types of correlated space and time relationships. Before MiSWIMS, many of these important relationships were not brought into the decision-making

process. A specific example of improved decision-making is found in the DEQ Water Bureau. The Bureau staff use MiSWIMS to research data output from one program, the Water Quality Based Effluent Limit recommendations, and in turn, use the data as the basis for the limits enforced by the National Pollutant Discharge Elimination System permits issued to pollutant discharging facilities. With such information available, scientists employing the technology can make many new discoveries about the relationships of events in Michigan's surface water system. Hypotheses about the cause and effect can be tested and solutions to problems can be made. Extensive, in-depth, and shared databases that have credibility with the XB participants now support a greatly improved decision-making environment. For example, prior to the availability of MiSWIMS, it was virtually impossible for environmental analysts and managers to integrate information in a timely manner to support a decision making process. Proper questions were often not asked because it was known that data was not readily available.

**Advanced Information Management:** Prior to MiSWIMS, multiple state and federal databases were either being managed as separately or stored in unmanaged spreadsheets. Not only was the data difficult to access, but in many cases, it was not being updated, backed-up and securely administered according to IT best practices. MiSWIMS served as the catalyst to move all data to a managed environment. In addition, the common spatial referencing that tied all linear hydrographic data together was the NHD data model. Today, all data are spatially referenced in relationship to all other data. This system design and architecture known as a Web 2.0 mash-up integrates all data a course of doing business in the respective agencies. Each database has a corresponding data steward who is responsible for data maintenance and correcting and validating all errors. The overall cost of data management has been reduced through the reduction of duplicate and redundant data development and management. The end result is an integrated information resource that is "blind" to jurisdictional ownership and the operational "silo" mentality.

**Improved Communications and Collaboration:** Information is assembled, processed, shared and displayed in a way that stakeholders and citizens can understand and use. Statewide water quality datasets and are systematically maintained through integrated partnerships.

**Advance Digital Government Maturity:** MiSWIMS represents the power of an enterprise mash-up—the integration of disparate data stores into a common mapping and reporting web system. Integrated, collaborative systems development creates intelligent systems through which sophisticated planning and analysis can be performed at the touch of a button.

## **E. Benefits Of the Project**

Benefits derive both from the XB approach as well as the processes and services strengthened and the technologies maximized. Jointly, these create a platform for enhanced and new government capabilities. In addition, implementing integrated XB asset management aligns with state priorities, improves and advances information management, improves existing and enables new statewide programs and services, improves communications, collaboration and decision-making. Quantitative benefits include increased productivity and cost savings by enabling access to query water quality information via the web. Qualitative benefits come in a variety of forms ranging from customer satisfaction and improved accuracy to increased efficiency.

## QUANTITATIVE BENEFITS

**Save Time/Money:** Inquiries on Michigan water quality have dropped 65% since MiSWIMS September 2007 release. DEQ and DNR have already saved nearly \$100,000 in staff time by granting access to water quality data through MiSWIMS. Inquiries continue to decrease as more and more users become familiar with the system.

-24 Hrs per Wk Responding to Inquiries x 52 Wks x \$90 Hr: \$112,320 Annual Savings

-5 Year XB Savings \$561,600

-Application Development Cost \$120,000

**Overall Return on Investment: \$561,600/\$120,000: 4.7**

## QUALITATIVE BENEFITS

**Customer/Employee Satisfaction:** State of Michigan staff now has a centralized location to access water quality data, thus speeding up and increasing quality of services, as well as customer satisfaction. In addition, internet based systems reduce trips by customers and travel to locations by employees.

**Improved accuracy, reduced errors:** The XB data integration standards, cross-referencing and validation processes, along with the support technologies improve accuracy and reduces error. The precision support technologies such as GPS, orthophotography, remote sensing and satellite imagery further increase the validity of data. For example, the previous data management system used by the DEQ, STORET, was cumbersome and difficult to run quality assurance. Now, with MiSWIM, QA is much easier and corrections can be made on the fly without having to upload new information to the EPA mainframe.

**Increase efficiency:** Eliminate redundant, outdated steps in processes; alter or reduce staff workloads; give employees access to a knowledge base for responding to customer inquiries or business tasks and decisions. For example, in the past staff have used 3 different systems to look up data for a specific location (STORET), view aerial images of the location (Google Earth), and used road maps to find driving direction for field work in the area (Terrain Navigator). MiSWIMS provides a simple one-stop-shop.

**Collaborative Process:** Partnership of organizations that pool funding, resources and design requirements can resolve a progression of challenges and opportunities to establish successful cross-boundary relationships, capabilities and services. Progressive accomplishments and shared benefits dynamically evolve from separate use of separate databases, to shared information and solutions, and to the development of completely new capabilities and services under a shared governance mechanism, standardized processes and technology. Today, Michigan's vast collection of water quality data is organized and integrated in a manner that is readily accessible to all stakeholders through MiSWIMS and architected to a national model.