

# Wisconsin's Great Lakes Beach Monitoring & Notification Program

## Annual Report 2011 Beach Season



**Bureau of Watershed Management  
Wisconsin Department of Natural  
Resources**



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### **Local participants include:**

Ashland County Health Department  
Bayfield County Health Department  
Brown County Health Department  
City of Milwaukee Health Department  
Door County Health Department  
Douglas County Health Department  
Iron County Health Department  
Kenosha County Division of Health  
Kewaunee County Health Department  
Manitowoc County Health Department  
North Shore Health Department  
Ozaukee County Health Department  
City of Racine Health Department  
Sheboygan County Human Services  
Shorewood/Whitefish Bay Health Department  
City of South Milwaukee Health Department

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**Thank you to everyone who makes Wisconsin's Great Lakes Beach Monitoring & Notification Program a success!**

Cover photo: City of Kewaunee Beach, Kewaunee County. WDNR Photo.

## Summary

The summer of 2011 was the ninth season of the Wisconsin's Great Lakes Beach Monitoring & Notification Program. The Wisconsin Department of Natural Resources (WDNR) was awarded \$231,000 by the United States Environmental Protection Agency (USEPA) to implement the federal Beaches Environmental Assessment and Coastal Health (BEACH) Act of 2000. With this funding, 112 public beaches along the Wisconsin shorelines of Lake Superior and Lake Michigan were sampled for *Escherichia coli* (*E. coli*) bacteria in 2011 and the data was used to make beach management decisions and implement a public notification program at these beaches.

Similar to past years, 16 health departments representing 13 Lake Michigan and Lake Superior coastal counties accepted BEACH Act funding and collected samples at selected public beaches one to five times per week. Beach *advisories* and/or *closures* were posted using signs placed on the beach property in addition to information being provided on an Internet Web Site (<http://ww.wibeaches.us>). Decisions to post an advisory versus a closure were generally triggered by the amount of *E. coli* present as compared to thresholds recommended by USEPA. In some cases, advisories and/or closures were prompted by rainfall, known or suspected sewage bypasses, or other factors that have been linked to high *E. coli* counts in the past, as well as the results of rapid lab methods (qPCR) and/or statistical "Nowcast" models.

Based on the monitoring results of the 2011 beach season, the overall percentage of beach samples that exceeded the health advisory threshold was the second lowest since beginning BEACH Act monitoring. Additionally, the percentage of total beach samples that exceeded the federal advisory criterion for *E. coli*, 235 Colony Forming Units per 100 mL of water (235 CFU/100mL), was 3% lower than the average of the eight previous beach seasons. These results suggest that ongoing remediation efforts and best management practices, implemented at beaches throughout Wisconsin, are having a positive impact on water quality at our Great Lakes beaches. Additional data analysis is needed to investigate the connection between these activities and water quality in greater detail.

## Introduction

The BEACH Act provides funding opportunities for coastal and Great Lakes states, territories, and tribes to develop and conduct beach pathogen monitoring and public notification programs at their coastal beaches. The recipients of BEACH Act grants are required to develop monitoring and notification programs in alignment with grant performance criteria specified by USEPA. The State of Wisconsin has participated in the federal BEACH Act program since its inception through a collaborative effort involving the Wisconsin Department of Natural Resources (WDNR), local health departments, academia, and the United States Geological Survey (USGS) to collect and share information related to water quality of Lake Michigan and Lake Superior public beaches.

The primary goal of Wisconsin's program is to increase visitors' awareness of potential exposure to pathogenic microorganisms while at the beach. *E. coli* is a bacteria species that serves as a pathogenic indicator organism because it is commonly found in the feces of warm-blooded animals. When high levels of *E. coli* are detected, it is likely that fecal matter is present in the water which suggests that humans may be exposed to other harmful pathogens like bacteria, viruses, and protozoans. Potential sources of *E. coli* contamination at Wisconsin beaches include agricultural and urban stormwater runoff and sewage overflows. In addition, localized sources from wildlife and waterfowl feces may contribute to high levels of *E. coli* in both beach sand and water.

The 2011 Beach season was the ninth consecutive summer of Wisconsin's Great Lakes beach monitoring and notification program. The activities described in this report were conducted during Federal Fiscal Year 2011 (October 1, 2010 through September 30, 2011).

## Program Overview

A BEACH Act Workgroup was formed in 2002 to help develop Wisconsin's Great Lakes Beach Monitoring & Notification Program. This workgroup was comprised of state-level environmental and public health officials, local health officials, and other interested parties to design a beach monitoring and notification program. Workgroup members included representatives from:

City of Milwaukee Health Department	City of Racine Health Department
City of Madison Health Department	Keep Our Beaches Open
Kenosha County Health Department	Milwaukee Metro Sewerage District
Ozaukee County health Department	United States Geological Service
University of Wisconsin – Oshkosh	Wisconsin State Laboratory of Hygiene
Wisconsin Department of Health & Family Services	

In 2002, approximately 55 miles of public beach miles at 192 coastal beaches were identified along Lake Michigan and Lake Superior. The definition of a "beach" for the purpose of the Wisconsin Great Lakes Beach Monitoring & Notification Program implementation is:

*“A publicly owned shoreline or land area, not contained in a man-made structure, located on the shore of Lake Michigan or Lake Superior, that is used for swimming, recreational bathing or other water contact recreational activity.”*

Coastal beaches were geo-located using geographic positioning software (GPS) and geographic information system (GIS) technologies were used to create maps for each county to identify the location of each beach. Information was collected on potential sources of pathogens for each beach, such as: location of stormwater outfalls, waterfowl usage, proximity of wastewater treatment plant outfalls and farms. This information – along with general estimates of swimmer density – was used to rank and classify beaches as “high,” “medium,” or “low” priority. These ranks were then used to distribute available program funds as equitably as possible to address the relative risk of pathogen exposure to people who swim or wade in the near-shore waters of public beaches.

In an effort to standardize as much of the statewide program as possible, the Workgroup agreed to collect samples using consistent field protocols and to use common advisory signs for beach posting. The signs were designed based on feedback collected during a beach user survey in 2002 and public meetings held around the state (Appendix D). With the assistance of BEACH Act funding, staff from the USGS designed and manage the Wisconsin Beach Health Website (<http://www.wibeaches.us>) in partnership with the local health department staff. The USGS also serves as the primary data manager and oversees all data integration needs with USEPA to support the national information exchange goals of the BEACH Act.

## **Beach Season - 2011**

The primary purpose of Wisconsin’s Great Lakes Beach Monitoring and Notification Program is to support a consistent statewide Great Lakes beach water quality monitoring and public notification program that reduces beach visitors’ risk of exposure to disease-causing microorganisms in water. For 2011 this meant that 112 Great Lakes beaches were monitored at least weekly and all monitoring data was uploaded to the Wisconsin Beach Health Website within 24hrs of collection. The data was used to make beach management decisions and generate beach advisory reports on the Wisconsin Beach Health Website. Additionally, members of the public could sign up to receive daily emails detailing the water quality at their favorite beaches.

For the 2011 beach season, we continued the thirteen week sampling season for the Lake Superior beaches (Ashland, Bayfield, Douglas, and Iron counties), while all Lake Michigan beaches received analytical support for a fourteen week sampling season. Due to budgetary constraints we were forced to reduce the sampling frequency at high priority beaches from four times a week to three times in 2011. However, all monitoring partners with high priority beaches were given some additional funding to collect four samples per week at their high priority beaches during critical times, such as holiday weekends or local festivals. Federal restrictions on how grant funds could be used prevent local partners from collecting samples for the explicit purpose of identification and control of pollution sources leading to elevated bacteria levels. Any efforts to do so were done independent of the BEACH Act funding.

## Time Schedule

The activities described in this report took place during Federal Fiscal Year (FFY) 2011 (October 1, 2010 through September 30, 2011). FFY 2011 encompassed the entire 2011 beach season, which is defined for Wisconsin coastal beaches as Memorial Day Weekend through Labor Day Weekend. However, at some coastal beaches in Wisconsin, swimming may not begin until mid-June due to cold water temperatures. Where weather and swimming history indicate this to be the case, initial sampling associated with these beaches was delayed to coincide with the local swimming season.

## Budget

In May of 2011, USEPA awarded Wisconsin a grant in the amount of \$231,000. Due to funding limitations and additional reporting requirements to increase financial accountability, a few changes were made to the contracts provided to local health departments in 2011. The most significant changes were the reduction in high priority beach monitoring and a requirement to provide more detailed reporting of travel and expenses to help better understand program costs. WDNR believes these data will help enable future allocations to be more equitable and reflective of actual costs incurred.

**Table 1.** Allocation of 2011 Beach Act Monitoring Funds

To prepare the 2011 Beach Act monitoring budget, WDNR used the invoices from 2010 season to establish baseline allocations for each partner. These baseline allocations were then adjusted to reflect the 2011 sampling regime modifications and beach priority changes (Table 1). Thus, there were some local public health department partners who saw an increase from their 2010 allocation and others

<b>Monitoring Partner</b>	<b>2011 Allocation</b>
Ashland, Bayfield, Douglas, Iron & Kewaunee Counties (Group Contract)	\$43,637
Brown County	\$2,888
Door County	\$56,310
Kenosha County	\$7,448
Manitowoc County	\$12,397
Milwaukee, City of	\$7,831
Northshore, Village of	\$3,261
Ozaukee County	\$18,060
Racine, City of	\$6,818
Sheboygan County	\$10,556
Shorewood, Village of	\$5,079
South Milwaukee, City of	\$6,435
<b>2011 Total</b>	<b>\$180,720</b>

health departments that saw a decrease in their funding. All told, 95% of BEACH Act funds received by WDNR were used for either beach monitoring or providing public information on beach conditions (electronic notifications, website and database maintenance) with 78% of BEACH Act funds being used directly for the monitoring of beaches.

## **Monitoring Summary Results**

In 2011, monitoring occurred at a total of 112 beaches generating 4,994 samples that were reported on the Beach Health Website (<http://www.wibeaches.us>). In the simplest of terms, 11.8% of the discrete samples collected during the beach season exceeded the water quality advisory threshold of 235 CFU/100mL (Table 2). In addition, 3.2% of all samples collected exceeded 1,000 CFU/100mL resulting in mandatory beach closures.

Based on monitoring results, the 2011 beach season had the second lowest overall percentage of beach samples that exceeded the health advisory threshold (235 CFU/100mL) since BEACH Act monitoring began in 2003. Compared to 2010, five counties in 2011 saw a decrease in the percent of advisory threshold exceedances and when the 2011 data is compared to the 8-year averages, eight counties had lower exceedance rates than their historic average. Four of the five counties that had exceedance rates greater than their historic averages were on Lake Superior, which experienced elevated water temperatures in 2011. This is consistent with the fact that several dynamic environmental factors are known to affect the quality of beaches from day-to-day and year-to-year, including, but not limited to: rainfall, stormwater and sewage discharges, accumulation of *Cladophora*, wind direction, wave height, and water temperature.

The data collected and summarized for 2011 suggests that many communities are having success educating stakeholders to beach water quality issues and successfully promoting efforts to reduce beach closures and advisories. The results of several years of monitoring and water quality research has led to beach managers throughout Wisconsin adopting best management practices that are improving water quality at Great Lakes beaches throughout the state.

**Table 2.** Annual Sample Percentages that exceed the advisory level of 235 CFU/100mL

<b>County</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2003-10 Annual Averages</b>
Ashland	3.2	10.2	4.6	3.5	3.8	3.3	4	5.8	8.9	4.8
Bayfield	1.9	2.2	4.3	7.1	7.1	3.1	0.8	5.8	8.0	4.0
Brown	0	2	1.8	0	4.5	0	5.2	5.9	2.1	2.4
Door	4.1	8.2	6.9	7.3	4.8	6.3	8.1	4.7	6.0	6.3
Douglas	9.5	11.8	23.7	12.9	11.3	18.8	1.5	18.4	23.3	13.5
Iron	1.1	1.5	2.7	3.5	0	0	0	7.1	10.5	2.0
Kenosha	21	36.3	31.9	29.9	32.2	31.7	23.5	24	11.7	28.8
Kewaunee	26	33.9	26.9	33.9	49.7	11.1	9.1	10.9	33.2	25.2
Manitowoc	49.6	40.1	20.4	54.4	31.7	31.3	5.3	16.3	18.9	31.1
Milwaukee	24.3	38.7	30.3	20	23.7	22.4	12.7	26.1	19.4	24.8
Ozaukee	15.9	28.9	12.9	17.1	27.6	24	4.8	22.9	6.4	19.3
Racine	16.5	17.6	7.4	6.9	6.7	6.7	6.4	0.7	6.8	8.6
Sheboygan	23.8	30.2	24.8	43.9	28.5	18.1	13.6	22.7	8.2	25.7
<b>State-wide</b>	<b>14.6</b>	<b>22.2</b>	<b>15.7</b>	<b>17.5</b>	<b>17.1</b>	<b>14.4</b>	<b>7.3</b>	<b>12.4</b>	<b>11.8</b>	<b>15.1</b>

## **Local Program Status, Research Initiatives, & Successes**

The partners involved in Wisconsin's Great Lakes Beach Monitoring & Notification Program continue to collaborate to increase public awareness about the problems associated with waterborne pathogens along nearshore waters – especially public beaches. In addition to the funding provided by the federal BEACH Act, other local, state, and federal resources have been used to help address some of these problems and increase the use of our public beaches. Some of the notable actions and observations by local partners include:

### ***Ashland, Bayfield, Douglas & Iron Counties***

With over 200 miles of Lake Superior shoreline that attract many tourists, Ashland, Bayfield, Douglas, and Iron Counties are keenly aware of the importance of clean water and clean beaches. Within these counties, 40 public beaches are monitored at least once per week during the normal Lake Superior beach season (mid-June through mid-September). While BEACH Act funding is helpful, additional resources are needed to supplement local efforts. In particular, partnerships have been built between the counties and Northland College, UW-Oshkosh, and the Lake Superior Alliance to create a comprehensive monitoring and source-tracking program that will help address problems as they are identified.

### ***Brown County***

The Brown County Health Department monitors three beaches: Bayshore Park Beach, Communiversity Park Beach, and Longtail Beach. In 2011, city and county officials discussed reopening the long closed Bay Beach in the city of Green Bay. Many of the historic pollution issues at this beach no longer exist and officials would like to see this beach open for public recreation once again.

### ***Door County***

Door County is one of the most popular summer tourist destinations in Wisconsin. Clean water for recreation is critical to the economy of this area – especially since the beach season coincides with the heaviest tourist activity. In total, 31 public beaches are tested regularly throughout the summer. Door County has been very successful in supplementing BEACH Act funding with additional resources, including those provided in partnership with the Door County Public Health Department, the Door County Soil & Water Conservation Department (DCSWCD), and UW-Oshkosh. Genetic finger printing and antibiotic resistance testing on *E. coli* isolates, rain event and storm water system samples, bird surveys, and spatial distribution surveys of *E. coli* at the beaches have been used to identify possible contamination sources leading to a better understanding of pathogen mitigation opportunities. Additionally, Door County has solicited beach improvement designs based on beach sanitary surveys for several of their beaches and has implemented the designs at two beaches.

### ***Kenosha County***

In 2011, Kenosha County beaches saw a 12% decrease in the number of beach samples that exceeded the health advisory threshold when compared to 2010 and a 17% decrease in exceedances when compared to the county's historic average. These decreases may be a result of beach managers implementing best management practices, such as modified beach grooming techniques.

### ***Manitowoc County***

In 2011, Manitowoc County beaches saw a 2% increase in the number of beach samples that exceeded the health advisory threshold when compared to 2010 and a 12% decrease in exceedances when compared to the county's historic average.

### ***Milwaukee County***

Milwaukee County beaches saw a 6.7% decrease in the number of beach samples that exceeded the health advisory threshold when compared to 2010 and a 5.4% decrease in exceedances when compared to the county's historic average. Beach improvement projects have been installed on several beaches in Milwaukee County recently and these efforts may account for the decrease in beach advisories seen in 2011.

### ***Ozaukee County***

Ozaukee County beaches saw a 16.5% decrease in the number of beach samples that exceeded the health advisory threshold when compared to 2010 and nearly a 13% decrease in exceedances when compared to the county's historic average. Ozaukee County has continued using a predictive model ("Nowcast") for Upper Lake Park Beach. The Nowcast was developed in partnership with the DNR using EPA's "Virtual Beach" modeling software. County staff report that this tool was helpful during the 2011 season.

### ***City of Racine***

The City of Racine's beach management program leads the state in addressing beach health issues. In addition to traditional cultured based *E. coli* analytical methods, the City of Racine used a real-time qPCR analytical method and a Nowcast model (developed with EPA's "Virtual Beach" software) at North Beach. Implementation of the qPCR method and Nowcast along with the traditional monitoring program allows Racine to build upon its previous research and can serve as a trial for USEPA as they look to support rapid beach quality monitoring programs. Their forward-thinking efforts at source identification and mitigation serve as a model for the other counties and communities in Wisconsin.

### ***Sheboygan County***

In 2011, Sheboygan County beaches saw a 14% decrease in the number of beach advisories compared to 2010 and a 17% decrease in advisories when compared to the county's historic average. These decreases may be a result of beach managers implementing best management practices.

## **Program Deficiencies**

Similar to past years, there are a several changes that would be helpful to Wisconsin's efforts to implement a more comprehensive and effective Great Lake Beach Monitoring Program. Two key areas that could use additional support include:

### **Source Identification & Remediation**

After the ninth year of full implementation of the program, the biggest outstanding concern among partners and the public is what is being done to **eliminate** beach advisories and closures. In order to be effective at pollution elimination, **source identification** must be a priority. Although an increasing number of communities would benefit by identifying the sources of *E. coli* to their beaches, the federal BEACH Act does

not allow for this. It is unlikely that state funding will be provided for this purpose at the level needed due to constraints on the state budget. Ideally, changes in the federal BEACH Act which have been proposed and debated in the US Congress would be made and funding associated with source identification and remediation would be authorized. Absent those changes, it will be left to local governments and volunteers to engage in effective source identification and remediation to the degree possible using all available tools (i.e., Beach Sanitary Surveys, Great Lakes Restoration Initiative funding, etc.).

### **Insufficient Funding for Full Program Implementation**

The 2011 Beach Season required additional cuts in program implementation to account for increased program costs. Reductions in the frequency of beach testing were part of the cost savings measures used in 2011. As has been estimated in the past, Wisconsin would achieve full implementation of the required monitoring outlined in the BEACH Act Grant Performance Criteria with an annual budget estimated at nearly \$350,000. If not state funding is available and federal funding remains static at approximately \$230,000 annually, Wisconsin will continue to implement a program that requires cost-saving measures that may not allow achievement of all of the federal program goals for addressing the problems associated with waterborne pathogens in Great Lakes coastal waters.

### **Ideas for the 2012 Beach Season**

Regardless of program deficiencies, there are ongoing efforts to increase program awareness and advance key program needs for the 2012 Beach Season. It is hoped that some of these efforts will continue to benefit the program as a whole, including, but not limited to:

#### **Increased Coordination**

In 2011, considerable efforts were made to increase coordination among – and build new partnerships between – the numerous local, state, federal, academic, and NGO managers, researchers, systems developers, and others working on beach issues in Wisconsin. These efforts culminated in regional “Beach Health” meetings on Lake Superior (Ashland) and Lake Michigan (Racine) attended by over 80 participants in late April/ early May. Sponsored by the Wisconsin Coastal Management Program, the 2-day meetings included presentations, hands-on training on rapid methods and modeling, field visits, and discussions on emerging beach health issues and opportunities. Similar efforts are underway in 2012.

#### **Predictive Modeling**

Efforts continue on the part of multiple researchers in academia and state, federal, and local government to develop, validate, and implement predictive models on a broader scale. As part of these efforts, DNR will continue to provide training and technical assistance to local Nowcast operators and work with EPA and USGS to enhance “Virtual Beach” and other modeling tools. Previous research and operational experience with the Nowcasts in Ozaukee County, City of Racine, and elsewhere in the Great Lakes suggest that the widespread adoption of Nowcast models will result in fewer false exceedances and non-exceedances, as well as fewer overall advisories and closures.

#### **Inland Beaches**

Health department officials throughout the state (including non-Great Lakes Coastal agencies) are engaged in a growing dialogue about how to seek program expansion to address pathogen testing and public notification for inland beaches using a program model similar to that used for the Great Lakes beaches.

### **Volunteer Monitoring**

The Alliance for the Great Lakes initiated their Adopt-a-Beach program in southeast Wisconsin last year. This volunteer monitoring effort may provide a cost-effective means to supplement the local beach program resources for source identification and mitigating the trash on the beaches. They are planning a pilot project to evaluate whether volunteers can collect data of sufficient quality to use in Nowcast modeling.

### **Conclusion**

In spite of a limited budget and an uncertain future for the federal BEACH Act, Wisconsin's Great Lakes Beach Monitoring & Notification Program continues to evolve and provide useful monitoring information for health departments and the public. It is hoped that continued support of this program will heighten awareness of beach health and will provide the resources necessary to increase the knowledge of health professionals allowing for more informed decision making by state and local leaders and less risk to the beach-going public. After nine years of program implementation, the contributing partners believe that the data and experience gained will continue to aid both the public and local and state decision makers in efforts to manage water quality and seek effective solutions to restore and maintain excellence in the quality of all public beaches throughout Wisconsin.