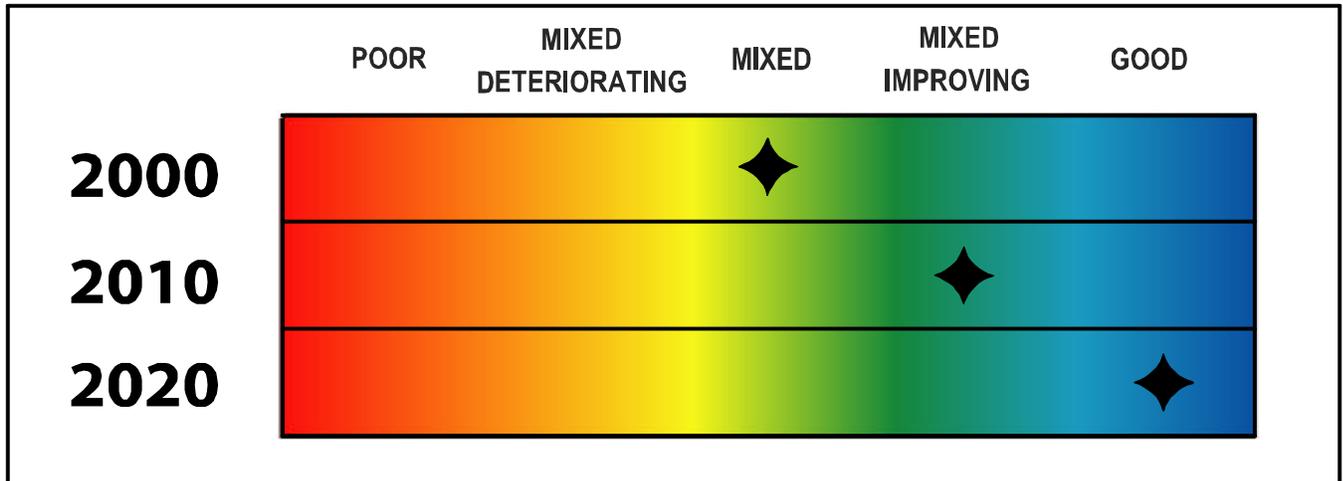


## Subgoal 3

### Can we swim in the water?



#### Status

Lake Michigan contains the world's largest collection of freshwater sand dunes and associated beaches, particularly along its eastern shore. Of a total of 3,100 coastal acres, 1,200 acres is publicly owned and available for use, while an additional 1,200 privately owned acres has significant potential for public use. It is important to note that most shoreline areas along Lake Michigan support swimming and secondary contact recreation. However, some areas do experience episodic beach closures because of elevated levels of *E. coli* bacteria. This may be due to stormwater runoff, sewer overflows or even waterfowl droppings. Recent studies show other factors like geography, water depth, weather, beach grooming practices and nearby animal populations contribute to beach closures. As a result, the current status of the goal is mixed.

#### Challenges

- Maintain and not overtax the wastewater control infrastructure.
- Address nonpoint sources of pathogen load to beaches and water bodies.
- Build a real-time beach monitoring and reporting system.
- Continue research and development on testing systems and beach grooming

#### Federal Beach Act

Beach closures resulting from high pathogen loads have a negative effect on the lake's significant tourist industry. Wet weather that causes overflows from aging wastewater collection systems or treatment plants, runoff from cities and farms, improperly sited or maintained septic systems, and natural sources release pathogens into tributaries and the lake. When pathogen levels exceed standards, beach managers post "Beach Advisory or Closure" notices in order to protect human health.

In October 2000, the U.S. Congress passed federal legislation amending the Clean Water Act that is

#### Defense Department Developing Rapid Water Quality Testing Technology

The U.S. Army Tank-Automotive and Armament Command (TACOM) are moving forward with a \$250 million development of a portable water quality detector for its soldiers. In addition, TACOM hopes to develop a hand-held device that can be used in the field to take samples and identify potential biological and chemical threats in real time. This technology will be made available to troops and civilians and can be used to monitor water quality on beaches more effectively in the future so that the public can be warned more quickly when it is unsafe to swim at beaches.

### NEEAR Water Study Helps Set New Beach Alert Standards

The National Epidemiological and Environmental Assessment of Recreational (NEEAR) Water Study is a multi-year research project evaluating the health effects of persons using recreational waters for swimming, boating, diving, surfing, and other activities. The objectives of the NEEAR Water Study are to (1) evaluate the water quality at two to three beaches per year for three years concurrently with a health study, (2) obtain and evaluate a new set of health and water quality data for the new rapid, state-of-the-art methods, and (3) develop new federal guidelines and limits for water quality indicators of fecal contamination (USEPA Office of Water) so that beach managers and public health officials can alert the public about the potential health hazards before exposure to unsafe water can occur. <http://www.epa.gov/nerlcwww/neeernerl.htm>

### Constructed Wetlands Could Help Beach Health

Wetlands and marshes help to clean water naturally before the water makes its way to its destination following the lowest point. Wetlands that are not ditched or filled in by developers provide this filtering to water. Ditches short-circuit the water from the treatment benefits of being spread out over large areas where the proper conditions of light, plants, and soil filtering take out some unwanted contaminants such as *E. coli*.

A man-made one-acre wetland is under construction at the Indiana Dunes State Park in the Dunes Creek watershed to help filter runoff before it gets to the beach on Lake Michigan. The constructed wetland will give scientists insights into the dynamics of how wetlands work and may serve as a prototype for building additional wetlands.

referred to as the Beaches Environmental Assessment and Coastal Health Act, or the BEACH Act. The BEACH Act requires adoption of consistent bacterial standards nationwide, research on new pathogens and pathogen indicators, issuance of new or revised criteria and guidance within 5 years, and development of rapid analytical techniques for faster notification of the public regarding elevated bacteria levels. The act also authorizes EPA to award grants to eligible coastal and Great Lakes states in order to set up beach monitoring and public notification

programs. In 2001, \$2 million was appropriated for coastal states to develop beach monitoring and notification programs, an additional \$10 million was appropriated in 2002 to continue program development and in 2003, and \$9.935 million was made available to coastal states to implement beach monitoring and notification programs. A similar amount will be made available this summer to continue program implementation. Out of the 2002 and 2003 appropriations, the four Lake Michigan states received over \$1 million each year.

To provide more protection against gastrointestinal illness, EPA requires that all states adopt *E. coli* criteria for use as beach water quality indicators by 2004. The BEACH Act grants will result in improved beach monitoring and public notification programs. EPA's Office of Research and Development (ORD) will be conducting epidemiological studies to examine health risks associated with swimming at several beaches across the country, including beaches on the Great Lakes.

Significant progress by state, county, and tribal governments has been made since the BEACH Act was implemented. Now, there is more widespread monitoring that takes place within the basin.

### Great Lakes Beach Conference and Follow-up Activities

In February 2001, an EPA, LaMP, and City of Chicago-sponsored Great Lakes Beach Conference was held to share information on the science and technology of beach monitoring as well as research on exposure, health effects, and water quality indicators. More than 250 environmental and public health officials, beach managers, and regulators attended the 3-day conference. The conclusions of the conference saw the formation of the Great Lakes Recreation Association whose list serve and annual meetings provide quick sharing of research findings. In addition, Great Lakes beach closure maps have been updated by EPA Region 5. Additional opportunities for information sharing and networking will be pursued. A National Beach Guidance and Performance Criteria for Recreational Waters was produced by EPA.

Additional information regarding the BEACH Act is available at [www.epa.gov/OST/beaches](http://www.epa.gov/OST/beaches). For more information on beach management issues, see the following web sites:

- BeachNet e-mail list - [www.great-lakes.net/lists/beachnet/beachnet.info](http://www.great-lakes.net/lists/beachnet/beachnet.info)
- Great Lakes Beach Conference 2001 complete conference proceedings - [www.glc.org/monitoring/beaches/GLBC/](http://www.glc.org/monitoring/beaches/GLBC/)
- Additional beach information or applying for beach grant funds - [www.epa.gov/waterscience/beaches](http://www.epa.gov/waterscience/beaches)

## Monitoring and Notification Program Development

**Wisconsin:** In the 2003 season, about 100 percent of the high and medium priority beaches identified along the Lake Michigan coast had beach monitoring and public notification programs in place. Thirty-six percent of the low priority beaches are being monitored. Those beaches that are not being tested because they are very small beaches with little or no use at all.

**Illinois:** In the 2003 season, 100 percent of Illinois' high-priority beaches in the Great Lakes basin had beach monitoring and public notification programs in place. The method of notification varied from web-based notification to posting paper notices at the beaches. Dog beaches were also monitored in many communities.

**Indiana:** In the 2003 season, 100 percent of Indiana's high-priority beaches in the Great Lakes basin had beach monitoring and public notification programs in place.

**Michigan:** In the 2003 season, 59% of Michigan's beaches in the Great Lakes basin had beach monitoring and public notification programs in place.

Because the Lake Michigan states currently use different standards and measurement methods to determine the need for beach closings, there are limitations on the ability to compare frequencies of exceedances of microbiological standards in

order to evaluate trends in recreational water quality. However, all states use *E. coli* standards officially and unofficially. Despite these limitations, the frequency of beach postings has traditionally been used as an indicator of recreational water quality. Microbial standard exceedances may be a better measure of the actual health risk associated with recreational water quality. By 2004, all Great Lakes states intend to adopt bacteria criteria at least as protective as EPA's Ambient Water Quality Criteria for Bacteria – 1986. EPA's annual voluntary beach survey program

### Chicago, Milwaukee Deep Tunnels to Control Combined Sewer Overflows

Both the Chicago Metropolitan area and the Milwaukee Metropolitan area have undertaken deep tunnel plans. Both tunnel systems allow for the containment of overflow wastewater until a time when the excess can be treated and returned to the nearest water body. The Chicago Tunnel and Reservoir Plan (TARP) ([http://www.southholland.org/Tarp\\_Plan.htm](http://www.southholland.org/Tarp_Plan.htm)) was created to address combined sewer systems of Chicago and 51 older municipalities in Cook County and their continuous problems of flooding and water pollution. The TARP was selected due to its cost effectiveness and its ability to incorporate other systems already in place. The TARP consists of 109 miles of underground tunnels that are burrowed under the city it intercept combined sewer overflow and divert it to large storage reservoirs until it can be treated. The United States Environmental Protection Agency has provided nearly 75% of the funds necessary for the TARP. The Milwaukee Deep Tunnel Plan was also instituted to address the problem of the area's flooding and water pollution (<http://www.mmsd.com/tunnelfactsheet.html>). The MDTP consists of 19.4 miles of tunnel and can hold up to 405 million gallons of wastewater.

### Wisconsin Beach Monitoring Program

In 2003, Wisconsin launched its first comprehensive beach monitoring program for Great Lakes beaches. Over 117 beaches were monitored for *E. coli* bacteria. Advisory or Closure signs were posted whenever the results exceeded EPA's recommended criteria of 235 cfu/100mL. The data was also posted on the Beach Health website, giving the public access to monitoring data and beach advisories or closures. In 2004 over 132 beaches will be monitored. For more information about the Wisconsin beach program visit [dnr.wi.gov/org/water/wm/wqs/beaches/](http://dnr.wi.gov/org/water/wm/wqs/beaches/).

## Cladophora Alga

*Cladophora* is a branching, green filamentous alga found naturally along the coastline of most of the Great Lakes. Research in the 1960's and 70's linked *Cladophora* blooms to high phosphorus levels in the water, mainly as a result of human activities such as fertilizing lawns, poorly maintained septic systems, inadequate sewage treatment, agricultural runoff and detergents containing phosphorus. Due to tighter restrictions, phosphorus levels declined during the 1970's and *Cladophora* blooms were largely absent in the 1980's and 90's.

There has been a recent resurgence of macroalgae, predominantly *Cladophora*, along the coast of Lake Michigan and other Great Lakes. These algae blooms lead to unsightly and foul-smelling beaches and have negative economic consequences as a result of the lowered beach use. In addition, *Cladophora* blooms result in reduced quality of drinking water and decreased property values. Reasons for the current resurgence are unknown. Possible causes include increased nutrient inputs, increased water clarity, increased water temperature and changing lake level. While there have been some efforts to remove *Cladophora* from beaches, ultimately the solution to the *Cladophora* problem requires the identification of the factors promoting *Cladophora* growth in the lake, and if possible the mitigation of those factors.

It is unknown if there are increased nutrient concentrations entering the lake via streams and rivers or if zebra mussels redistribute existing nutrients from the phytoplankton they consume to the *Cladophora*. Both may be happening. Work on the Milwaukee River indicates that input of the nutrient most likely to foster *Cladophora* growth, phosphorus, has increased in recent years. (Source: Great Lakes Water Institute, University of Wisconsin-Milwaukee)

For more information on cladophora, see chapter 8 and [www.uwm.edu/Dept/GLWI/cladophora](http://www.uwm.edu/Dept/GLWI/cladophora).

provides an indication of the status of beach health.

- **Illinois:** Illinois has a total of 69 beaches on Lake Michigan, 23 of which are in Chicago. In the 2003 season, 10% of Illinois beaches in the Great Lakes basin outside of Chicago met bacteria standards more than 95% of the time. In Chicago, based on the Chicago Park District's beach closure procedures, 60% of the lakefront beaches met bacteria standards more than 95% of the time.\*
- **Indiana:** In the 2003 season, 28 percent of the Indiana beaches in the Great Lakes basin met bacteria standards more than 95 percent of the time.
- **Michigan:** In the 2003 season, 70 percent of the Michigan beaches in the Great Lakes basin met bacteria standards more than 95 percent of the time.
- **Wisconsin:** In the 2003 season, 45% of the beaches monitored met bacteria standards more than 95% of the time.

## Water Quality Research and Indicators

New research in the field of water quality indicators has revealed that the use of fecal coliform and *E. coli* are no longer the most accurate indicators of contaminated water available. According to M.E. Bruesch and P. Biedrzycki of the Milwaukee Health Department, Division of Disease Control and Prevention, "Prediction of *E. coli* levels can support but does not assure accurate prediction of risk to swimmers at the time of contact". The usefulness of these indicators is dependant upon the source (animal or human) and local conditions. Time is no longer a variable in determining a health risk through the detection of *E. coli*. A study by R.L. Whitman, et al (2003) entitled, "Seasonal Persistence of *Escherichia coli* and Enterococci in Backshore Sand at the Groundwater Table of Two Lake Michigan Beaches" states that the "long-term persistence of these bacteria independent of pollution events further complicates their use as indicator organisms." Current practices rely on

\* The Chicago Park District (CPD) closes a beach if a water quality standard is exceeded for 2 consecutive days, not when one sample exceeds the bacteria standard, as recommended by EPA. Therefore, the percentage of beach closures in Chicago is not consistent with the number of beach closures in Illinois and other states.

the use of *E. coli* and Enterococci as water quality indicators. While these indicators are useful in detecting potential threats to human health, they are not the most efficient indicators and much of this new research helps to demonstrate the need to adopt new indicators.

Great Lakes Information Network's new human health web site -  
[www.great-lakes.net/humanhealth/](http://www.great-lakes.net/humanhealth/)

## Next Steps

- Help coordinate outreach materials development.
- Continue support of Great Lakes recreation managers meetings at State of Lake Michigan meetings.
- Report on research on beach grooming, tests and cladophora cause.

## Long-Term Objectives

- By 2004, states will adopt criteria, standards, and monitoring programs for beach bacteria.
- By 2005, achieve a 30 percent reduction from the 1992 per capita loadings from combined sewer overflows (CSO), POTWs, and industry.
- By 2005, 95 percent of high-priority beach waters (as defined by the state) will be monitored and a public advisory system will be in place.
- By 2007, 90 percent of monitored high-priority beach waters (as defined by the state) will meet federal and state bacteria standards for more than 95 percent of the average swimming season.

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