

**COASTAL HEALTH STRATEGY TEAM CHAPTER**  
**APPENDICES A, B, and C**

**Appendix A: Chapter Endnotes**

Please refer to endnotes located after the chapter text.

## **Appendix B: Sources of Coastal Health Problems**

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| <p><b><i>A.1. Direct Pollution Sources</i></b></p> <ul style="list-style-type: none"><li>• Wet weather overflows (e.g., due to aging or overburdened infrastructure) that result in the release of raw sewage to source waters in urban areas through:<ul style="list-style-type: none"><li>○ Sanitary sewer overflows (SSOs)</li><li>○ Combined sewage overflows (CSOs) in municipalities where storm and sanitary systems remain co-mingled</li></ul></li><li>• Bacterial and chemical pollution from illegal and malfunctioning private sewage treatment systems:<ul style="list-style-type: none"><li>○ Septic systems</li><li>○ Aerobic systems</li><li>○ Diffuse inputs such as run-off from animal feed lots and agrarian sources</li></ul></li><li>• Storm water discharge, which can contribute to the fecal burden on bathing waters via storm drains because it may contain fecal contamination from humans (from illegal connections/leaks) or animals.</li><li>• Direct sewage inputs due to improper disposal of untreated fecal material originating from boats; coastal communities containing large marinas or harbors, and lacking sufficient pumping facilities, are particularly at risk.</li><li>• Aging and overloaded wastewater treatment and collection infrastructure</li></ul> |
| <p><b><i>A.2. Indirect Pollution Sources</i></b></p> <ul style="list-style-type: none"><li>• Storm water runoff, carrying bacterial and chemical pollution as a result of traveling over agricultural, industrial, and/or urban areas<sup>1</sup></li><li>• Avian/animal deposition</li><li>• Shedding from bathers</li><li>• Discharge of untreated onboard boater waste</li><li>• Industrial discharge/legacy<sup>2</sup></li><li>• Contaminated sediments (foreshore beach sand and submerged sediments) that release of bacterial (e.g., fecal indicator organisms) and chemical pollutants; especially prevalent in Areas of Concern<sup>3</sup></li><li>• Groundwater discharge</li><li>• Algal blooms (can appear during dry weather, but are caused by nutrient loading during wet weather and aquatic invasive species)</li><li>• Ecosystem/food web changes caused by aquatic invasive species' impact on water quality<sup>4</sup></li><li>• Air deposition<sup>5</sup></li></ul>  |
| <p><b><i>A.3. Beach and Coastal Assessment Methods</i></b></p> <ul style="list-style-type: none"><li>• Microbial assessment</li><li>• Physical assessment</li></ul>   |
| <p><b><i>B. Threats to Drinking Water Quality</i></b></p> <ul style="list-style-type: none"><li>• Lack of source water protection criteria for pathogens and disinfectant by-products</li><li>• Outdated drinking water distribution systems</li><li>• Inconsistent compliance with sewage treatment and control</li><li>• Weak storm and wastewater enforcement</li><li>• Sprawling land use with inadequate storm water runoff controls</li></ul>   |

<sup>1</sup> The Nonpoint Source Strategy Team will address rural storm water.

<sup>2</sup> Elevated pH levels from industrial legacies are closing beaches.

<sup>3</sup> The Areas Of Concern (AOC) Team will address contaminated sediments in greater detail.

<sup>4</sup> The Aquatic Invasive Species team will addresses AIS issues. With particular regard to their impact on near shore water quality, zebra and quagga mussels reduce a lake's ability to assimilate phosphorus and increase the likelihood that harmful algal blooms will occur. Furthermore, because zebra mussels select against Microcystis, they remove its competitors and allow it to bloom.

<sup>5</sup> The Persistent Bio-accumulative Toxics (PBT) Team will address air deposition of pollutants in greater detail.

- Incomplete filtration/removal of contaminants during the drinking water treatment process

## **Appendix C: On-Going Efforts in Great Lakes Research**

Human well-being and progress toward sustainable development are vitally dependent upon improving the management of Earth's ecosystems to ensure their conservation and sustainable use; without this, preservation services will be diminished, including those nonmaterial benefits, such as recreation and ecotourism, obtained from these ecosystems (Millennium Ecosystem Assessment – <http://www.millenniumassessment.org/en/index.asp>, last accessed 16<sup>th</sup> January 2005). The loss of recreational use can have an economic impact as well as create public dissatisfaction through loss of utility and, therefore, must be addressed through the formation of sound public policy. In his April 2000 Millennium Report to the United Nations (UN) General Assembly, UN Secretary-General Kofi Annan stated that it was “impossible to devise effective environmental policy unless it is based on sound scientific information.” The studies presented below represent a sampling of the intensive scientific studies necessary to detect direct and indirect contamination sources, improve beach and coastal assessment methods, and ensure the quality of drinking water originating from the Great Lakes.

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#### ***Direct Pollution Sources (CSO, SSO, septic systems, storm water discharge, rivers and streams)***

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### ***Drinking Water Quality***

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## **PUBLISHED ABSTRACTS**

### ***Direct Pollution Sources (CSO, SSO, septic systems, storm water discharge, rivers and streams)***

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## **WEB PAGES**

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Illinois-Indiana Sea Grant, <http://www.iisgcp.org/>  
Michigan Sea Grant, <http://www.miseagrant.umich.edu/>  
Minnesota Sea Grant, <http://www.seagrant.umn.edu/>  
New York Sea Grant, <http://www.seagrant.sunysb.edu/>  
Pennsylvania Sea Grant, <http://www.pserie.psu.edu/seagrant/seagindex.htm>  
Wisconsin Sea Grant, <http://www.seagrant.wisc.edu/>

### **State of Ohio**

Evaluate Ohio's Lake Erie beaches, [www.sg.ohio-state.edu](http://www.sg.ohio-state.edu)

Forecasting Bacteria Levels at Bathing Beaches in Ohio, <http://oh.water.usgs.gov/reports/fs-132-02.pdf>

*Escherichia coli* in the swash zone at four Ohio bathing beaches. <http://oh.water.usgs.gov/reports/fs-134-02.pdf>

*Escherichia coli* at Ohio Bathing Beaches—distribution, sources, wastewater indicators, and predictive modeling. <http://oh.water.usgs.gov/reports/Abstracts/wrir02-4285.html>

Ohio Lake Erie Commission/EPA  
<http://www.epa.state.oh.us/oleo/>

U.S. Geological Survey Ohio District's "Beach-Monitoring Research" website (including information on Lake Erie research in which the Northeast Ohio Regional Sewer District has been involved):

<http://oh.water.usgs.gov/beaches/>

Ohio Department of Health's "Beach Monitoring" website (including links to Lake Erie beach sample results): <http://www.odh.ohio.gov/ODHPrograms/BEACH/beachmain.htm>

### **State of Michigan**

Michigan Beach Monitoring home page

[http://www.michigan.gov/deq/0,1607,7-135-3313\\_3686\\_3730---,00.html](http://www.michigan.gov/deq/0,1607,7-135-3313_3686_3730---,00.html)

Michigan Department of Environmental Quality – Great Lakes

[http://www.michigan.gov/deq/1,1607,7-135-3313\\_3677---,00.html](http://www.michigan.gov/deq/1,1607,7-135-3313_3677---,00.html)

### **US EPA**

EPA Great Lakes National Program Office

<http://www.epa.gov/glnpo/>

USEPA Beach WEB Page

<http://www.epa.gov/OST/beaches/>

USEPA BEACH Act

<http://www.epa.gov/waterscience/beaches/act.html>

USEPA Beach Standards, Monitoring, and Notification

<http://www.epa.gov/ost/beaches/>

USEPA Beach home page

<http://www.epa.gov/beaches/>

EPA Great Lakes National Program Office

<http://www.epa.gov/glnpo/>

U.S. EPA's "Beach Standards, Monitoring, & Notification" website (including links related to the Clean Beaches Plan and the Beaches Environmental Assessment and Coastal Health Act of 2000)

<http://www.epa.gov/waterscience/beaches/>

U.S. EPA's "Wet Weather Discharges" website (including links to websites on the storm water, CSO, and SSO programs)

<http://cfpub.epa.gov/npdes/wetweather.cfm>

U.S. EPA's "Report to Congress: Impacts and Control of CSOs and SSOs" (delivered August 26, 2004)

[http://cfpub.epa.gov/npdes/cso/cpolicy\\_report2004.cfm](http://cfpub.epa.gov/npdes/cso/cpolicy_report2004.cfm)

Great Lakes indicators (1998-2002)

<http://www.epa.gov/glnpo/glindicators/water/beachb.html>

USEPA Great Lakes National Program Office (1981-1994 beach report)

<http://www.epa.gov/glnpo/beach/>

National coastal beach data (through 2003)  
[http://oaspub.epa.gov/beacon/beacon\\_national\\_page.main](http://oaspub.epa.gov/beacon/beacon_national_page.main)

### **Other Web Sites**

Great Lakes Water Institute  
<http://www.uwm.edu/Dept/GLWI/ecoli/>

Great Lakes Beach Association  
<http://www.great-lakes.net/glba/>

Great Lakes Information Network (GLIN)  
<http://www.great-lakes.net/>

Great Lakes Beach Association Annual Proceedings 2004  
<http://www.great-lakes.net/glba/2004conference.html>

Beaches in the Great Lakes Region  
<http://www.great-lakes.net/tourism/rec/beach.html#new>

Center for Disease Control; Healthy Swimming  
[http://www.cdc.gov/healthyswimming/beaches\\_rivers.htm](http://www.cdc.gov/healthyswimming/beaches_rivers.htm)  
<http://www.cdc.gov/healthyswimming/>

Great Lakes BeachCast---many links from this site  
[http://www.great-lakes.net/beachcast/nr\\_moreinfo.html](http://www.great-lakes.net/beachcast/nr_moreinfo.html)

Great Lakes Research Consortium (Dr. Jack Manno)  
<http://www.esf.edu/glrc/>

Great Lakes Research Consortium publications  
<http://www.esf.edu/glrc/pubs.htm>

Great Lakes Fishery Commission  
<http://www.glfc.org/>

Great Lakes Environmental Research Laboratory/NOAA  
<http://www.glerl.noaa.gov/>

NOAA Great Lakes Environmental Research Laboratory (GLERL)  
Center of Excellence for Great Lakes and Human Health  
<http://www.glerl.noaa.gov/res/Centers/HumanHealth/>

USGS Great Lakes Science Center  
<http://www.glsc.usgs.gov/>

Great Lakes Commission  
<http://www.glc.org/>

International Joint Commission  
<http://www.ijc.org/>

International Joint Commission Research Inventory (queriable)  
<http://ri.ijc.org>

Great lakes Protection Fund  
<http://www.glpf.org/>

International Association for Great lakes Research  
<http://www.iaglr.org/>

Duluth Streams  
[www.DuluthStreams.org](http://www.DuluthStreams.org)

### **University Centers**

**[Great Lakes at Buffalo State College](#)**

**[Great Lakes Environmental Education at Buffalo State College](#)**

**[The Great Lakes Program at the University at Buffalo](#)**

**[Great Lakes Aquatic Ecosystem Research Consortium, Ohio State University](#)**

**[Institute of the Environment, University of Ottawa](#)**

**[Environmental Modeling Centre, Trent University](#)**

**[Great Lakes WATER Institute](#)**