COASTAL HEALTH STRATEGY TEAM
STRATEGY DOCUMENT DRAFT
APPENDICES A, B, C, D, E

Appendix A: Goals for Coastal Health Categories

1. Wet Weather Events (CSO, SSO, storm water, run-off)
    - Adopt long term combined sewer overflow control programs consistent with the CWA National CSO policy by 2010:
        - Comply with CWA National CSO Policy as soon as possible but no later than 2008.
        - Receive Congressional allocations of $1.5 billion in matching grant funds per year for 5 years for correcting CSOs in eligible communities.
        - Implement storm water control programs by 2008.
        - Review and update industrial pretreatment programs by 2007 in communities with CSO and SSO events.
        - Issue updated NPDES permits, where appropriate, based on IPP reviews.
    - EPA shall promulgate rules necessary to eliminate chronic wet weather sanitary sewer overflows by 2007.
    - By 2010 the eight Great Lakes States will develop and promulgate rules governing the operation, maintenance, and discharge from private sewage treatment systems with full compliance to be achieved by 2013. *(See NPS Strategy Team's nutrients and pathogen section.)*
    - Achieve a 90-95% reduction in surface runoff (agricultural and urban) by 2010. *(See NPS Strategy Team's altered flow regime section, especially: urbanization objective and action items; Agriculture/Forestry objective; and contaminants action item 7.)*
    - By 2010, all unpermitted sources of bacterial and/or chemical contamination to the Great Lakes Basin will be issued the appropriate NPDES permit and all Great Lakes States shall have fully current NPDES permits for municipal and industrial dischargers.
    - Reduce the bacterial and chemical contamination of Great Lakes near shore water resulting from storm water discharge through the development, implementation, and maintenance of BMPs. *(See NPS Strategy Team's altered flow regime section, especially: urbanization objective and action items; Agriculture/Forestry objective; and contaminants action item 7.)*
    - By 2010, the eight Great Lakes States and USEPA will develop and implement an effective enforcement program to insure continuing compliance with all issued NPDES permits, rules, and regulations as appropriate for the protection of coastal health.

2. Dry Weather Impacts (algal blooms, wildlife, beach sands)
    - Achieve a 90 – 95% reduction in bacterial and chemical contamination of Great Lakes near shore water resulting from the transport of pollution present in beach sands through the development, implementation, and maintenance of BMPs by 2010.
    - Achieve a 90 – 95% reduction in bacterial contamination of Great Lakes near shore water resulting from the deposition of pollutants due to avian/animal sources through the development, implementation, and maintenance of BMPs by 2010.

- Achieve a 90 – 95% reduction in bacterial and chemical contamination of Great Lakes near shore water and their tributaries resulting from the re-suspension of pollutants from contaminated sediments (targeting AOCs) by 2010. *(See AOC Strategy Team's document.)*
- Reduce nutrient, especially phosphorous, inputs to the Great lakes to prevent blue-green algae (Microcystis spp) and minimize green algae (Cladophora spp) growth whose presence has been recently linked to human health effects (blue-green) and a potential increase in bacterial indicator organisms (green).
- Prevent the pollution of the near shore waters of the Great Lakes by providing adequate, cost-effective pumping facilities and enforcing regulations with regard to the disposal of onboard (boater) waste.

3. Improved Beach Management Schemes
    - Improve the bathing water quality of the Great Lakes by 2010 through the inception of basin-wide BMPs designed to detect and remediate contamination sources.
    - Assess contamination sources using a holistic, watershed approach.
    - Assist USEPA in the trialing, standardization, and implementation of rapid testing techniques for the improvement of Great Lakes health risk assessment.
    - Assist in refining USEPA beach management protocols.

4. Public Communication and Education
    - Develop and post informational signage for all Great Lakes beaches regarding the potential health risks associated with bather shedding in conjunction with a well-publicized educational campaign.
    - Provide public education in conjunction with agricultural and citizen incentives to encourage the development of sustainable practices which improve the health of the Great Lakes ecosystem.

5. Drinking Water Quality

    GAP – TO BE COMPLETED.

Appendix B: Detailed Description and Evaluation of Alternative Approaches to Achieving Goals

B.1. Wet Weather Events Alternative Approaches

Alternative 1 is to continue the present approach for eliminating wet weather overflows. It depends largely on each community developing, finding funding for, and implementing a LTCP in compliance with the national CSO Policy and Clean Water Act. Apart from municipal bonds, the State Revolving Loan Fund (SRLF) is the primary source of funding.

Cost/Feasibility Considerations:

- The SRLF is significantly under-funded. Without funding assistance, even municipalities that have LTCPs may not be able to implement them, and state and federal regulatory agencies cannot hire the personnel to monitor and enforce NPDES permits.
- LTCPs allow a flexible approach (not a one-size-fits-all) to CSO management, and numeric goals (based on percent reductions in discharge, not on the quality of receiving water). This could keep costs down.
- The emphasis of the national CSO Policy is on construction solutions in LTCPs. This drives costs up, especially in densely populated urban areas.

Advantages/Disadvantages:

- Time schedules and funding sources to achieve full compliance are undefined. For almost half of the Basin's CSO communities that have not yet developed LTCPs, actual control of CSOs is years away.
- Focus is on CSOs, not a system-wide or comprehensive approach to wet weather overflows. A piecemeal approach may lead to overflows elsewhere in the system (e.g., see Milwaukee example).
- Focus is on percent reductions in discharge volumes, not on monitoring impacts on receiving waters. May not accomplish the overarching goal or adequately protect sensitive or recreational areas.

Alternative 2 looks for $13.75 billion over 10 years for construction of facilities to control wet weather overflows. This approach would provide major federal funding for projects such as construction of additional treatment facilities, storm and sanitary sewer separation, deep tunnel construction, controls to eliminate infiltration and inflow of storm and ground water, and related physical facilities.

Cost/Feasibility Considerations:

- Costs will be excessive in large metropolitan areas as the focus is mainly "end of the pipe," i.e., not based on minimizing flows into the system, although new storm sewers would be subject to EPA storm water permit requirements.

Advantages/Disadvantages:

- In some cases, may totally eliminate wet weather overflows.
- Insofar as this is mainly a facilities construction approach, it does not address the underlying problem of increasing demand and increasing impermeable surface areas in sewersheds. (See footnote on costs based on the installation of "hard" controls.)
- Deep tunnel storage may negatively impact groundwater.
- May involve extensive disruption to travel and access as roads are torn up for construction activities.
- Long time periods may be needed to complete the projects.

B.2. Dry Weather Impacts Alternative Approaches

Alternative 1 is to develop beach management practices based on the reduction of bacterial or chemical contamination from beach sands. Employ techniques to reduce *E. coli* content in beach sands. Beach sands have been proven to harbor bacterial indicators of bathing water quality and potentially human pathogens with the possibility of replication. When beach sands are located in the vicinity of storm drains or receive large amounts of water from other sources, such as run-off, there is the potential for chemical contaminants to be deposited. For example, improper disposal of spent oil and leaching from impervious surfaces may contribute to the deposition of oils and greases in beach sands. Some studies have been conducted that look at beach management practices, such as mechanically grooming beaches, changing the grade/slope of the beach, constructing bio-retention basins or wetland areas, or employing other techniques to reduce *E. coli* content in beach sands. Other studies have looked at the association between beach width and the number of waterfowl attracted to bathing beaches. Pilot studies have used bio-retention basins and wetland areas as a means of managing storm water. These studies could be replicated at other beaches to determine a set of best management practices that could be applied throughout the Great Lakes.

Cost/Feasibility Considerations:

- It could be costly to conduct these studies on a large scale; however, representative beaches depicting a variety of conditions could be chosen as surrogates rather than conducting a study at each Great Lakes beach.
- Alternatively, prior studies could be validated at additional sites.
- Baseline levels would need to be determined in order to calculate reductions.

Advantages/Disadvantages:

- A comprehensive study of the behavior of bacterial indicators and pathogens in beach sands would allow for best management practices to be developed.
- Comprehensive studies regarding the relative contribution of chemical contaminants would aid in the fine-tuning of existing storm water management plans.
- Using bio-retention basins and wetlands to filter bacterial and chemical contaminants from storm water and surface run-off would have the added benefit of restoring habitat.
- Extrapolating the results of focused studies to non-participant beaches would not take into account local variability.
- The cost of reproducing sediment studies may be prohibitive for some municipalities without an external source of funding.

Alternative 2 is to establish and enforce ordinances. Empirical evidence, in some instances validated by microbial source tracking studies, indicates that a percentage of Great Lakes bathing water quality failures can be attributed to non-human sources of fecal contamination such as migratory waterfowl and domesticated animals. There is also a potential risk of disease transmission. The establishment and enforcement of ordinances prohibiting practices that attract or allow animals in near shore areas could significantly reduce the fecal burden from these sources.

Cost/Feasibility Considerations:

- State and municipal departments of public health could assist in the development and enforcement of ordinances such prohibiting dogs on the beach or the feeding of waterfowl.
- Information would need to be disseminated and ordinances would need to be visibly posted.

Advantages/Disadvantages:

- In order to achieve a 90 – 95% reduction, some assessment of the current contribution would need to be made. This may prove difficult.
- Host source studies would need to be funded in order to determine to what extent near shore waters are being impacted by non-human fecal contamination.
- Ordinances would need to be adopted.
- Ordinances would need to be enforced.
- Would need support of beach mangers and law enforcement officials.
- Ordinances designed to prohibit certain practices at the beach would not impact outlying areas, i.e. waterfowl could feed elsewhere and return to the beach.

Alternative 3 is to develop and implement best management practices resulting in habitat modification. In rural areas, best management practices have been developed to decrease the impact of agricultural run-off on surface waters. Management practices that reduce the burden of non-human fecal contamination in near shore areas will assist in the improvement of recreational water quality.

Cost/Feasibility Considerations:

- With regard to resident or roosting waterfowl, rookeries may need to be identified and multiple deterrent techniques may need to be tested in order to assess their efficacy. This would require funding for controlled studies.
- Significant costs could be incurred to make some beach sites less attractive to wildlife.
- There may be significant concern from pet owners and alternatives may need to be identified, i.e. dog parks.

Advantages/Disadvantages:

- Not all techniques may be feasible in all locations.
- Any management practices developed would need to conform to existing USEPA, DNR, or other agency guidelines regarding the handling of domestic, resident or migratory wildfowl and animals.
- The relative contribution from wild vs. domestic inputs may need to be determined prior to implementing any management practices. This may prove difficult.

B.3. Improved Beach Management Alternative Approaches

Alternative 1 is to conduct sanitary surveys. Comprehensive sanitary surveys should be conducted at all Great Lakes beaches so that best management practices based on relative inputs unique to each site can be developed and implemented. A sanitary survey provides a tool for municipalities to systematically assess the beach environment. It generally includes an assessment of facilities and usage (frequency and type), but also quantifies beach areas with regard to their physical characteristics. A systematic assessment of areas immediate to and surrounding the beach will aid in determining what conditions exist that may adversely impact surface water quality. Identification of contamination sources will aid in the development of targeted remediation efforts.

Cost/Feasibility Considerations:

- In order to assess the impact of such a tool, a standardized form would need to be developed. There are several examples of this type of tool that could be used as a reference.[1]
- Staff would need to be secured and/or trained.
- Sanitary surveys may need to be repeated to assess environmental changes, maybe annually.

[1] USEPA #815-R-99-016 (4/99), WHO, and some local Great Lakes communities.

Advantages/Disadvantages:

- A standardized assessment tool would allow for the determination of relative inputs of contamination basin-wide. This information could be used to assess common factors impacting a majority of beach areas within the Great Lakes as well as provide knowledge into unique factors impacting specific locations. This information could then be used to standardize best management practices relating to beaches.
- Uniformity in assessing conditions would need to take place in order for this tool to provide usable results. This could involve some costs as a workshop may be necessary to uniformly train personnel.

Alternative 2 is to implement pilot projects. Implement pilot projects to identify pollution sources at Great Lakes beaches which will allow managers to develop plans for the reduction or elimination of these sources of contamination.

Cost/Feasibility Considerations:

- Funding for source identification pilot projects.
- Funding for remediation projects.
- Costs to train staff to conduct source identification and remediation projects**.**

Advantages/Disadvantages:

- Will provide information on pollution sources that are contributing to water quality standards exceedances at beaches and steps needed to provide better protection of public health.
- Findings/solutions may be applicable at other Great Lakes beaches.
- There are several source identification projects going on along the Great Lakes; can collaborate with other beach managers for ideas on what works.
- Workshops are available to train staff on identifying beach contamination sources.
- Can use information to develop a predictive model for high bacteria counts at beaches.
- Need to secure funding sources to implement source identification and remediation projects as well as to train staff.
- Difficulty in pin-pointing contributing sources.
- Resource intensive.

Alternative 3 is to conduct public education campaigns. Encourage the public to become stakeholders in the improvement of Great Lakes water quality. Poor personal practices at the homeowner and small business level can contribute to the overall chemical and bacterial contamination of the Great Lakes. Water quality would be improved through educational initiatives encouraging proper waste disposal (including pet waste), disconnection of downspouts to the sewer system, reducing or eliminating the application of fertilizers and pesticides to lawns, the use of native plants, and the use of environmentally friendly household products.

Cost/Feasibility Considerations:

- Development and distribution of educational multilingual brochures, holding community workshops, issuing press releases or other media pieces would require a funding source.
- Would need to provide incentives to local grocery and hardware stores to supply environmentally-sound products.
- Advantages/Disadvantages:
- Activities would require citizens to “buy in” to the idea in order to commit to lifestyle changes.
- Materials would be transferable.

Alternative 4 is to adopt the use of a beach classification scheme. In 1999, the USEPA and WHO jointly hosted a meeting in Annapolis, Maryland, to develop a health –risk based approach to

monitoring recreational waters. The approach includes employment of a beach classification scheme in addition to compliance monitoring based on bacterial indicators to assess health risk (EU, Australia/New Zealand, WHO). In a classification scheme, a beach is assigned to a class (very poor, poor, fair, good, excellent) based upon health risk. The regulation of recreational waters in this manner would better reflect health risk and provide enhanced scope for effective management intervention. By enabling beach managers to respond to sporadic or limited areas of pollution, and to upgrade a beach's classification, it provides a significant incentive to local management actions as well as to pollution abatement. A large number of factors can influence the condition of a given beach. A classification system reflects this, and allows regulators to invoke mitigating approaches for beach management.

Cost/Feasibility Considerations:

- Costs to study the relationships between factors that affect beach water quality and the ability of monitoring schemes to detect these changes.
- Funding pilot studies to evaluate the approach.

Advantages/Disadvantages:

- The approach requires substantial testing.
- Field testing would need to be amended to take into account local circumstances.
- Information concerning the existence of sources of contamination and their likely influence upon recreational water quality could provide a robust and rapid means to increase the reliability of the overall assessment.

B.4. Public Communication and Education Alternative Approaches

Alternative 1 is to conduct educational campaigns to increase public awareness about bathing water quality. State agencies have worked with local public health departments to design uniform signs to be placed at public bathing beaches to inform beachgoers about bathing water quality. In addition to the signs posted at the beach, many states and municipalities have web sites, hot lines, and printed materials in several languages. These materials allow the public to make an informed decision with regards to bathing water quality. Similar tactics could be used to design materials informing beachgoers of the risk of transmissible disease from bather to bather and measures they should take to reduce the risk of spreading – or contracting – waterborne illnesses (e.g., don't swim if you have diarrhea). Such signs exist at public swimming pools. These signs are important especially at beaches with a high bather density or those lacking bathroom facilities where the likelihood of human fecal contamination is greatest.

Cost/Feasibility Considerations:

- State/municipal staff responsible for the design and implementation of warning signs at public bathing beaches could take the lead on designing these materials eliminating the formation of new work groups.
- The CDC may be interested in this project as an expansion to their existing initiative regarding swimming pools (i.e. six pleas for protection against recreational water illnesses).
- Federal or state funding might be needed for the manufacture of the signs and printing/distribution of the brochures.

Advantages/Disadvantages:

- Bathers would become more educated on the risks associated with swimming in contaminated waters and would use better judgment with regard to personal practices.
- A uniform document would ensure that all people utilizing Great Lakes beaches would have access to the same information. This information may reduce public health concerns regarding the person-to-person spread of disease from bathing water encounters.
- Materials would be transferable.

- If there are no funding sources, this information would only be available to those municipalities who could afford to self-finance the project.

B.5. Drinking Water Quality Alternative Approaches

GAP – TO BE COMPLETED.

Appendix C: Draft of Coastal Health Team Recommended Action Priority-setting Matrix

Recommended Actions	Irreversibility	Scope	Urgency	Threats	Tribal Interests	Research / Development	F, S, T, and L Support	Confidence	Benefits	Tools	Funding	Preventability	Implementation	**Total Score**
Wet Weather														
CSO Grant Program	3	2	3	3	1	2	3	3	3	3	2	3	3	**34**
Dry Weather														
Identify sources and educate	2	3	2	2	3	2	2	1	2	3	2	2	3	**29**
Beach Mgmt.														
Risk-based beach mgt.	1	2	2	2	3	3	2	2	2	2	2	2	2	**27**
Public Communication														
Public education campaign	1	3	2	2	3	1	2	1	2	3	2	1	3	**26**
Drinking Water														
SWP implementation grants (1)	2	3	2	3	3	2	2	1	3	2	1	2	2	**28**

Key:
1 = low relevance to the prioritization criterion
2 = moderate relevance to the prioritization criterion
3 = high relevance to the prioritization criterion

(1) The recommended action for drinking water is some form of source water protection implementation funding. This action has not yet been developed by the drinking water team and is inserted as a placeholder.

Goal: By 2015 or sooner wherever possible, eliminate inputs of untreated or inadequately treated human and industrial waste to waters of the Great Lakes Basin from municipal wastewater treatment systems.[2] [Note: See Non-point Source section for goals and action items related to private septic systems and to minimizing storm water runoff from urban and agricultural areas. See PBT section for more on preventing discharges of industrial and pharmaceutical wastes from municipal sewage treatment systems.]

Background: In 1994 USEPA issued a national CSO Control Policy (subsequently incorporated into the Clean Water Act) whose goal was to achieve 85 percent reduction in CSO volumes and/or reduce the frequency of overflow events to an average of no more than four per year. The policy used a phased approach to address the control of CSOs beginning with the implementation of nine minimum controls followed by the development and implementation of a Long Term Control Plan (LTCP). Because the control of CSOs is very site specific, no deadline was established in the policy for final compliance by all municipalities. It was envisioned that enforceable schedules would be established in NPDES permits that would require the earliest practicable compliance.

According to the EPA, there are 147 CSO communities in the Great Lakes Basin. Of those, only 77 have EPA-approved LTCPs currently in some stage of implementation. The rest are in some stage of competing a plan.[3] A major impediment to more timely progress on CSO abatement has been lack of funding for the high infrastructure costs typically involved. The EPA and states estimate costs for addressing the remaining CSOs in the Great Lakes Basin at $8.6 billion, and total costs for minimizing discharges of untreated human waste from CSOs, SSOs[4] and treatment plants at $13.75 billion.[5]

[2] This goal is intended to capture the intent of the US Policy Committee's 2002 Great Lakes Strategy goals, several of which are now outdated. For example:

- "By 2003, USEPA and State will assist local governments in establishing alternate funding vehicles to implement CSO/SSO abatement construction projects. Storm water permits will be in place for all phase II storm water discharges
- By 2005, 100% of all CSO permits in the Great Lakes will be consistent with the national CSO policy.
- By 2010, all sewer systems will be operated under LTCPs which will optimize performance and minimize discharges from SSOs.
- By 2010, 90% of monitored high priority Great Lakes beaches will meet bacteria standards more than 95% of the swimming season."

[3] There are 129 Great Lakes CSO communities in Region V, 1 in Region III, and 27 in Region II. Of these, 60 in Region V, 1 in Region III, and 16 in Region II have EPA-approved LTCPs. This information is as of February 2005 and is provided by the Divisions of Water in Regions V and II.

[4] Many Great Lakes communities also have sanitary sewer overflows (SSOs). Properly designed, operated, and maintained sanitary sewer systems are meant to collect and transport all of the sewage that flows into them to a publicly owned treatment works for proper treatment. SSOs mainly occur because of unwanted water infiltration into the system during wet weather, or inadequate system operation and maintenance. Untreated sewage from these overflows can cause serious water quality problems and also back-up into basements causing property damage and threatening public health. SSOs are prohibited under the CWA other than in unique circumstances that are approved by the regulatory agency.

[5] It should be noted that these costs are based upon the installation of "hard" controls, i.e. construction projects, and do not reflect cost savings that could be realized through the use of "soft" controls, i.e. use of best management practices, etc, to reduce the amount of storm water entering the sewerage system.

For the eight Great Lakes states, total State Revolving Loan funds for sewer system upgrades in 2005 were $393 million, with $260 million budgeted for 2006. Less than half of these amounts will be directed to communities within the Great Lakes Basin.

Premises: The Coastal Health group approached this issue with the following premises:

- Given the potential impact on human health, it is imperative that overflows of untreated human and industrial waste into Great Lakes waters be controlled sooner rather than later.
- Combined sewer overflows (CSOs), sanitary sewer overflows (SSOs) and sewage treatment plant overflows of untreated wastes are system wide issues that communities must address in controlling wet weather flows.
- These issues must be dealt with through comprehensive solutions that may include structural controls such as separating storm and sanitary sewers, constructing storage capacity, or controlling infiltration/inflow (I/I); non-structural controls such as land use planning and aggressive use of best management practices to minimize impervious surfaces and prohibit increases in storm water run-off; and regulatory controls such as updating and enforcing NPDES permits, and implementing more rigorous antidegradation guidance.

We preferred the third approach – developing and implementing a comprehensive approach – as most cost-effective and most consistent with our basic premises.

Detailed Recommended Actions:

1. Beginning in FY 2008, Congress should allocate $1 billion in federal grants per year over five years to Great Lakes communities with major wet weather overflow problems. Grants will require up to 45% in state or local matching funds. The focus of this funding is for comprehensive programs addressing wet weather overflows to Great Lakes waters, according to definitions and criteria set in the grant offering. Rules governing the disbursement of funds will include but not be limited to the following:
   - Grants will only be awarded to communities with approved comprehensive programs addressing wet weather controls including the control of CSOs, SSOs, storm water runoff, overflows from bypassing at the wastewater treatment plant, and related issues.
   - Priority funding will go to communities who can demonstrate that non-structural controls – including preservation and restoration of Green Infrastructure such as wetlands, riparian corridors and forest cover – and other land use regulations and best management practices that reduce or eliminate storm water flows into the system, are employed to the greatest extent possible.[6]
   - Plans must include provisions for review and updating industrial pretreatment programs to reduce the discharge of toxics to sewage treatment systems (See PBT section for further detail).
   - A discretionary provision for reimbursing communities that implement overflow controls as part of comprehensive programs consistent with grant criteria, before October 1, 2008.
   - A discretionary provision for rewarding those communities that fully implement and achieve their comprehensive wet weather control plan before 2012.

[6] See, for example, Center for Watershed Protection, "Model Land Development Principles," www.cwp.org, also quoted in full in the International Joint Commission's *2001-2003 Priorities Report*.

2. Congress should allocate $10 million to the three USEPA Regions to review and upgrade their Great Lakes wet weather programs – including NPDES permit issuance and enforcement, SS0 rules, storm water management, water quality standards for nutrients, and final rules to fully implement the BEACH Act of 2000 – to insure that issues are addressed comprehensively. For example, the national CSO Policy should be revised to require use of a comprehensive solution to wet weather problems and specifically to include the use of "soft path" approaches to minimizing storm water runoff in addition to the nine minimum controls. The "anti-degradation" mandate of the Clean Water Act needs federal guidance to allow states to implement rules prohibiting new hook-ups to wastewater systems that have not yet controlled wet weather overflows.

3. Congress should allocate $25 million to the Great Lakes States to administer the grants program, to review and upgrade all of their wet weather programs, including NPDES permits and enforcement, and implement anti-degradation rules in relation to sewage system expansions.

Appendix E: Assessment (List) of Ongoing Efforts

Publications and Articles

Wet Weather Events (CSO, SSO, storm water and run-off)

Byappanahalli, M., M. Fowler, D. Shively and R. Whitman. 2003. Ubiquity and persistence of *Escherichia coli* in a Midwestern coastal stream. Appl. Environ. Microbiol. 69(8): 4549 – 4555.

Davies-Colley, R.J., R.G. Bell, and A.M. Donnison. 1994. Sunlight inactivation of enterococci and faecal coliforms in sewage effluent diluted in seawater. Appl. Environ. Microbiol. 60, 2049-2058.

Geldreich, E.E. 1978. Bacterial populations and indicator concepts in feces, sewage, stormwater and solid wastes. *In*: G. Berg (Ed.), Indicators of viruses in water and food, pp. 51-97. Ann Arbor Science Publishers, Inc., Ann Arbor, MI.

Irvine, K.N. and G.W. Pettibone. 1993. Dynamics of indicator bacteria populations in sediment and river water near a combined sewer outfall. Environ. Technol. 14, 531-542.

Levitt, J.T., van der Kraak, G., and Sorensen P.W., 2002. Ten-Week Exposure to Treated Sewage Discharge has Relatively Minor, Variable Effects on Reproductive Behavior, and Sperm Production in Goldfish. Environ. Toxicol. Chemistry 21(10): 2185-2190.

McCauley, D. J. 2001. Stormwater Source Identification, Sampling and Analysis at Select Storm Drains and Tributaries to Grand Traverse Bay (Lake Michigan). A Report to the Watershed Center Grand Traverse Bay. Great Lakes Environmental Center
Traverse City, MI.

McDonald, A., Kay, D., A. Jenkins, 1982. Generation of fecal and total coliform surges by stream flow manipulation in the absence of normal hydrometeorological stimuli. Appl. Environ. Microbiol. 44, 292-300.

McLellan S.L. and A.K. Salmore. 2003. Evidence for localized bacterial loading as the cause of chronic beach closings in a freshwater marina. *Water Research* 37:2700-8.

Mclellan S.L., and E.T. Jensen. 2003. Lake Michigan Beaches: Urban Stormwater and Water Quality Advisories. Lakeline 23:27-29.

McLellan, S.L. 2004. Genetic diversity of *Escherichia coli* isolated from urban rivers and beach water. Appl. Environ. Microbiol. 70:4858-65.

Nicosia, L.A., J.B. Rose, L. Stark, and M.T. Stewart. 2001. A Field Study of Virus Removal in Septic Tank Drainfields. *J. Environ. Quality* 30(6):1933-1939.

Olyphant, G., J. Thomas, R. Whitman and D. Harper. 2003. Characterization and statistical modeling of bacterial (*Escherichia coli*) outflows from watersheds that discharge into southern Lake Michigan. Environ. Monitoring and Assessment 81(1-3): 289 – 300.

Salmore, A.K., E.T. Jensen, and S.L. McLellan. Delineation of a chemical and biological signature for stormwater pollution in urban rivers. Journal of Water & Health (*in press*)

Sampson, R., S. Swiatnicki, C. McDermot and G. Kleinheinz. 2004. The effects of Rainfall on *E. coli* and total coliform levels at 15 Lake Superior Beaches. *Submitted*: Water Resource Management.

Sherer, B.M., J.R. Miner, J.A. Moore, and J.C. Buckhouse. 1992. Indicator bacterial survival in stream sediments. J. Environ. Qual. 21, 591-595.

Dry Weather Impacts (algal blooms, wildlife, beach sands, submerged sediments)

Alm, E., J. Burke, and A. Spain. 2003. Fecal indicator bacteria are abundant in wet sand at freshwater beaches. Water Research 37(16), 3978-3982.

Bolton, F.J., S. B. Surman, K. Martin, D.R.A. Wareing, and T.J. Humphrey. 1999. Presence of campylobacter and salmonella in sand from bathing beaches. Epidemiol. Infect. 122, 7-13.

Byappanahalli,M., D. Shively, M. Nevers, M. Sadowsky and R. Whitman. 2003. Growth and survival of *Escherichia coli* and enterococci populations in the macro-algae *Cladophora* (Chlorophyta). FEMS Microbiol. Ecology 1575(2003): 1 – 9.

Calderon, R.L., E.W. Mood, and A.P. Dufour. 1991. Health effects of swimmers and nonpoint sources of contaminated water. Int. J. Environ. Health Res. 1, 21-31.

Casman, E., B. Fischoff, M. Small, H. Dowlatabadi, J. Rose, and M. Morgan. 2001. Climate Change and Cryptopsoridiosis: A Qualitative Analysis. Kluwer Academic Publishers. *Climatic Change* 50: 219-249.

Esenreich, S.J., Hollod, G.J., and Johnson, T.C. Atmospheric Concentrations and Deposition of Polychlorinated Biphenls to Lake Superior. Chapter 21 *in* Atmospheric Pollutants in Natural Waters.

Fogarty, L., S.K. Haack, M.J. Wolcott and R. Whitman. 2003. Abundance and characteristics of the recreational water quality indicator bacteria Escherichia coli and enterococci in gull faeces. J. Appl. Micrbiol. 94(5): 865 – 878.

Garza EL, and R.L. Whitman. 2004. The nearshore benthic invertebrate community of southern Lake Michigan and its response to beach nourishment J. Great Lakes Research 30 (1): 114-122.

Guan, S., R. Xu, S. Chen, J. Odumeru and C. Gyles. 2002. Development of a procedure for discriminating among *Escherichia coli* isolates from animal and human sources. Appl. Environ. Microbiol. 68: 2690 – 2698.

Hancock, C.M., J.B. Rose, and M.R. Callahan. 1998. *Crypto* and *Giardia* in US Groundwater. *J. Amer. Water Works Assoc*. 90:58-61.

Hatch, J.J., 1996. Threats to public health from gulls (Laridae). Int. J. Environ. Health Res. 6, 5-16.

Kinzelman, J. 2002. Microbiological Examination of Recreational Water, Sand & Sediment at North Beach, Racine, WI, June 2002 (Masters Thesis)

Kinzelman J., S. L. McLellan, A. D. Daniels, S. Cashin, A. Singh, S. Gradus, and R. C. Bagley. 2004. Non-point Source Pollution: Determination of Replication versus Persistence of *Escherichia coli* in Surface Water and Sediments with Correlation of Levels to Readily Measurable Environmental Parameters, J. Wat. Health 2(2): 103-114.

Levesque, B., P. Brousseau, F. Bernier, E. Dewailly, and J. Joly. 2000. Study of the bacterial content of ring-billed gull droppings in relation to recreational water quality. Wat. Res. 34, 1089-1096.

Levesque, B., P. Brousseau, P. Simard, E. Dewailly, M. Meisels, D. Ramsay, D., and Joly, J., 1993. Impact of the ring-billed gull (*Larus delawarensis*) on the microbiological quality of recreational water. Appl. Environ. Microbiol. 59, 1228-1230.

Mendes, B., M.J. Nascimento, and J.S. Oliveira. 1993. Preliminary characterization and proposal of microbiological quality standard of sand beaches. Water Sci. Technol. 27, 453-456.

Moulton-Hancock, C., J.B. Rose, G.J. Vasconcelos, S.I. Harris, P.T. Klonicki, and G.D. Sturbaum. 2000. *Giardia* and *Cryptosporidium* occurrence in groundwater. *J.Amer. Water Works. Assoc.* 92:117-123.

Papadakis, J.A., A. Mavridou, S.C. Richardson, M. Lampiri, and U. Marcelou. 1997. Bather-related microbial and yeast populations in sand and seawater. Wat. Res. 31, 799-804.

Sampson, R., S. Swiatnicki, V. Osinga, J. Supita, C. McDermott, and G. Kleinheinz. 2004. Effect of temperature and sand on *E. coli* survival in a lake water microcosm. *Submitted*: Journal of Water and Health.

Shively, D., H. Pawlik, M. Nevers, and M. Byappanahalli. 2003. Occurrence of Escherichia coli in Cladophora (Chlorophyta) in nearshore water and beach sand of Lake Michigan. Appl. Environ. Microbiol. 69(8): 4714 -4719.

Slifko, T.R., D.E. Huffman, D. Bertrand, J.H. Owens, W. Jakubowski, C.N. Haas, and J.B. Rose. 2002. Comparison of Animal Infectivity and Cell Culture Systems for Evaluation of *Cryptosporidium parvum* oocycts. Exp. Parasit. 101:97-106.

Standridge, J., J. J. Delfino, L. B. Kleppe and R. Butler. 1979. The effect of waterfowl (*Anas platyrhynchos*) on indicator bacteria populations in a recreational lake in Madison, Wisconsin. Appl. Environ. Microbiol. 38:547-550.

Whitman, R. L. and M. B. Nevers. 2003. Foreshore sand as a source of Escherichia coli in Nearshore water of a Lake Michigan beach. Appl. Environ. Microbiol. 69(9): 5555 – 5562.

Whitman, R., D. Shively, H. Pawlik, M. Nevers and M. Byappanahalli. 2003. Occurrence of *Escherichia coli* and enterococci in *Cladophora* (Chlorophyta) in nearshore water and beach sand of Lake Michigan. Appl. Environ. Microbiol. 69(8): 4714 – 4719.

Improving Beach Management

Bolin, C., C. Brown and J. Rose. 2004. Emerging zoonotic diseases and water. IN: Waterborne Zoonoses, Identification, Causes and Control, Cotruvo, J.A, Dufour, A., Rees, G. Bartram J., Carr, R., Cliver, D.O., Craun, G.F., Fayer, R. and Gannon, V.P.J. (eds) WHO, USEPA and IWA publishing, London, UK.p.19-26.

Bonde, G.J., 1966. Bacteriological methods for estimation of water pollution. Health Lab. Sci. 3, 124-128.

Brenner, K.P., C.C Rankin, Y.R. Roybal, G.R. Stelma, P.V. Scarpino, and A.P. Dufour. 1993. New medium for simultaneous detection of total coliforms and *Escherichia coli* in water. Appl. Environ. Microbiol. 59, 3534-3544.

Brinkman N.E., R.A. Haugland, L.J. Wymer, M.N. Byappanahalli, R.L. Whitman, and S.J. Vesper. 2003. Evaluation of a rapid, quantitative real-time PCR method for enumeration of pathogenic Candida cells in water. Applied and Environmental Microbiology 69(3), 1775-1782.

Bruesch, M.E. and S.L. McLellan. 2003. Beach Monitoring in Milwaukee. Wisconsin Great Lakes Chronicle 2003 edition.

Cabelli, V.J., A.P. Dufour, L.J. McCabe, and M.A. Levin. 1982. Swimming-associated gastroenteritis and water quality. Am. J. Epidemiol. 115, 606-616.

Cabelli, V.J., H. Kennedy, and M.A. Levin. 1976. *Pseudomonas aeruginosa*-fecal coliform relationships in estuarine and fresh recreational waters. J. Wat. Poll. Control Fed. 48, 367-376.

Dombek, P., L. Johnson, S. Zimmerley and M. Sadowsky. 2000. Use of repetitive DNA sequences and the PCR to differentiate *Escherichia* coli isolates from human and animal sources. Appl. Environ. Microbiol. 66: 2572 – 2577.

DuFour, A. P. 1984. Health Effects Criteria for Fresh Recreational Waters. EPA 600/1-84-004, United States Environmental Protection Agency, Cincinnati, OH.

DuFour, A. P. 1992. Water Quality Health Effects Criteria for Marine and Fresh Recreational Waters: A Review of Studies Carried Out in the United States of America, in Annex 1 of *Health Risks from Bathing and Marine Waters*, a report on a joint WHO/UNEP meeting. WHO regional office for Europe.

Dufour, A.P. 1984. Bacterial indicators of recreational water quality. Can. J. Public Health 75, 49-56.

Francy D.S. and R.A. Darner. Comparison of methods for determining *Escherichia coli* concentrations in recreational waters Water Research 34 (10): 2770-2778 2000

Griffin, D.W, K.A. Donaldson, J.P. Paul and J. B. Rose. 2003. Pathogenic Human viruses in Coastal Waters. *Clin. Microbiol. Rev*. 16(1):129-143.

Griffin, D.W., E.K. Lipp, M.R. McLaughlin, and J. Rose. 2001. Marine Recreation and Public Health Microbiology: Quest for the Ideal Indicator. *BioScience.* 51(10): 817-825.

Haack, S.K., L. Fogarty and C. Wright. 2003. Escherichia coli and enterococci at beaches in the Grand Traverse Bay, Lake Michigan: sources, characteristics, and environmental pathways. Environ. Sci. Technol. 37(15): 3275 – 3282.

Heath Kelsey, R., I. Geoffrey Scott, E. Dwayne Porter, B. Thompson and L. Webster. 2003. Using multiple antibiotic resistance and land use characteristics to determine sources of fecal coliform bacterial pollution. Environ. Monitoring Assess. 81(1-3): 337 – 348.

Jacobsen, Wade. 1997 Summary of U.S. Great Lakes Beach Closings 1981-1994 USEPA. EPA 905-R97-003

Jenkins, T.M., T.M. Scott, J.R. Cole, S.A. Hashsham and J.B. Rose. 2004. Assessment of virulence-factor activity relationships (VFARs) for waterborne diseases; Wat. Sci. & Tech. 50 (1): 309-314.

Kinzelman, J. 2004. Integrating Research and Beach Management Strategies for the Improvement of Public and Environmental Health - Sustainable Beaches Summit, Sandestin,FL, March 2004 (Published in the conference proceedings of the *Sustainable Beaches Summit, Sandestin, FL, March 2004*)

Kinzelman, J. 2004. Wisconsin Water - Our Way of Life: Protect, Racine Beach Health Monitoring, p. 15. *In* L. Wessel and S. Cook (ed.), Wisconsin Water - Our Way of Life an Action Guide for Community Leaders, July 2004. Madison Environmental Group, Madison, WI.

Kinzelman, J., A. Singh, C. Ng, K. Pond, R. Bagley, and S. Gradus. 2004. Use of IDEXX Colilert-18 and Quanti-Tray/2000 as a More Rapid and Simple Enumeration Method for the Detection of E. coli *in Recreational Freshwater, Lake and Reserv. Manage. 21(1): 73 -77.*
Kinzelman, J., C. Ng, E. Jackson, S. Gradus and R. Bagley. 2003. Enterococci as indicators of Lake Michigan recreational water quality: comparison of two methodologies and their impacts on public health regulatory events. Appl. Environ. Microbiol. 69(1): 92 – 96.

Kinzelman, J., K. Longmaid, and R. Bagley. 2004. The Effect of Two Mechanical Beach Grooming Strategies on *Escherichia coli* Density in Beach Sand at a Southwestern Lake Michigan Beach, Aquatic Ecosystem Health Manag. 7(3): 1-8.

Kinzelman, J., R. Whitman, M. Byappanahalli, E. Jackson, and R. Bagley. 2003. Evaluation of Beach Grooming Techniques on *Escherichia coli* Density in Foreshore Sands at North Beach, Racine, WI. Lake and Reserv. Manage. 19(4): 349-354.

Kinzelman, Kinzelman, J.L., A. P. Dufour, L. J. Wymer, G. Rees, K. R. Pond, and R. C. Bagley. 2004. Comparison of Multiple Point and Composite Sampling for the Purpose of Monitoring Bathing Water Quality (*Submitted for publication)*

Kleinheinz, G.T., McDermott, C.M., and R.W. Sampson. 2003. Recreational Water: Microbial Contamination and Human Health. In: C. Meine (Ed.), Wisconsin's waters: A confluence of 16 Perspectives. Transactions of the Wisconsin Academy of Sciences, 90:75-86.

Lauber, C., L. Glatzer and R. Sinsabaugh. 2003. Prevalence of pathogenic Escherichia coli in recreational waters. J. Great Lakes Res. 29(2): 301 – 306.

Lee, J. and R.A. Deininger. 2004. Detection of *E. coli* in beach water within one hour using Immunomagnetic Separation and ATP Bioluminescence. Luminescence. 19:31-36.

Lightfoot, N.E. 1989. A prospective study of swimming related illnesses at six freshwater beaches in southern Ontario. PhD thesis. University of Ontario, Canada.

Lipp, E.K., S.A. Farrah, and J.B. Rose. 2001. Assessment and Impact of Microbial Fecal Pollution and Human Enteric Pathogens in a Coastal Community. *Marine Poll Bull.* 42 (4): 286-293.

Malakoff, D. 2002. Microbiologists on the trail of polluting bacteria. Science 295: 2353 – 2353.

McLellan S.L., A.D. Daniels, and A.K. Salmore. 2001. Clonal populations of thermotolerant *Enterobacteriaceae* in recreational water and potential interference with fecal *Escherichia coli* counts. *Appl. Environ. Microbiol*. 67:4934-8.

McLellan, S., A. Daniels and A. Salmore. 2003. Genetic characterization of *Escherichia coli* populations from host sources of fecal pollution by using DNA fingerprinting. Appl. Environ. Microbiol. 69(5): 2587-2594.

Nobles, R.E., P. Brown, J. Rose, and E. Lipp. 2000. The Investigation and Analysis of Swimming-associated Illness Using the Fecal Indicator enterococcus in Southern Florida's Marine Water. *Fl J. of Environ. Hlth.* June: 13-19.

Olyphant, G.A. and R.L. Whitman. 2004. Elements of a predictive model for determining beach closures on a real time basis: The case for 63rd Street beach Chicago. Environmental Monitoring and Assessment 98(1-3), 175-190.

Patz J.A., M.A. McGeehin, S.M. Bernard, K.L. Ebi, P.R. Epstein, A. Grambsch, D.J. Gubler, P. Reiter, I. Romieu, J.B. Rose, J.M. Samet, and J. Trtanj. 2001. The potential health impacts of climate variability and change for the United States - Executive summary of the report of the health sector of the US National Assessment. J. Environ. Health 64 (2): 20-28.

Quintero-Betancourt, W, E.M. Peele, and J. B. Rose. 2002. Cryptosporidium Parvum And Cyclospora Cayetanensis: A Review Of Laboratory Methods For Detection Of These Waterborne Parasites. J. Microbiol. Methods (49) 209-224.

Ram J.L., R.P. Ritchie, J.W. Fang, F.S. Gonzales, and J.P. Selegean. 2004. Sequence-based source tracking of *Escherichia coli* based on genetic diversity of beta-glucuronidase. Journal of Environmental Quality 33(3), 1024-1032.

Rose, J., R. Atlas, C. Gerba, M. Gilchrist, M. LeChavallier, M. Sobsey, M. Yates, G. Cassell and J. Tiedje. 2003. Microbial pollutants in our nations water – environmental and public health issues. American Society for Microbiology Office of Public Affairs. [Online].

Rose, J.B., D.E. Huffman and A. Gennaccaro, 2002. Risk and Control of Waterborne Cryptosporidiosis. FEMS Microbiology Reviews (26)113-123.

Rose, J.B., P.R. Epstein, E.K. Lipp, B.H. Sherman, S.M. Bernard, and J. A. Patz. 2001. Climate Variability and Change in the United States: Potential Impacts on Water- and Foodborne Diseases Caused by Microbiologic Agents. Environ. Hlth Persp. 109 (S2): 211-221.

Sabat, G., P. Rose, W. Hickey and J. Harkin. 2000. Selective and sensitive method for PCR amplification of *Escherichia coli* 16S rRNA genes in soil. Appl. Environ. Microbiol. 66(2): 844 – 849.

Sampson, R., S. Swiatnicki, C. McDermott and G. Kleinheinz. 2005. *E.coli* at Lake Superior Recreational Beaches. Journal of Great Lakes Research. (*In-press*)

Scopel, C.O. and S.L. McLellan. 2004. Sources and nearshore transport of *Escherichia coli* at Lake Michigan beaches. Appl. Environ. Microbiol. (*submitted for publication*)

Scott, T. M., T.M. Jenkins, J. Lukasik and J.B. Rose. 2005. Potential Use of a Host Associated Molecular Marker in *Enterococcus faecium* as an Index of Human Fecal Pollution; Environ. Sci. & Tech. 39: (1) 283 – 287

Scott, R.M., J.B. Rose, T.M. Jenkins, S.R. Farrah and J. Lukasik. 2002. Microbial Source Tracking: Current Methodology and Future Directions. Appl. Environ. Microbiol. 68 (12):5796-5803.

Selegean J.P.W., R. Kusserow, R. Patel, *et al*. Using zebra mussels to monitor *Escherichia coli* in environmental waters J. Environ. Quality 30 (1): 171-179 2001

Selvakumar, A., M. Borst, M. Boner, and P. Mallon. 2002. Effects of Sample Holding Time on Concentrations of Microorganisms in Water Samples. Water Environ. Research 76 (1): 64 – 72.

Sherry, J.P. 1986. Temporal distribution of faecal pollution indicators and opportunistic pathogens at a Lake Ontario bathing beach. J. Great Lakes Res. 12, 154-160.

Simpson, J., J. Santo Domingo and D. Reasoner. 2002. Microbial source tracking: state of the science. Environ. Sci. Technol. 36(24): 5279 – 5288.

Smith, B.G. and A.P. Dufour. 1997. A modified mTEC medium for monitoring recreational waters. American Society for Microbiology Annual Meeting, May 4-8, 1997, Miami Beach, Florida.

Tseng, C., E. Ting, D. Johnson, M. Saluta, and R. Dunst. 2001. RAPD fingerprinting as a potential means for differentiating human and animal E. coli. Life Science News (7) 10-11.

Vail, J., R. Morgan, C. Merino, F. Gonzales, R. Miller and J. Ram. 2003. Enumeration of waterborne *Escherichia coli* with petrifilm plates. J. Environ. Quality 32: 368 – 373.

Wade, T., N. Pai, J. Eisenberg and J. Colford. 2003. Do US EPA water quality guidelines for recreational waters prevent gastrointestinal illness? A systematic review and meta-analysis. Environ. Health Perspectives doi:10.1289/ehp.6241 [Online] http://dx.doi.org]

Whitman, R.L. and M.B. Nevers. 2004. *Escherichia coli* sampling reliability at a frequently closed Chicago beach: Monitoring and management implications. Environmental Science & Technology 39, 4241-4246.

Whitman, R.L., M.B. Nevers, and P.J. Gerovac. 1999. Interaction of ambient conditions and fecal coliform bacteria in southern Lake Michigan waters: monitoring program implications. Nat. Areas J. 19, 166-171.

Whitman, R.L., M.B. Nevers, G. C. Korinek, and M.N. Byappanahalli. 2004. Solar and temporal effects on *Escherichia coli* concentration at a Great Lakes swimming beach. Applied and Environmental Microbiology 70, 4276-4285.

Whitman, R.L., T.A. Sobat, W.A. Dustman, and S.W. May. 1991. Fecal contamination source determination of Derby Ditch. Indiana Dunes National Lakeshore, National Park Service, Porter, Indiana.

Public Communication and Education

Jensen, E.T. and S.L. McLellan. 2004. Beach Closings: Scientific Studies and Public Perception. Submitted for publication to ActionBioscience.org

Kinzelman, J. and J. Hiller. 2005. Incorporating Education and Outreach in the Re-Engineering of a Storm Water Outfall Impacting Recreational Water Quality at Two Public Bathing Beaches on Lake Michigan. Current: The J. of Marine Education x (x) : xx – xx.

Murray, C., B. Sohngen, and L. Pendleton. 2001. Valuing Water Quality Advisories and Beach Amenities in the Great Lakes. Water Resources Research. 37(10) 2583 - 2590.

Rabinovici S.J.M., R.L. Bernknopf, A.M. Wein, *et al.* 2004. Economic and health risk trade-offs of swim closures at a Lake Michigan beach Environ. Sci. Technol. 38 (10): 2737-2745.

Stewart. M.H., M.V. Yates, M.A. Anderson, C.P. Gerba, J.B. Rose, R. DeLeon and R.L. Wolfe. 2002. Predicted public health consequences of body-contact recreation on a potable water reservoir. J. Amer. Water Works Assoc. 93(5):84-97.

Published Abstracts

Wet Weather Events (CSO, SSO, storm water and run-off)

Kinzelman, J. 2003. Evaluating the Efficacy of a Storm Sewer Outfall Re-engineered for the Reduction of Bacterial Contamination to Surface Water - State of Lake Michigan (SOLM)/Great Lakes Beach Association (GLBA) joint conference, Muskegon, MI, October, 2003.

McLellan, S.L. 2004. Genetic diversity of *Escherichia coli* isolated from urban rivers and comparison with *E. coli* from host sources of fecal pollution. American Society of Microbiology 104th General Meeting. New Orleans, LA, May 23-27, 2004.

Salmore A.K. and S.L. McLellan. 2003. Characterization of urban stormwater contaminants in the Menomonee River, Milwaukee, Wisconsin. American Society of Microbiology 103rd General Meeting. Washington D.C., May 18-22, 2003.

Salmore A.K. and S.L. McLellan. 2002. Urban stormwater contributions to poor water quality in the Menomonee River, Milwaukee, Wisconsin. Great Lakes Recreational Water Quality Association, Chicago, Illinois, October 30, 2002.

Thuman, A, S.L. McLellan, C. Magruder**,** and D. Lau. 2004. Assessing CSO impacts on beaches: A modeling approach. The 77th Annual Water Environment Federation Technical Exhibition and Conference. New Orleans, LA, October 2-6, 2004.

Dry Weather Impacts (algal blooms, wildlife, beach sands, submerged sediments)
Improving Beach Management

Kleinheinz, G. and E. Englebert. 2004. *Cladophora* and the beach: Implications for Public Health. Presentation at Cladophora research and management in the Great Lakes meeting held at the UW-Milwaukee WATER Institute, December 8, 2004.

McLellan SL, O.A. Olapade, E.T. Jensen and M. Depas. 2005. Sequence analysis of microbial communities on *Cladophora* mats along coastal Lake Michigan. American Society of Microbiology 105th General Meeting. Atlanta, GA, May, 2005.

McLellan, S.L., A.D. Daniels, and L. Peng. 2001. Distinguishing *E. coli* of human and animal origin from environmentally occurring bacteria using molecular-based methods. American Society of Microbiology 101th General Meeting. Orlando, FL, May, 2001.

Osinga, V., R. Sampson, S. Swiatnicki, G.T. Kleinheinz, and C.M. McDermott. 2004. Survival of a Beach-Recovered *E. coli* Isolate in a Lake Water Microcosm. ASM North Central Branch Annual Meeting, Madison, WI, Nov. 12-13, 2004.

Ting, W.T.E., C.C. Tseng, D.S. Johnson, L. Dominguez, J. Vander Hoogt, M. Saluta, and R.L. Whitman. 2000. Genetic diversity of *Escherichia coli* isolated from Lake Michigan water, beach sand, and seagull droppings as revealed by random amplified polymorphic DNA fingerprints. 100th General Meeting of the American Society for Microbiology. 2000 May 21- 25. Los Angeles, California.

Improving Beach Management

Becker, G. and J. Kinzelman. Remediation & Best Management Practices, A City of Racine Perspective - 2004 International Association of Great Lakes and St. Lawrence Mayors' Conference, Chicago, IL, July 2004.

Brown, A., J. Felt, G. Kleinheinz, and C. McDermot. 2004. Detection of *E.coli* contamination at Door County, WI beaches: Association with environmental factors. ASM North Central Branch Annual Meeting, Nov. 12-13, 2004, Madison, WI.

Bruesch, M.E. and P.A. Biedrzycki. 2002. Preliminary comparative analysis of two models used to predict *E. coli* levels in recreational water in Milwaukee. Great Lakes Beach Conference, 2002 October 30. Chicago, Illinois.

Dufour, A.P., G. Anderson, and R.L. Whitman. 2002. New approaches to rapid testing of indicators of fecal contamination. Great Lakes Beach Conference, 2002 October 30. Chicago, Illinois.

Felt, J., C. Otte, A. Brown, G.T. Kleinheinz and C. McDermott. 2004. Source-tracking of microbial contamination at Door County, WI. ASM North Central Branch Annual Meeting, Nov. 12-13, 2004, Madison, WI.

Francy, D.S., and R.A. Darner. 2002. Predictive models for *Escherichia coli* at Ohio bathing beaches. Great Lakes Beach Conference, 2002 October 30. Chicago, Illinois.

Graves, M.J., B. Langolf, G.T. Kleinheinz, and C.M. McDermott. 2002. Microbial contamination of recreational waters in Oshkosh, WI. Proceedings of the North Central Regional Meeting of the American Society for Microbiology, Minneapolis, MN.

Hughes, S. S. Hartrich, T. Sandrin, W. Gorman, C. McDermott, and G. Kleinheinz. 2004. *E.coli* and Lake Superior Recreational Beaches. ASM North Central Branch Annual Meeting, Nov. 12-13, 2004, Madison, WI.

Jeter, S., G. Kleinheinz, and C. McDermott. 2004. *E.coli* and *Stapylococcus aureus* as indicators of contamination of recreational water. ASM North Central Branch Annual Meeting, Madison, WI, Nov. 12-13, 2004.

Kinzelman, J., A. Dufour, L. Wymer, G. Rees, and R. Bagley. 2004. Composite Sampling as an Alternative Technique for the Determination of Bacterial Indicators in Recreational Waters - US EPA National Beaches Conference, San Diego, CA, October, 2004.

Kinzelman, J. 2004. The Effectiveness of Spatial Distribution Studies in the Development of Successful, Cost-Effective, Targeted Remediation Efforts - US EPA National Beaches Conference, San Diego, CA, October, 2004.

Kinzelman, J. 2004. The Improvement of Lake Michigan Surface Water Quality through Targeted Remediation Efforts - Wisconsin Environmental Health Association, Joint Educational Conference, Baraboo, WI, September, 2004.

Kinzelman, J., A. Dufour, L. Wymer, G. Rees, and R. Bagley. 2004. Comparison of Multiple Point and Composite Sampling for the Purpose of Monitoring Bathing Water Quality - American Society for Microbiology, New Orleans, LA, May, 2004.

Kinzelman, J. 2004. Integrating Research and Beach Management Strategies for the Improvement of Public and Environmental Health - Sustainable Beaches Summit, Sandestin, FL, March, 2004.

Kinzelman *et al*. 2003. Characterization of Enterococci in a Freshwater Environment: Applicability as an Indicator of Lake Michigan Recreational Water Quality - American Society for Microbiology, Washington, DC, May, 2003.

Kinzelman, J. 2003. Assessing Current Beach Management Practices to Reduce Bacterial Contamination of Surface Water - Public Beach Closings Conference, Milwaukee, WI, May, 2003.

Kinzelman, J. 2003. The Influence of Lake Shore Management Practices on *Escherichia coli* Densities in Foreshore Sands - A Study of North Beach at Racine, WI - Research Symposium, University of Surrey, Guildford, UK, February, 2003.

Kinzelman *et al.* 2002. Evaluation of Mechanical Grooming Techniques on *Escherichia coli* Densities in Foreshore Sands at North Beach, Racine, WI - Great Lakes Recreational Water Quality Association Annual Meeting, Chicago, IL, October, 2002.

Kinzelman *et al.* 2002. *E. coli* Densities in Sands of Two Southwestern Lake Michigan Beaches: Implications for Beach Management - Presented at the5th International Symposium on Sediment Quality Assessment-SQA5 conference, Chicago, October, 2002 [www.aehms.org, *Online*]

Kinzelman *et al.* 2002. Effects of Beach Grooming Techniques on *Escherichia coli* Densities in Foreshore Sands at North Beach, Racine, WI – American Society for Microbiology, Salt Lake City, UT, May, 2002.

Kinzelman *et al.* 2002. Use of IDEXX Colilert ® Quanti-Tray/2000 as a More Rapid & Simple Enumeration Method for the Detection of *E. coli* in Recreational Waters - Midwest Water Analysts Association, Kenosha, WI, January, 2002.

Kinzelman *et al.* 2001. Use of IDEXX Colilert ® Quanti-Tray/2000 as a More Rapid & Simple Enumeration Method for the Detection of *E. coli* in Recreational Waters – USEPA Great Lakes Beach Conference, Chicago, IL, February, 2001.

Langolf, B, M. Graves, C. McDermott, and G.T. Kleinheinz. 2003. Microbial Contamination of Menominee Park Beach in Oshkosh, WI, Proceedings of the North Central Regional Meeting of the American Society for Microbiology, Oshkosh, WI.

Langolf, B, M. Graves, C. McDermott, and G.T. Kleinheinz. 2003. Microbial Contamination of Menominee Park Beach in Oshkosh, WI, MI Branch "Twig" Meeting of the American Society for Microbiology. Marquette, MI.

Langolf, B.M. and G.T. Kleinheinz. 2002. Water Quality Study of Beatons Lake, MI. Annual Student Research and Scholarship Symposium, UW-Oshkosh.

Langolf, B., M. Graves, G.T. Kleinheinz, and C.M. McDermott. 2003. Microbial contamination of recreational waters in Oshkosh, WI. Annual Student Research and Scholarship Symposium, UW-Oshkosh.

McLellan, SL. 2004. Southeast Environmental Enforcement Network/Midwest Environmental Enforcement Association Spring Conference. Microbial source tracking approaches and application to investigating environmental contamination. Memphis, TN, April 27-30, 2004.

McLellan, S.L., E.T. Jensen, and C.O. Scopel. 2004. Comparison of bacterial source tracking methods in an urban coastal system, the Great Lakes. Environmental Pollution Source Tracking Workshop of Bathing Waters. Robens Centre for Environmental and Public Health, University of Surrey, Guildford, UK, January 11-13, 2004.

McLellan, S.L. and A.K. Salmore. 2003. Differentiating sources of fecal pollution using fecal coliform profiling. Midwest Water Analysts Association Winter Expo. Kenosha, WI, January 2003.

McLellan, S.L., A.D. Daniels, and L. Peng. 2001. *E. coli* source identification using molecular based methods. EPA Great Lakes Beach Conference. Chicago, IL, February 2001.

Otte, C., D. Horn, J. Okon, T. Sandrin, G. Kleinheinz, and C. McDermot. 2004. Monitoring and Molecular Source-tracking of *Escherichia coli* on Door County, WI beaches. ASM North Central Branch Annual Meeting, Nov. 12-13, 2004, Madison, WI.

Pfister, M. 2002. Factors that affect *E. coli* concentrations at Lake Michigan beaches in Lake County, Illinois *presented at* 2nd Annual Great Lakes Beach Association Annual Meeting, Chicago, IL, October, 2002

Rabinovici, S. J. and R.L. Whitman. 2002. Modeling the variability of *Escherichia coli* at West Beach, Indiana using GIS: Implications for beach management. Great Lakes Beach Conference, October 30, 2002, Chicago, Illinois.

Sampson, R, S. Swiatnicki, C. McDermott, and Kleinheinz, G.T. 2003. Source Tracking and Assessment of *E. coli* at Lake Superior Beaches, Proceedings of the North Central Regional Meeting of the American Society for Microbiology, Oshkosh, WI.

Sampson, R, S. Swiatnicki, and G.T. Kleinheinz. 2003. Lake Superior beach monitoring and microbial source tracking, MI Branch "Twig" Meeting of the American Society for Microbiology. Marquette, MI.

Ting, W. T. E., Johnson, D. S., and C.C. Tseng. 2002. Discriminating *E. coli* isolated from various human and nonhuman sources based on analysis of random amplified polymorphic DNA (RAPD) patterns. Great Lakes Beach Conference. October 30, 2002, Chicago, Illinois.

Topp, E., K. Leung, B. Ball-Coelho and G. Lazarovits. 2002. Identification, environmental fate, and mitigation of biological and chemical contaminants including antibiotics, hormones, enteric bacteria, and

genes encoding bacterial pathogenicity and antibiotic resistance. Poster presentation. American Society for Microbiology – 102nd General Meeting, Salt Lake City, Utah.

Public Communication and Education

None submitted at time of publication.

Great Lakes Beach Association, 4th Annual Meeting, Parma, OH

Wet Weather Events (CSO, SSO, storm water and run-off)

Corsi, S. Sources and Variability of Cryptosporidium in the Milwaukee River Watershed, GLBA, Parma, OH 2004

Zmuda, J. Estimation of the *Escherichia coli* to fecal Coliform ratio in Wastewater Effluents and Ambient Waters of the Metropolitan Water Reclamation District of Greater Chicago, GLBA, Parma, OH 2004

Dry Weather Impacts (algal blooms, wildlife, beach sands, submerged sediments)

Begotka, B., J. Kinzelman, and R. Bagley. The Effects of Beach Slope on Bacterial Counts in Near Shore Sediments and Its Potential Impact on Surface Water Quality, GLBA, Parma, OH 2004

Brady, A. Concentrations of *Escherichia coli* in Water and Bed Sediments in Maumee Bay, Toledo and Oregon, Ohio, GLBA, Parma, OH 2004

Francis, E. Transfer of Antibiotic Resistance Plasmids to *E. coli* in Beach Sand, GLBA, Parma, OH 2004

Kleinheinz, G. Effect of Temperature and Sand on *E. coli* Survival in a Lake Water Microcosm, GLBA, Parma, OH 2004

Kumar Nayak, A. Detection of the Algal Toxin Microcystin in Michigan lakes, GLBA, Parma, OH 2004

Osinga, V., R. Sampson, S. Swiatnicki, G.T. Kleinheinz, and C.M. McDermott. Effect of temperature and sand on *E. coli* survival in a lake water microcosm. GLBA, Parma, OH 2004.

Sigler, V. A library-independent, community-based method to assess structural differences in *E. coli* populations in freshwater and sediment, GLBA, Parma, OH 2004

Struffolino, P. The Role of Suspended Sediment in *E. coli* Transport, GLBA, Parma, OH 2004

Improving Beach Management

Briggs, S. Beach Monitoring in Michigan. GLBA, Parma, OH 2004

Bushon, R. Rapid Method for the Determination of Fecal-Indicator Bacteria Concentrations in recreational Water, GLBA, Parma, OH 2004

Byappanahalli, M. Solar and Temporal Effects on *Escherichia coli* Concentration at a Lake Michigan Swimming Beach, GLBA, Parma, OH 2004

Byrd, D., Rapid Instrumental Methods for Identification of Micro-Organisms. GLBA, Parma, OH 2004

Byrd, D., The Tale of Two Beaches, GLBA, Parma, OH 2004

Dichter, G. Approved US EPA Technology for the Rapid Detection of *E. coli* in Fresh Waters and Enterococci in Marine Waters using DST ™ Technology (Colilert ®, Colilert-18 ®, and Enterolert ®), GLBA, Parma, OH 2004

Edge, T. Microbial Source Tracking of Fecal Pollution Impacting Lake Ontario Beaches, GLBA, Parma, OH 2004

Francy, D. Source-Tracking Tools for Understanding Fecal Contamination and Predicting Water Quality at Lake Erie Beaches, GLBA, Parma, OH 2004

Hughes, S. S. Hartrich, T. Sandrin, W. Gorman, C. McDermott, and G. Kleinheinz. *E.coli* and Lake Superior Recreational Beaches. GLBA, Parma, OH 2004.

Kinzelman, J. Using a Public-Health Based Monitoring Program to Assess Recreational Water Quality Advisories and Initiate Remediation - GLBA, Parma, OH, 2004

Leamond, B. National Beach Conference Summary (San Diego, California, October 13-15, 2004). GLBA, Parma, OH 2004

McDermott, C. Source Tracking of Microbial Contamination at Lake Michigan (Door County, WI) Beaches Using Various Methods, GLBA, Parma, OH 2004

Nevers, M. Fixed and Random Factors Affecting *E. coli* Results at Southern Lake Michigan Beaches, GLBA, Parma, OH 2004

Parramoure, E., J. Kinzelman, and R. Bagley. Lake Michigan Surface Water Quality: Evaluating the Diurnal Variation of *E. coli* and its Response to Environmental Parameters, GLBA, Parma, OH 2004

Pfister, M. Reducing the Sources: The Lake County, Illinois Experience, GLBA, Parma, OH 2004

Rediske, R. Beach Monitoring in Muskegon County, Michigan: A Partnership between the Annis Water Resources Institute at Grand Valley State University and the Muskegon County Health Department, GLBA, Parma, OH 2004

Sackett, D. NYS Department of Health BEACH Grant 2004. GLBA, Parma, OH 2004

Sams, E. Preliminary Health Burden Analysis for Epidemiologic Recreational Water Studies, GLBA, Parma, OH 2004

Sams, E.The National Environmental and Epidemiological Assessment of Recreational Water: *The relationship between novel indicators of water quality and health.* GLBA, Parma, OH 2004

Santo Domingo, J. The EPA MST Guide Document. GLBA, Parma, OH 2004

Stoekel, D. Results of Microbial Source Tracking Methods Comparison Studies. GLBA, Parma, OH 2004

Whitman, R. Toward a Regional Nowcast Model for Southern Lake Michigan Using Data Readily Available to Beach Managers. GLBA, Parma, OH 2004

Wirick, H. Beaches Environmental Assessment and Coastal Health (BEACH) Act. GLBA, Parma, OH 2004

Public Communication and Education

Corsi, S. Monitoring and Public Communication of Enteric Pathogen, Fecal Indicator and Real-Time Environmental Data at Madison, Wisconsin Beaches, GLBA, Parma, OH 2004

Projects - Ohio State University Sea Grant

Wet Weather Events (CSO, SSO, storm water and run-off)

Advanced Treatment Process for the Removal of Cyanobacterial Toxins from Drinking Water (project R/PS-31), Harold W. Walker, The Ohio State University, March 2003-February 2005.

Assessment of Antifouling Mechanisms of Non-toxic Natural Product Antifoulant Incorporated Silicone Coatings (project R/MB-2), Bi-min Newby, The University of Akron, September 2002-August 2004.

Origin and fate of the organic matter exchanged between coastal wetlands and the Great Lakes (project R/EM-22), Virginie Bouchard, The Ohio State University, March 2002-February 2004.

Dry Weather Impacts (algal blooms, wildlife, beach sands, submerged sediments)

Heavy Metal Bioremediation Using Genetically Altered Biomass (project R/BT-6), Richard Sayre, The Ohio State University, March 2000-February 2003.

Development of Fluorescent Biosensors for *In Situ* Trace-Metal Quantification and Biomonitoring (project R/BT-8), Richard Sayre, the Ohio State University, June 2003-May 2005.

Understanding the Links between Policy and Patterns of Land Use Change in Urbanizing Watersheds: A Spatial Economic Model of Land Use Conversion (project R/ME-25), Elena Irwin, The Ohio State University, March 2000-February 2002.

The Influence of Water Quality and Lake Amenities on the Demand for Residential Development around Lake Erie (project R/ME-30), Elena Irwin & Tim Haab, The Ohio State University, March 2004-February 2005.

Cyanotoxins in the Great Lakes: Is *Microcystis* Toxin Production Linked to Iron Deficiency? (project R/ER-58-PD), Michael L. McKay, Bowling Green State University, August 2000-May 2001.

Examining the Effects of Lake Water Level Variations on Sediment Resuspension (project R/ES-7), Diane L. Foster, The Ohio State University, March 2003-February 2005.

Improving Beach Management

Great Lakes Limnology: Interactions Among Physics, Chemistry, and Biology in a Large Lake (project R/ER-62-PD), David A. Culver, The Ohio State University, March 2002-March 2003.

Developing a spatial watershed model to predict the effects of watershed policies on coastal water quality and habitat change (project R/EM-23), Jay F. Martin, The Ohio State University, March 2003-February 2005.

Public Communication and Education

A comparison of Recreation and Amenity Values in the Lake Erie Basin (project R/ME-24), Brent Sohngen & Leroy Hushak, The Ohio State University, March 2001-February 2003.

The Economic Importance of Nature-based Tourism in Ohio's Lake Erie Tourism industry: The Case of Ottawa and Erie Counties (project R/ME-27-PD), Leroy J. Hushak, The Ohio State University, April 2001-February 2002.

Estimating the Spatial and Temporal Benefits of Recreational Boating and Angling in the Lake Erie Basin (project R/ME-28), Timothy C. Haab, The Ohio State University March 2002-February 2004.

Other

Freshwater Shrimp Production in Southern Ohio (project R/A-16-PD); David Apsley, Laura Tiu, & Geoff Wallat; The Ohio State University Extension-South Centers, April-December 2002.

Impact of Latitude on Freshwater Shrimp Culture in Ohio (project R/A-17-PD); Donald McFeeters, Laura Tiu, & Geoff Wallat, The Ohio State University Extension-South Centers; Jeffrey M. Reutter, Ohio Sea Grant; May 2003-April 2004.

USEPA Documents

Wet Weather Events (CSO, SSO, storm water and run-off)

United States Environemntal Protection Agency. 2003. Protecting water quality from urban runoff. EPA 841-F-03-003. Nonpoint Source Control Branch (4503T), Washington, D.C.

EPA CSO Guidance Series & Related Reports & Documents. October, 2004. U.S. Environmental Protection Agency. {Available from U.S. EPA in CD-ROM only.}

Improving Beach Management

United States Environmental Protection Agency. 1986. Ambient Water Quality Criteria for Bacteria. EPA 440/5-84-002. Office of Water Regulation and Standards. Criteria and Standards Division. United States Environmental Protection Agency, Washington, D.C.

United States Environmental Protection Agency. Bacterial Water Quality Standards for Recreational Waters (Fresh and Marine). 2000. Status Report. USEPA, Regional Offices and Office of Science and Technology, Standards and Applied Science Division. [Online.] http://www.epa.gov/OST/beaches/.

United States Environmental Protection Agency. Office of water (4303T). 2002a. Method 1604: total coliforms and *Escherichia coli* in water by membrane filtration using a simultaneous detection technique (MI medium). EPA-821-R-02-024. Environmental Protections, Regulations, and Standards, Agency Criteria and Standards Division. United States Environmental Protection Agency, Washington, D.C. 20460.

United States Environmental Protection Agency. Office of water (4303T). 2002b. Method 1603: *Escherichia coli (E. coli)* in water by membrane filtration using modified membrane-thermotolerant *Escherichia coli* agar (modified mTEC). EPA-821-R-02-023. Environmental Protections, Regulations, and Standards, Agency Criteria and Standards Division. United States Environmental Protection Agency, Washington, D.C. 20460.

United States Environmental Protection Agency. 2000. Beaches environmental assessment and coastal health act of 2000. 106th United States Congress. Public law 106-284.

United States Environmental Protection Agency. 2001. Guidelines establishing test procedures for the analysis of pollutants in ambient water; proposed rule. United States Federal Register – 40 CFR Part 136, Vol. 66, No. 169, August 30, 2001.

United States Environmental Protection Agency. Office of Science and Technology. 2000. Improved Enumeration Methods for the Recreational Water Quality Indicators: Enterococci and *Escherichia coli.*, EPA/821/R-97/004. United States Environmental Protection Agency, Washington, D.C. 20460.

United States Environmental Protection Agency. Office of Water. 1999. Action Plan for Beaches and Recreational Waters. EPA/600/R-98/079. United States Environmental Protection Agency, Washington, D.C. 20460.

United States Environmental Protection Agency. United States Office of Water (4305). May 1998. Bacterial water quality standards for recreational water (freshwater and marine waters). *In* Beaches Environmental Assessment, Closure and Health Program - Water Quality. EPA-823-R-98-003. United States Environmental Protection Agency, Washington, D.C. 20460.

United States Environmental Protection Agency. United States Office of Water. 1986. Ambient Water Quality Criteria for Bacteria. EPA 440/5-84-002. USEPA Environmental Protections, Regulations, and Standards, Agency Criteria and Standards Division. United States Environmental Protection Agency, Washington, D.C. 20460.

USEPA. 2002. Great Lakes strategy 2002 - a plan for the new millennium. Promoting clean and healthy beaches. [Online.] http://www.epa.gov/grtlakes/gls/gls04.html

Annual reports of the Survey of Great Lakes Bathing Beaches 1981-1996 available at USEPA Library 77, West Jackson Boulevard, Chicago, Illinois 60604-3590.

Richard Haugland, Real-time Quantitative PCR, U.S. EPA Office of Research & Development, NERL,http://clu-in.org/studio/r5productexpo_100604/agenda.cfm

Great Lakes Strategy 2002. U.S. Policy Committee. April, 2002. Annual Tracking reports also available from EPA's Great Lakes National Program Office.

US Geological Survey Reports

Wet Weather Events (CSO, SSO, storm water and run-off)

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

Dry Weather Impacts (algal blooms, wildlife, beach sands, submerged sediments)

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

Improving Beach Management

Francy, D.S., Darner, R.A., 1998. Factors affecting *Escherichia coli* concentrations at Lake Erie public bathing beaches. US Geological Survey, Columbus, Ohio.

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

Haack, S. K. 2003. Beach monitoring and forecasting technologies. USGS. [Online. http://www.mi.water.usgs.gov/splan8/spl0300/CB02/pdf/beaches].

United States Geologic Survey. 1998. How do we determine when the beaches are safe for swimming? USGS Fact Sheet FS-112-98.

Whitman, R., T. Horvath, M.L. Goodrich, M. B. Nevers, M. J. Wolcott, and S. K. Haack. 2001. Characterization of *E. coli* at 63rd Street Beach. United States Geological Survey Report. Chicago Park District and the City of Chicago. Agreement #3208-ARH72.

Other Technical Reports

Wet Weather Events (CSO, SSO, storm water and run-off)

Dorfman, M. 2004. Swimming in Sewage- The Growing Problem of Sewage Pollution and How the Bush Administration Is Putting Our Health and Environment at Risk. NRDC/EIP.
Katonak, R. and J. Rose. 2003. Public Health Risks Associated with Wastewater Blending. USEPA.

Association of Metropolitan Sewerage Agencies' January 2005 Action Plan (in response to the Report to Congress): http://www.amsa-cleanwater.org/advocacy/co/2005-01-14apltr.pdf

National Resource Defense Council – Swimming in Sewage, 2004.
http://www.nrdc.org/water/pollution/sewage/sewage.pdf

Dry Weather Impacts (algal blooms, wildlife, beach sands, submerged sediments)

Kinzelman J, R Bagley, S. L. McLellan. 2002. Microbiological and Molecular Examination of Recreational Water and Sediments at North Beach, Racine, Wisconsin - A Technical Report to the Wisconsin Department of Natural Resources, August 2002

Kleinheinz, G. and E. Englebert. 2005. *Cladophora* and the beach: Implications for Public Health. *In-press*: Technical Report, UW-Milwaukee WATER Institute.

Improving Beach Management

Beach Advisories, Posting and Closures SOLEC indicator # 4200 in State of the Great Lakes 2005

Foran, J. 2003. Closings and swimming advisories at Lake Michigan beaches near Racine, Wisconsin - sources, trends, and research. A report prepared for the S. C. Johnson Fund, Racine, Wisconsin (5 February 2003).

Kinzelman J, SL McLellan, RC Bagley, S Pedley, K Pond, and G. Rees. 2004. Integrating Research and Beach Management Strategies fro the Improvement of Public and Environmental Health. Annual Report to the SC Johnson Fund.

McLellan SL, AD Daniels, AK Salmore. 2002. Elevated indicator bacteria levels at South Shore Beach: *Escherichia coli* source detection using repetitive element anchored PCR. Great Lakes WATER Institute Technical Report contribution #432.

McLellan, S. 2004. Sources of E. coli at South Shore Beach. Great Lakes WATER Institute Technical Report contribution #445.

National Resource Defense Council – Testing the Waters, 2004.
http://www.nrdc.org/water/oceans/ttw/titinx.asp

Public Communication and Education

Dorfman, M. 2004. Testing the Waters 2004-A Guide to Water Quality at Vacation Beaches. NRDC.

Murray, C., Sohngen, B., Lichtkoppler, F., and Bielen, M. 2000. The Economics of Lake Erie Beaches: 1998 Lake Erie Beach Users Survey Results. Ohio Sea Grant Fact Sheet. OHSU-FS-82.

Sohngen, B., Bielen, M., and Lichtkoppler, F. 1999. The Value of Lake Erie Beaches. Ohio Sea Grant Fact Sheet. OHSU-FS-78.
Sohngen, B., Lichtkoppler, F., and Bielen, M. 1999. The Value of Day Trips to Lake Erie Beaches. Ohio Sea Grant Technical Bulletin TB-039.

Web Sites

Great Lakes States' Beach Web Sites

IL: www.idph.state.il.us/envhealth/beachhome.htm
IN: www.in.gov/idem/beaches/proj.html
MI: www.michigan.gov/deq/1,1607,7-135-3313_3686_3730---C1,00.html
MN: www.pca.state.mn.us/water/beaches/
OH: www.odh.state.oh.us/ODHPrograms/BEACH/sample.htm
NY: www.beach.com/stateofthebeach/6-state/state.asp?state=NY
PA: www.great-lakes.net/beachcast/pa
WI: www.dnr.state.wi.us/org/water/wm/wqs/beaches/

Great Lakes Sea Grant

Great Lakes Sea Grant Network, http://www.greatlakesseagrant.org/
Ohio Sea Grant, http://www.sg.ohio-state.edu/
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

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

Michigan Department of Environmental Quality – Great Lakes
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

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

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/

Great Lakes BeachCast---many links from this site
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

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