

COASTAL HEALTH STRATEGY TEAM CHAPTER

I. Problem Statement

Contact (including external, ingestion, and inhalation)¹ with near shore water of the Great Lakes can pose a risk to human health.² This results in the need to close beaches, issue boil water notices, publish fish consumption advisories,³ and mechanically remove stranded algae. Much of the cause of this human health risk is due to pollution that enters and accumulates in the Great Lakes as a result of wet weather overflows, bacterial and chemical pollution from illegal and malfunctioning private sewage treatment systems (e.g., septic and aerobic systems), runoff (e.g., storm water, agricultural, industrial, and urban landscape),⁴ avian/animal deposition, shedding from bathers, discharge of untreated onboard boater waste, industrial discharge/legacy,⁵ groundwater discharge, release of pollutants from contaminated sediments, and ecosystem/food web changes caused by aquatic invasive species' impact on water quality.⁶ Lack of source water protection requirements, outdated drinking water distribution systems, inconsistent compliance with sewage treatment and control, weak storm and wastewater enforcement, sprawling land use with inadequate storm water runoff controls, incomplete filtration/removal of contaminants during the drinking water treatment process, inadequate and inconsistent water quality assessment tools, and aging and overloaded wastewater treatment and collection infrastructure also contribute to the risk of adverse health effects.

As the primary source of drinking water, supplier of fish for both personal and commercial benefit, and recreational outlet for millions of US residents, contact with the near shore waters of the Great Lakes should pose a minimum risk to human health. (The Great Lakes are a natural body of water and hence the achievement of null risk is unrealistic.) To achieve this minimum risk to human health, Great Lakes near shore water should be drinkable, swimmable, and the fish harvested should be consumable at all times.

II. Goals and Milestones

To improve the quality of our surface waters, public decision-makers at municipal, State, and national levels must intervene through the development of regulations and enforcement schemes, combining both political and technical elements that are flexible and adaptive in order to meet changes both in the ecosystem and in the field of science as it evolves. The replacement of sanitary and storm water infrastructure, either failing or constructed in an era where the impact on surface water was underestimated, would have a direct, positive impact on improving surface water quality, but rectification is costly and many communities lack the necessary resources to do so. Compliance monitoring, while providing protection of public health to varying degrees based on the currently approved testing methodologies, is insufficient to determine sources of contamination and provide a true health risk assessment. More intensive sanitary surveys are necessary to detect pollution sources and these data could in turn be targeted for the development of cost-effective remediation schemes.

A. Control of Direct and Indirect Pollution Sources and Beach and Coastal Assessment Methods

A.1. Direct sources of contamination are those sources that originate from a single, identifiable, fixed point such as rivers, streams, sewer pipes, septic systems, a point of industrial discharge, or even an individual bather. Aging or overburdened infrastructure can result in the release of raw sewage to source waters in urban areas through sanitary sewer overflows (SSO) or combined sewage overflows (CSO) in those municipalities where storm and sanitary systems remain co-mingled. Coastal communities containing large marinas or harbors, and lacking sufficient pumping facilities, can be at risk of direct sewage inputs due to improper disposal of untreated fecal material originating from boats. Storm water can also contribute to the fecal burden on bathing waters via storm drains because it may contain fecal contamination from both humans (from illegal connections or leaks) and animals. In rural areas, septic

systems and diffuse inputs such as run-off from animal feed lots and agrarian sources can increase the bacterial burden on riverine systems. Given the potential impact on human health, overflows of untreated human and industrial waste into Great Lakes waters must be controlled. CSOs, SSOs, and sewage treatment plant overflows of untreated wastes are system-wide issues that communities must address 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 allow no net increase in storm water run-off; and regulatory controls such as issuing new, updating, and enforcing NPDES permits.

Long Term Goal: By 2018 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.⁷

Interim Milestones:

- By 2007, USEPA and the Great Lakes states will undertake a thorough review of their ongoing wet weather control programs to identify and correct any deficiencies to insure the programs are achieving the requirements of the Clean Water Act (CWA).
- By 2008, EPA, in cooperation with the Great Lakes states, will promulgate rules governing the disbursement of grant funds towards achieving this goal.
- By 2009, or as soon as possible, all significant wet weather overflow communities in the Great Lakes Basin will have adopted and begun to implement comprehensive storm water control programs with the objective of meeting all appropriate state and federal regulations.
- For those communities with wet weather problems that have not proceeded with the required planning and implementation by 2009 or sooner, the Great Lakes States or USEPA will proceed with the necessary enforcement actions (administrative order or judicial action) to require correction of the wet weather problems by a date certain with appropriate penalties.

A.2. Indirect sources of contamination are those sources whose origination cannot be traced back to a single point such as a storm drain or sewer outfall. The effects of indirect sources of contamination are diffuse and therefore determining their origin may require intensive investigation. For example, determining a correlation between increased bacterial level density at the bathing beach and various coastal processes, predominating weather conditions, and anthropogenic and non-anthropogenic sources is often difficult. Fecal indicator organisms from indirect sources are key contributors to poor surface water quality and can be found in sediments such as beach sands, groundwater (due to infiltration), resident wildlife, and plant populations, such as algal blooms, occurring at the shore. Precipitation, as runoff, traveling over agricultural and urban areas may also contribute significant amounts of bacteria to the near shore waters of coastal areas.

Long Term Goal: Identify indirect pollution sources capable of adversely impacting Great Lakes coastal health, educate communities regarding their impact on the environment and remediate all potential dry weather sources so that a 90-95% reduction in bacterial, algal, and chemical contamination will occur at all local Great Lakes beaches.

Interim Milestones:

- By 2007, the Great Lakes Sea Grant Network will have an education and outreach program in place for K-12, college, the general public, and coastal decision makers.
- By 2008 enforceable city ordinances will be in place which call for the placement of signs regarding the health risk associated with bather shedding, provision of adequate sanitary facilities for bathers, availability and importance of proper boater waste disposal, and prohibition of practices that attract nuisance wildlife to which fines are attached for violations.
- By 2010, a reduction in the number of non-rainfall associated incidents of poor water quality will have decreased by 90-95% (as determined at the local level based on historic levels in bacterial, algal,

and chemical contamination) at all local Great Lakes beaches by remediation of 90-95% of dry weather sources identified by sanitary surveys.

- By 2020 nutrient loading will have decreased as evidenced by a decrease in algal blooms, elimination of the dead zone in Lake Erie, and the use of non-phosphorous containing fertilizers in coastal areas.

A.3. Beach and coastal assessment methods (microbial and physical) are the front lines of defense for determining when influxes of contaminants are most likely to impact human health in the context surface water encounters. The tools available to beach managers and authorities responsible for monitoring these bodies of water need to accurately reflect risk, provide timely notification to the public, and serve as a means of investigating potential contamination sources (both direct and indirect) which will lead to the remediation of these sources.

Long Term Goal: The number of beaches classified as having “good” water quality will comprise 90-95% of all Great Lakes public bathing beaches. At the local level, individual contamination events will occur no more than 5% of available days within a bathing season, the sources of these contamination events will be identified through standardized sanitary surveys, and remediation measures will be in place to address these events.

Interim Milestones:

- By 2005, the BEACH Act will be fully funded to continue routine compliance monitoring of coastal waters.
- By 2006, real-time testing methodologies will be evaluated and trialed at Great Lakes beaches.
- By 2006, all coastal states will have complied with the requirements for public notification as specified under the BEACH Act of 2000.
- By 2006, a standardized sanitary survey form will be drafted.
- By 2007, standardized sanitary surveys will be trialed at select coastal communities.
- By 2009, states will add to their existing water quality monitoring programs, a standardized tool for conducting sanitary surveys which will identify sources of contamination at the local level in those instances when bacterial indicator levels exceed published standards.
- By 2010, regional predictive models will be available using local data and forecasts of water mass movements derived from the Great Lakes Observation System.
- By 2011, real-time test methodologies will supplant existing test methods (which take in excess of 18 hours before results become available) under the BEACH Act of 2000.

B. Protection of drinking water quality is essential, as the Great Lakes serve as the primary source of potable drinking water for millions of U.S. residents. To that end, an authority comprised of Federal, State and municipal entities shall be created to develop and implement source water protection plans.

Long Term Goal: The quality of Great Lakes Basin drinking water from coastal and tributary sources will be protected from chronic and episodic threats of chemical and biological contamination.

Interim Milestones:

- By 2007, amendments to the Safe Drinking Water Act (SDWA) will be adopted to enhance flexibility in how State Revolving Funds may be used for system improvements.
- By 2007, amendments to the SDWA and CWA will be adopted to require development and implementation of Source Water Protection Plans.
- By 2007, amendments to the Bioterrorism Act will be adopted to require security measures be implemented that address resource/facility vulnerabilities.
- By 2010, all States and local municipalities/water supply systems will establish Source Water Protection Plans (“Plans”) that integrate security measures for vulnerable resources/facilities and corresponding emergency response plans.
- By 2015, 50% of water supply system Plans for highly susceptible, threatened or stressed systems will be implemented.
- By 2025, all public and private drinking water systems will have integrated Plans implemented.

III. Recommended Actions

Based on *assessments* that identify pollution sources affecting coastal health in a particular area, there are multiple actions that ‘entities’ can take to *remediate* and *prevent* adverse impacts on near shore waters, as well as *protect* near shore water quality. In order to achieve the desired state, immediate (0-3 years), short term (3-5years), mid-term (5-10 years), and long term (10-20 years), the following two actions are required to achieve a minimum risk to human health within the Great Lakes:

Recommended Action A:

Prevent adverse impacts to coastal health through the control/abatement and remediation of direct and indirect sources of pollution.

The following specific sub-actions, derived from Recommended Action A, are most likely to have the greatest impact on minimizing the risk to human health from contact with the near shore waters of the Great Lakes.

A.1. Control of Direct Pollution Sources

Summary: There currently exist Federal and State statutory or regulatory requirements to address and control the adverse impacts of wet weather overflows including CSOs, SSOs, storm water, beach closings, etc. For a number of reasons, the administration of these programs at the Federal and State levels has not resulted in the full achievement of the goals and requirements of the CWA. For example, as of February 2005, of the 147 CSO communities in the Great Lakes Basin only 77 have completed or are in the process of implementing LTCPs⁸ to achieve the requirements of controlling CSOs. SSOs are prohibited under the CWA yet a large number of communities have chronic SSOs. Excessive storm water is entering the sewerage systems of many communities thereby using needed capacity to convey sewage; sewerage systems are overloaded to the point that communities experience the need to bypass part of their flows around portions of their wastewater treatment plants.⁹ A major impediment to more timely progress on reducing inputs of untreated waste to Great Lakes waters has been lack of funding for the high infrastructure costs typically involved. For example, 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, SSOs¹⁰ and treatment plants at \$13.75 billion.¹¹ The control of direct pollution sources will be facilitated through the following:

- EPA and the States must undertake a thorough review of their ongoing wet weather control programs to identify and correct any deficiencies with the clear objective of creating fully effective programs to insure achieving the requirements of the CWA in a timely manner.
- Congress should appropriate \$7.535 billion in Federal funds as part of a 55-45% Federal-local cost share to raise \$13.70 billion to fund wastewater treatment improvements. 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, such as local land use regulations and best management practices that reduce or eliminate storm water flows into the system, are employed to the greatest extent possible.¹²
 - 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.

- Congress should appropriate \$10 million to the three USEPA Regions to review and upgrade their Great Lakes wet weather programs – including the CSO Control Policy, NPDES permit issuance and enforcement, storm water management, water quality standards, and final rules to fully implement the BEACH Act of 2000 – to insure that issues are addressed comprehensively.
 - The 1994 national CSO Control Policy, for example, established no deadline for final compliance with overflow reduction targets by all municipalities.
 - Further, the “anti-degradation” mandate of the CWA needs Federal guidance to allow States to implement rules prohibiting new hook-ups to wastewater systems that have not controlled wet weather overflows.
- Congress should appropriate \$40 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 to implement anti-degradation rules in relation to sewage system expansions.
 - The focus of this approach is on comprehensive solutions involving construction items, storm water controls, policy revision, strict monitoring and enforceable schedules.
 - Funding and permits for future sewer district expansions will be tied to having a comprehensive well-integrated plan and to ongoing compliance with timelines set out in NPDES permits or other enforceable documents.

Cost: \$13.75 billion over 10 years plus the cost of wet weather control program review.

Benefit: GAP

Best-suited entity(s) to accomplish recommended sub-action: Partnering of Federal and State entities.

A.2. Control of Indirect Pollution Sources

Summary: Identify indirect pollution sources capable of adversely impacting Great Lakes coastal health including, but not limited to, bacterial loading from foreshore beach sand and submerged sediments, avian/animal deposition, algal blooms (can appear during dry weather, but are caused by nutrient loading during wet weather and aquatic invasive species), bather shedding, and untreated onboard boater waste. The identification of sources will be facilitated through:

- Educating communities regarding the ramifications of their actions on the environment and the anthropogenic factors capable of adversely impacting Great Lakes coastal health through public education and/or incentives to reduce impacts of nutrient-loading household and industrial products, attraction of nuisance wildlife, improper discharge of onboard boater waste, and bather shedding.
- Requesting that the Great Lakes Sea Grant Network make this an education/outreach priority for the region and to make it a component of a Great Lakes COSEE through NSF.
- Promulgating and enforcing existing regulations which take action against boaters who discharge waste to the open waters of the Great Lakes.
- Promulgating and enforcing existing regulations regarding the availability of adequate toilet and shower facilities based on projected bather density.

Cost: Depends on indirect pollution sources identified at individual beaches based on annual sanitary surveys (see examples in the Ongoing Efforts Appendix).

Benefit: Remediating contamination sources responsible for dry weather water quality failures will reduce health risks, increase availability/access to Great Lakes recreation, improve the health of the ecosystem, promote sustainable practices, decrease economic loss (millions of dollars are lost each year due to beach closures), and increase commercial benefits.

Best-suited entity(s) to accomplish recommended sub-action: Partnering of Federal, State, academic (Great Lakes Sea Grant Network), tribal, local municipalities and NGOs to conduct public information campaigns will improve sustainable practices and identify potential contamination sources by reaching a wider audience.

A.3. Improved Beach and Coastal Assessment Methods

Summary: Standardize, trial, and implement a risk-based approach¹³ to manage recreational water. The approach should build upon existing water quality monitoring programs and employ the latest technology for microbial assessment and standardized sanitary survey criteria, based on a holistic watershed assessment.

Cost: \$2.0 million annually.

Benefit: A holistic watershed approach to beach management will improve the identification of contamination sources at the local level, encourage remediation of those sources, ensure the protection of public health through a risk-based approach, decrease economic loss, and increase commercial benefits. To attract tourism and improve the economy of municipalities, investments in the development and maintenance of healthy and attractive beach recreational opportunities need to be a part of regional planning. The economic loss to a community from a swim closure day has been estimated to range from \$1,274 to \$37,030/day.¹⁴ Commercial benefits for an individual Great Lake beach projected over the swimming season would range from a low of \$100,000 to over \$3,000,000. For major municipalities, the economic value of beach recreational opportunities is estimated to exceed \$100,000,000 per beach per season. With over 800 beaches in the Great Lakes Basin, healthy beaches can be a major driver of the economy of the Great Lakes.

Best-suited entity(s) to accomplish recommended sub-action: Federal, State, tribal and local municipalities have worked together to standardize the microbial assessment of recreational water and these working groups can also standardize the sanitary inspection process. Once these two tools are in place they can be trialed at the local level, adopted by the Federal government, and implemented at the state and tribal level.

Recommended Action B:

Protect drinking water quality.

Summary: Protection of drinking water quality by public and private water supply systems throughout the Great Lakes Basin must be improved. This action requires a combination of enhanced Federal policy requirements to mandate source water protection, full Federal funding and greater flexibility in how State Revolving Funds may be used to address outdated systems, and integration of plans for source water protection with security measures for vulnerable resources/facilities to reduce chemical contaminant and bioterrorism risks to drinking water supplies. Specific steps include the following:

- Amend the SDWA and CWA to require the development and implementation of Source Water Protection Plans that respond to the needs identified in the State Source Water Assessments.
- Fully-fund the Drinking Water State Revolving Fund (DWSRF) and Clean Water State Revolving Fund (CWSRF) to allow the States and local municipalities greater flexibility in how the funds may be used for water infrastructure improvements, including the implementation of security measures that address resource/facility vulnerabilities identified in emergency response plans for critical infrastructure developed under the Bioterrorism Act's authority.

Cost: GAP

Benefit: GAP

Best-suited entity(s) to accomplish recommended sub-action: Congress to amend national policy and appropriate funds necessary to meet full authorization level of DWSRF. States and local municipalities to implement plans at local level for prioritized systems.

¹ Various levels of body contact experienced by swimmers, water skiers, users of personal watercraft, scuba divers and tribal communities who live along the shore.

² Coastal Health is affected by the overall health of the natural ecosystem addressed in the Great Lakes Collaboration *Habitat/Species* strategy chapter. Coastal Health is also affected by the legacy of industrial pollution

addressed in the *Persistent Bio-accumulative Toxics Reduction and Areas of Concern/Restoration Sediments* strategy chapters.

³ The Persistent Bio-accumulative Toxics team will address fish consumption advisories.

⁴ The Non-Point Source Strategy Team will address rural storm water.

⁵ Elevated pH levels from industrial legacies are closing beaches.

⁶ The Aquatic Invasive Species team will address 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.

⁷ 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."

See Non-point Source chapter for goals and action items related to private septic systems and to minimizing storm water runoff from urban and agricultural areas. See PBT chapter for more on preventing discharges of industrial and pharmaceutical wastes from municipal sewage treatment systems.

⁸ According to the Water Divisions in EPA Regions V and II, there are 129 Great Lakes CSO communities in Region V, 1 in Region III, and 27 in Region II. Sixty of these in Region V, 1 in Region III, and 16 in Region II have completed or are implementing LTCPs.

⁹ Not all wet weather overflows are from CSOs and SSOs. Numerous wastewater treatment plants experience excessive wastewater flows that result in the bypassing of untreated or partially treated wastewater. Such problems contribute excessive pollutants to the Great Lakes Basin and should be controlled by improvements in the sewerage collection system or treatment plant expansion.

¹⁰ Many Great Lakes communities also have 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.

¹¹ 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.

¹² 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*.

¹³ WHO, Annapolis Protocol, USEPA National Beach Guidance and Required Performance Criteria for Grants, June 2002, EPA 823B02004.

¹⁴ 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.