



# Great Lakes Debris

A CONVENING AT SHEDD AQUARIUM — JULY 22, 2011





## EXECUTIVE SUMMARY

Shedd Aquarium's third convening on Great Lakes issues focused on debris, both waterborne and originating on land, that poses a serious threat to the health of the region's beaches, waters and wetlands, and therefore its wildlife and human population. While the problem is often called marine debris — because it was first addressed on ocean coasts — it is also a pressing freshwater issue. Marine debris is defined as any persistent solid material that is manufactured or processed and directly or indirectly discarded, disposed of, or abandoned in the marine environment and the Great Lakes.

Convening participants identified a host of issues associated with Great Lakes debris, then grouped them into nine broad categories and prioritized them for next action steps. Top-tier issues include (1) precisely defining the scope of the problem and giving the problem a name that the public can identify with and rally around; (2) identifying gaps in data; (3) determining the impacts of debris on natural and manmade environments; (4) establishing who has authority over release, cleanup and prevention of debris, and by what regulations; (5) determining who carries out or enforces regulations; (6) standardizing monitoring and data-collecting methods; (7) identifying sources of funding; (8) solving the problem through removal, recycling and rethinking how debris is dealt with; and (9) providing communications to varied audiences, especially educating, involving and inspiring schoolchildren.

Participants also identified current sources of information to utilize. These include results of Adopt-a-Beach and similar organized volunteer data-collecting efforts along coastlines; data from river-monitoring programs; data collected by municipal, state and federal agencies; and debris- or pollution-related complaints or reports filed with local police and fire departments. They then brainstormed a wish list for additional data and for practices, programs and partnerships. High on the list of partners to bring into future discussions were Canadian counterparts, commercial and recreational fishermen, and the U.S. Coast Guard.

This convening began a dialogue toward researching and understanding the aspects and impacts of Great Lakes debris in its many forms. The ultimate goal is to reduce, remove and finally prevent this pollution in the Great Lakes.

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## INTRODUCTION

Marine debris. Lake trash. The flotsam and jetsam of individuals and industrial processes. Call it what you will, it plagues the beaches, waters and wetlands of the Great Lakes and threatens the health of its wildlife and human population. And it was the focus the third convening on Great Lakes issues at Shedd Aquarium, held July 22, 2011.

From the vantage point of the glass-walled conference room in which the convening took place, it was hard to forget that 20 percent of the world's fresh water is in Shedd's — and Chicago's — back yard. The spectacular thunderstorm that punctuated the morning session was a dramatic demonstration of one part of the hydrological cycle and a reminder of the lake's power to move *stuff* around its shoreline.

Shedd Aquarium is committed to engaging communities in protecting the lakes. The convenings on Great Lakes issues invite experts from the conservation, academic, governmental and corporate communities to come together in an impartial setting to share information and ideas, and then problem-solve complex issues, together and in break-out groups tackling specific components. The convenings are incubators for new and creative collaborative plans and actions.

This series of daylong sessions is a pilot program initiated by Shedd and sponsored by the National Oceanic and Atmospheric Administration (NOAA). The Great Lakes debris convening was also sponsored by Alliance for the Great Lakes.

Attending NOAA officials were especially interested in using the issues identified and ideas put forward at this convening to inform the agency's fall meeting to address the problem of Great Lake debris.

All 20 participants represented a wide array of natural resources, conservation, metropolitan and corporate stakeholders: AKT Peerless Environmental & Energy Services (environmental consulting, management and energy services); Aspen Institute (Washington, D.C.); Chicago Park District; Environmental Protection Agency/Great Lakes National Program Office; Euclid Beach (Cleveland, Ohio) Adopt-a-Beach Volunteers; Friends of Sleeping Bear Dunes (Michigan); Great Lakes Commission; Hi-Cone (plastic ring-carrier manufacturer); Michigan Clean Marina Program/Michigan Sea Grant (MSU); NOAA/Marine Debris Program; Ocean Conservancy; Shedd Aquarium; University of Wisconsin-Superior; U.S. Geological Survey/University of Wisconsin-Madison; U.S. Smokeless Tobacco Co.; and West Michigan Shoreline Regional Development Commission.

Also participating were several of the hosts and volunteers for the day from the Alliance for the Great Lakes, NOAA and Shedd Aquarium. The convening was facilitated by Leah Goldman.

In addition to their official capacities, convening participants also revealed themselves to be private stakeholders in the health and well-being of the Great Lakes. They swim, kayak and fish in Lake Michigan, play with their children on the beach, play beach volleyball, bird watch, walk or bike along the shoreline, and take part in beach cleanups and restoration projects on their local Great Lakes shores.

## BACKGROUND INFORMATION

The convening began with three assumptions and corresponding objectives:

- Debris, both waterborne and originating on land, and often called marine debris, is a serious threat to the health of the Great Lakes. The ideas generated will contribute to NOAA's Great Lakes debris strategies.
- A host of issues are swirling around the presence of this debris. These need to be enumerated, categorized and prioritized.
- Debris monitoring is not new. Independent efforts by many groups and agencies need to be identified. Gaps in information need to be pinpointed and actions taken to fill them in.

Sarah Opfer, Great Lakes regional coordinator of the National Oceanic and Atmospheric Administration's Marine Debris Program, presented an overview of marine debris in the Great Lakes. Despite its name, marine debris is also a freshwater issue that encompasses lake litter, one-time runoff events or combined sewage overflows of mingled wastewater and storm water, and the large volume of shoreline garbage, which may or may not make its way into the water.

She defined marine debris as any persistent solid material that is manufactured or processed and directly or indirectly discarded, disposed of, or

abandoned in the marine environment and the Great Lakes. It can enter the water in many ways, either directly from boats, or indirectly by way of streams, waterways, or storm drains.

The most dangerous debris is derelict fishing gear—synthetic nets, lines, traps and other equipment either lost, discarded, or abandoned—that continues to entangle and kill fishes, seals, crabs, sea turtles, seabirds—and and, in the Great Lakes, gulls, geese and other birds. Plastic debris also poses navigation threats, snagging around boat propellers. Nets, sheeting and large pieces of plastic can settle on the bottom, smothering reefs or damaging freshwater habitats. Small loops of plastic can strangle animals, and assorted debris, from clear bags to colorful pellets, can be mistaken for food. Once ingested, the plastic blocks digestive systems, starving everything from sea turtles to baby seabirds. An emerging threat is microplastic debris, bits of broken or biodegraded plastic smaller than 5 mm. While plastic breaks down, it never completely goes away.

It is illegal to dump garbage and other debris anywhere in the Great Lakes, and unlike marine regulations, there are no shoreline or mile limits to that prohibition. Adopt-a-beach and cleanup programs that involve data collection have shown that most Great Lakes debris is food- and smoking-related. Currently, actions to combat the problem include beach cleanups, in-water cleanups and prevention efforts.



## ISSUES

Following the presentation, participants divided into groups of four or five to discuss Great Lakes debris from any and all perspectives and share information. From that, they were instructed to think of as many issues as possible—causes, impacts, data, needs, behavioral change—and write each one on a separate piece of notepaper. Each group presented its issues and posted the notepapers under broad category headings. In the event of duplicate issues among groups, presenters were encouraged to add refinements. The notepapers were recombined under nine final categories—an organizational accomplishment to fit the issues into just nine headings—which were then prioritized by vote.

### FIRST TIER

#### Definition

Starting at square one, the problem needs a name. Participants, depending on their home base and background, referred to the flotsam, jetsam and worse as marine debris, ocean trash, or Great Lakes debris. A descriptive, accurate, yet succinct, term used across the board is essential for communication and public buy-in. “Marine,” while often used as an umbrella term to include all aquatic debris, might not resonate with people in the Great Lakes area. On the other hand, does Great Lakes debris have the status of an ocean issue, and if not, how can it be elevated to that level of concern?

From there, the problem needs to be defined before it can be solved. What constitutes debris? Define the types or classes: smoking-related (cigarette butts), food, plastic, fishing gear (commercial and recreational, derelict and intentionally disposed of), lumber, medical waste, boat and ship garbage, microdebris, other? These come from different sources and will have to be addressed with individual strategies. What is the extent of each one and are there priorities? Most of these debris classes represent solid-waste management issues that require not just cleanup but prevention.

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Participants wondered where to draw the line in defining debris—would it include medical wastes and nonpoint-source pollution? Certainly medical waste is disturbing and threatening to the health of people and wildlife. It overlaps in part with plastic debris. The problem can also be defined or categorized by scale: small-scale localized hotspots that can be remedied by citizen action such as cleanups, and large-scale historic industrial dumping and filling, requiring costly removal. And are there emerging issues?

#### Research

Research is not as well developed for the Great Lakes as it is for the oceans. While not exactly a new frontier, the lakes have not attracted the same spectrum of scientific investigation. The first step might be to identify gaps in data—what don't we know or have?—and then determine research needs and priorities. Each type of debris could generate its own research efforts, very basically involving what's the source, who is responsible and what can be done. Participants brainstormed



specific data needs later in the day (see **GAPS IN INFORMATION**). They also raised the question of whether oceanographic research methods and models could be applied to the Great Lakes. For example, are freshwater processes—currents, tides, waves, nutrient movement, natural filtration, debris movement—the same as those in marine ecosystems? Another huge area for research is wildlife, in the water and on the shore, native and non-native.

### Impacts

This is its own subset of research topics. Areas of concern include the impact of debris on wildlife and habitat. For example, is debris affecting the endangered piping plover pairs that nest at Sleeping Bear Dunes National Lakeshore? What other species are susceptible to or impacted by debris, and which kinds of debris? How much habitat has been lost to Great Lakes debris? What are the other impacts, in terms of the aquatic and lakeshore environment, human health, and the regional economy? A later discussion fleshed out areas for monitoring and research.

## SECOND TIER

### Authority

Participants differentiated authority from management. They defined authority as who is in charge and who is establishing policies, laws, regulations and treaties regarding debris. Confusion, and counterproductive efforts, can arise because authority is divided among local, state and federal agencies. Individuals, corporations and institutions also have authority over the release, cleanup, or prevention of some categories of debris. Finally, four of the five lakes are also bounded by Canada—a partner who must be at the table.



### Management

Participants clarified management as implementation: carrying out policy and enforcing regulations. Again, responsibility is spread, perhaps with gaps and overlaps, across such federal bodies as the Environmental Protection Agency, National Oceanic and Atmospheric Administration, the U.S. Coast Guard; eight states and two Canadian provinces; local governing bodies; and numerous NGOs. Jurisdictions need to be clarified and priorities set, perhaps by location and situation so that the best interests of the Great Lakes are always served. Challenges might best be met with regional strategies employing uniform standards and policies. Everything needs to work toward an agreed-upon end goal, which needs to be set: How clean is clean?

### Data Needs

This is another subset of research. Specific needs are recorded below (see **GAPS IN INFORMATION**). Standardized monitoring and data-collection methods are a must, especially because a wealth of information can be collected by “citizen scientists” during beach cleanups, with more observations, and perhaps records, provided by long-term intensive lake users such as fishermen. Data sharing is also critical.



## THIRD TIER

### Funding

Discovering and evaluating all sources of Great Lakes debris, undoing decades, and even a century and a half, of degradation, and implementing preventive procedures and regulations carries a hefty price tag. Funding—and funders—for each stage will probably vary by issue. One daunting example cited is the prevalence of outdated combined sewer systems that are part of the original infrastructure of many Great Lakes cities, including Chicago. Replacing these systems will be costly, long-term projects for municipalities. How much resources can or should be invested in solving huge problems? Research will have to rely more and more on private funding, while the cost of stemming and remediating the pollution of industrial or commercial debris must fall on the sources.

### Solutions

The Great Lakes debris problem can be attacked from three angles: remove, reuse/recycle, and rethink how we deal with the materials polluting the lakes to prevent debris in the first place.

Debris hot spots need to be identified (by type of debris and by geographic location) so efforts can be focused in those areas. Use and build on existing Areas of Concern and Lakewide Management Plans (LaMPs) to identify the extent of habitat-related marine debris and fill problems. Removal has to target what's in the water, on the beaches and in the sediments. It should also coordinate with or lead to restoration or remediation projects. (In dealing with removal, several occupational challenges have to be accommodated, including funding availability, timing so that crews can be mobilized when there is a problem, communications with maintenance staff, and priority based on a community's or area's immediate need.)

Whether the debris source is individual or industrial, one entity's trash might be another's treasure. Look for beneficial reuse of the debris removed. Economic incentives should be developed to aggressively recycle debris and reuse recycled content in existing or new products that create markets and jobs.

Current prevention strategies target river and sewer inputs—so-called upstream prevention. But regulating the source of debris is not enough. Prevention—and protection—have to become a conscious behavior at all levels and permeate how we do business, from production to consumption to disposal. A specific example is reduction of packaging: Food-related refuse constitutes a high percentage of aquatic debris, and it not only degrades beaches and habitats but also poses lethal threats to wildlife.

These solutions can only be accomplished through partnerships, from grassroots to binational, research to restoration. Take advantage of and reinvigorate the shared sense of pride that Great Lakes citizens in the United States and Canada have in their beautiful and valuable “inland seas.”

## Communications

A name for and definition of Great Lakes debris (“marine debris,” “lake trash”) is square one in any communication, whether it’s a call to action at a beach cleanup, an aquarium exhibit, or a marketing campaign. The need for public education was unanimous. To get attention, communicators have to create prominence for this issue and position it as a national priority. Great Lakes might be tied to the issue of water quality, or public awareness might coalesce around a regional rallying issue such as landfill. Schoolchildren in grades K through 8 (and even through 12) are a primary audience. Develop an education package that integrates with curriculum and fulfills science

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standards. Monitoring, data collecting, or restoration projects are ideal for service learning, and students would be engaged knowing their data would be used or their efforts had tangible results. Public education extends to older students and adults, raising awareness through outreach and volunteer stewardship programs and practical everyday actions such as recycling. It’s crucial that information and programs be available in Spanish. Communications can also be tailored for targeted audiences. Recreational boaters might come onboard over the issue of marine debris damaging motors and spoiling the aquatic experience. Event planners, educators, clergy, scout leaders and others who might oversee or provide premises for helium balloon releases should be informed about balloons’ negative effects on the environment and potentially lethal consequences for wildlife. The issues need compelling stories, but also actions for citizens to take and some metrics or feedback for them on “difference made.”

## BEACH WORDS FROM PARTICIPANTS TO DESCRIBE THE CONVENING PROCESS

**Squeaking sand:** Friction, from blades of marram grass or a bare human foot, creates a high-pitched musical sound on the Great Lakes’ unique dunes sand. The Great Lakes’ problems are unique, too.

**Lake effect:** When conditions are right, the lakes affect weather in a big way. With this group of people, maybe conditions are right to accomplish something big for the lakes.

**Unpredictable:** The issues are entirely separate from ocean issues, scary but promising.

**Expansive:** The Great Lakes are so huge, and so are its issues.

**Ripple:** Ideas are starting to overlap.

**Sunrise:** It’s a beginning.

**Fulgurite:** When lightning hits sand, it fuses the grains into a glass formation called a fulgurite. Like this convening, it creates something out of many pieces.

**Swell:** A rising wave of water, carrying energy forward.



## CURRENT SOURCES OF INFORMATION

With such broad representation, participants were able to list a wide variety of data-collecting efforts already taking place.

### BEACH DATA

The Alliance for the Great Lakes' Adopt-a-Beach program in six states and the Ocean Conservancy's annual International Coastal Cleanup, which includes eight Great Lakes states, are beach-cleaning projects that involve trained volunteers who record data on how many pieces of what kind of debris they collect, along with total weight. NOAA has monitoring protocols by debris material type; it also tracks beach conditions, tallies debris and collects other data. The U.S. EPA monitors water quality and beach conditions. The Great Lakes Commission received Great Lakes Restoration Initiative funds to conduct beach sanitary surveys. The National Park Service also conducts volunteer beach cleanups with an educational component.



### RIVER DATA

River Keepers, American Rivers and other “friends-of-the-river” or watershed groups organize cleanups that generate data. These groups also have monitoring programs.

### OTHER WATER DATA

Metropolitan water reclamation districts keep data on intakes and outfalls. The U.S. Coast Guard monitors ballast discharge and illegal dumping by ships. It conducted “mystery trash” investigations in 2008 and 2010. State Sea Grants have “clean marina” programs.

### GENERAL DEBRIS

State departments of natural resources or environmental quality issue permits, respond to complaints and enforce litter laws. Local police and fire departments field complaints and respond to debris or pollution emergencies.

### PROCESS

Coastal areas have more history in monitoring and data collection. Learn from them which methods work best. Tap into existing data resources and combine them.

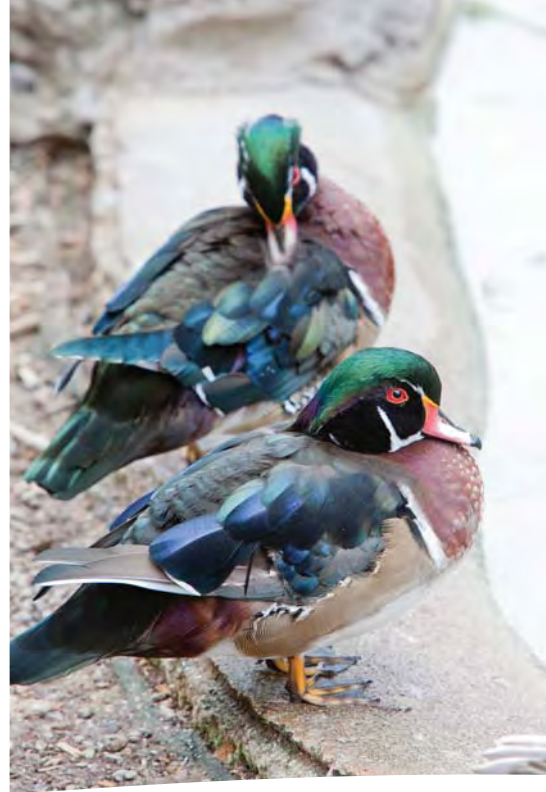


## GAPS IN INFORMATION

This brainstorming session was posed as a wish list for data as well as for practices, programs and partnerships.

### DEBRIS DATA

- Coverage of all lakeshores, including Canada; integrated collaboration with Canada
- Statistically valid baseline monitoring
- Identification of sources, especially major sources, of debris
- Other contributing factors to debris
- Type, location and amount of debris
- Identification of debris accumulation points
- Is it “legacy” debris—from a long time ago, especially from landfills—or recent debris?
- After basic research, track impacts over time
- Debris breakdown time in fresh water vs. ocean salt water; use data already gathered on water quality to find breakdown of products
- Microplastics monitoring: pellets and other products from sources; biodegraded nanoparticles
- Air-quality data that reflect debris
- More information on what data-collection groups do with their data (projects, actions)
- Amount of city/county/state/federal money spent to clean beaches
- Medical waste monitoring
- Debris in the water column and benthos; on-the-water data collection (by volunteer teams)
- Traditional ecological knowledge from local fishermen; anecdotal information
- Data collection during storms: runoff
- Debris beyond beaches, open water, wetlands
- Storm retention-system information; data sharing with solid-waste/stormwater management agencies



- Data collection using municipal park districts’ trash collection mechanisms
- Fishing gear loss: commercial vs. recreational; extent; monofilament line recycling programs
- Debris from cruise ships, containers, barges
- Maps: major debris location sites; historic usage (iron and steel mills, saw mills, coastal landfills, etc.)
- Economic impacts on shore and in lakes

### WILDLIFE AND HUMAN HEALTH DATA

- Connection between food litter, animal waste and beach closings
- Human health pathogens related to solid waste
- Entanglement statistics
- Habitat degradation and loss
- Bird and fish stomach-content data; information from commercial fisheries, both observational and on stomach contents
- Fish/debris interaction data from departments of natural resources/environmental quality
- Persistent organic pollutants monitoring

## PRACTICES

- Standardized data-collection protocols
- Streamlined monitoring/data-collection system
- Clear communications and data sharing
- More widespread information gathering by organizations and agencies
- Coordinated reporting of marine debris, whoever hears about it
- Incorporation of debris data into water-quality monitoring
- Identification of response or point person
- Monitoring associated with prevention efforts
- Monitoring for performance measures/target reaching; evaluation data on longer-term behavior change related to data-collection experiences (especially in K–12 students)

## PROGRAMS

- Involve students K–12 in collecting data as service-learning projects
- Create trained volunteer response teams
- Obtain beach-cleaning information, equipment

## PARTNERSHIPS

- Canada
- Fishing communities (commercial and recreational)
- U.S. Coast Guard, especially to enforce the Act to Prevent Pollution from Ships (APPS)
- Industry: strengthen and expand
- Public schools: involve

## CONCLUSIONS AND NEXT STEPS

This convening began a dialogue toward researching and understanding the aspects and impacts of Great Lakes debris in its many forms. The ultimate goal is to reduce, remove and finally prevent this pollution in the Great Lakes, which poses threats to people, wildlife and ecosystems.

Participants deconstructed the sprawling subject of Great Lakes debris into nine key issues that they then defined and prioritized. By identifying current sources of data, they were then able to compile a long list of gaps in information that can serve as a springboard for new research and programs.

The interdisciplinary nature of the convening helped participants see beyond their own organizations' goals to more, often interconnected, aspects of the issues, giving them new dimensions for shaping their own action plans and solutions. This broader awareness was apparent as each participant created a “pie-in-the-sky” program of five first steps to alleviate some aspect of Great Lakes debris as the day's final exercise.

Sarah Opfer, NOAA's Great Lakes marine debris regional coordinator, had concrete next steps: presenting one or two of the issues defined at the convening at an upcoming NOAA meeting on Great Lakes debris. She planned on involving more people to delve deeper into those issues.

Hawaii, Washington, Oregon and California have implemented marine debris action plans. That's still a far-off goal for the Great Lakes, but participants in this convening identified what they have and what they need to move in that direction.



