

# **Symposium on Ballast Water Management and Aquatic Nuisance Species: Setting a Research Agenda for the Great Lakes**

*April 29, 1999  
Duluth, Minnesota*

## **Symposium Proceedings**

### **Welcome and Opening Remarks**

*Gary Isbell, Chair, Great Lakes Panel on Aquatic Nuisance Species*

Isbell opened the symposium and welcomed the participants. He reviewed the mission, membership and activities of the Great Lakes Panel. The Panel was formed in 1991 pursuant to the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 and is an official committee of the national Aquatic Nuisance Species Task Force. The Panel includes a broad array of stakeholders and provides a Great Lakes regional perspective on aquatic nuisance species (ANS) prevention and control. It organizes its work around the three major themes of prevention, control and abatement of aquatic nuisance species and their impacts. Isbell noted that the Panel has produced a number of useful products for the Great Lakes states and other entities working on ANS issues, including a model state ANS management plan, model legislation for ANS prevention and control, inventories of ANS research and information/education resources and other materials.

The ballast water research symposium is an initiative of the Great Lakes Panel. Isbell suggested that the outcome would be useful at many different levels and would be important in developing strategies to *prevent* new ANS introductions, which, for many people, is the fundamental issue. While it is a difficult issue to address at the state and local level, bodies like the Great Lakes Panel and the national ANS Task Force provide a forum for seeking effective prevention strategies. Thus, in short, the focus of the ballast water symposium is on “closing the door” to new ANS introductions to avoid the need for control and abatement programs.

*Marc Tuchman, U.S. Environmental Protection Agency, Great Lakes National Program Office*

Tuchman provided background on why the agency is supporting and sponsoring the symposium in conjunction with the Great Lakes Panel. The symposium grew out of the Great Lakes National Program Office’s (GLNPO) annual planning meeting to discuss priorities. Invasive species have been identified as a new priority, and when they ask stakeholders how they should address the issue, prevention is emphasized. GLNPO has set aside approximately \$300,000 for ANS work, including a video on invasive species that will be shown on the Discovery Channel in August.

Tuchman noted that a great deal of good work is being done in the area of ballast water, as evidenced in the previous day’s conference presentations. U.S. EPA is interested in determining what the next logical steps should be. Where do we need to go to continue making progress on this issue. Thus, U.S. EPA’s goal is to develop a list of specific recommendations to guide its work on the ballast water issue over the next three to five years. Specifically, the recommendations will help guide funding decisions for U.S. EPA and other agencies and organizations that fund ballast water or ANS-related activities. They also will be used to leverage additional resources for critical priorities. Tuchman thanked the participants for attending and emphasized the value of their input in guiding his agency’s work in the area of ballast water and invasive species.

## **Current Initiatives in Ballast Water Research**

*The Binational United States-Canadian Ballast Water Research Strategy: A Framework for Setting Priorities*

*Michael J. Donahue, Executive Director, Great Lakes Commission*

Donahue thanked Tuchman for supporting the symposium and welcomed the participants. He noted that, beyond the knowledge gained, the symposium would produce concrete results in the form of specific recommendations. The discussions were being recorded and all ideas put forth for enhancing current research or initiating new research on ballast water would be noted and incorporated into draft recommendations. This material will be returned to all participants for further comment, after which the Great Lakes Panel on Aquatic Nuisance Species will finalize the recommendations and aggressively disseminate them to entities that fund, manage, conduct or utilize ballast water research. Donahue noted that the registration packet included a form that participants could use to submit additional input on the two major discussion questions.

Donahue reviewed the objectives for the morning session, which were to review current ballast water research efforts in the context of the Binational United States-Canadian Ballast Water Research Strategy, a copy of which was provided to all registrants in advance. The session builds upon presentations from the conference's ballast water research workshop held the previous day. Donahue provided background on the Great Lakes Panel, which was the first regional aquatic nuisance panel (ANS) formed pursuant to the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990. The Panel has had a long-standing interest and role in the ballast water issue and has identified it as a major priority for ANS prevention and control in the Great Lakes. More specifically, the Panel has approved a ballast water research policy statement that was largely patterned after the Binational United States-Canadian Ballast Water Research Strategy.

Donahue reviewed the Binational Ballast Water Research Strategy, noting that it was an element of the 1996-97 Binational Report on Great Lakes Water Quality submitted in accordance with an annex to the Great Lakes Water Quality Agreement. In March 1998 the Great Lakes Panel endorsed the strategy, which was authored by the Canadian Department of Fisheries and Oceans, Canadian Coast Guard, Transport Canada, and the U.S. Coast Guard. The guidance used in developing the research strategy included research initiatives embodied in the Canadian Great Lakes 2000 Agenda and recommendations from the Marine Board of the U.S. National Academy of Sciences. Under the National Invasive Species Act of 1996, Congress directed that the recommendations of the Marine Board be used to focus on methods, efforts, actions or programs to prevent introductions or control infestations of aquatic nuisance species that minimize adverse impacts to the structure and function of an ecosystem and adverse effects on non-target organisms and ecosystems and emphasize integrated pest management techniques and nonchemical measures. Additionally, the authors relied on past and present efforts and a Great Lakes perspective in developing the document.

The three key provisions of the Binational Research Strategy are to assess the nature of the ballast water threat; ensure that both mandatory and voluntary exchange procedures are safe and effective; and assess and compare leading options for creating a practical control regime. Specific recommendations include reviewing the safety of pump-down exchanges and developing tests and protocols for determining that exchange has taken place; evaluating the threat from NOBOBs; modeling feasible tank retrofitting options; testing the feasibility and effectiveness of heat treatment; and conducting realistic cost comparisons of competing options. The research strategy builds upon and supports other initiatives, such as the ballast demonstration project, studies of biocides sponsored by the Michigan Office of the Great Lakes, and efforts by the Canadian Department of Fisheries and Oceans.

The organizing team for the symposium felt that the research strategy is important because it provides a statement of U.S. and Canadian commitments under the Water Quality Agreement, identifies needs, offers a framework for more specific proposals, and provides a foundation for identifying and addressing other priorities. Thus, Donahue suggested that the binational strategy and the previous day's ballast water research presentations offered an excellent basis for identifying and evaluating ballast water research priorities.

*Perspectives on Current Initiatives and Unmet Needs in Ballast Water Research*  
*Chris Wiley, Department of Fisheries and Oceans Canada*

Wiley noted that in the last five years the research community had come a long way in addressing the ballast water issue and that there is a much higher level of interest in the issue now. He provided an overview of the presentations from the conference's ballast water session.

NOBOB Realities: A significant issue is the realities of NOBOBs, including vessels that may not be well maintained, may have ballast tanks full of mud, or other complicating factors. What is the state of our knowledge of these types of vessels?

Great Lakes Demonstration Project: This significant research effort has examined issues related to mechanical, biological control and the issue of pathogens in ballast water.

Hydrocyclone/UV: This is a new technology that did not exist even nine months ago. While this is state of the art technology from the oil industry, it has not traditionally been applied to a need such as ballast water treatment.

Biocides: The strategy in this area has been on short-term solutions to NOBOBs. The University of Michigan study, sponsored by the Michigan Department of Environmental Quality, is examining glutaraldehyde, and periacetic acids are also being researched as a potentially realistic and cost-effective treatment option.

Secondary treatments: A great deal of discussion centered on potential options for secondary ballast water treatment, which likely will be necessary for most ships entering the Great Lakes. Some options are UV light and electrostatic treatment.

Wiley discussed the three primary focuses of the Binational Research Strategy:

**Ballast water exchange**: After ten years in force, there is still much that is not known about the effects of exchange. Some specific aspects of exchange include:

- Safety of exchange: Safety is a primary concern, including an unmet need to assess the effects of exchange on large ships. The age and condition of vessels need to be considered when assessing factors related to the safety of exchange for different classes of ships. Some specific issues are dynamic stress, metal fatigue, brittle fracture, and steel type.
- Confirmation of exchange: This is a major issue for marine agencies. There is no way of knowing for sure if ships entering the Great Lakes have actually conducted an open-ocean exchange. A real-time technique for confirming exchange is needed for regulators as well as approaches that are scientifically reliable and enforceable. Some research has been done in this area but it remains a major unmet need.
- Flow-through exchange: This approach has been examined outside of North America, including in Australia.
- Costs: The costs of ballast exchange is an important issue. Regulators have viewed it as a short-term approach. Some of the analyses that have been done do not apply to the types of vessels that enter the Great Lakes. This is an important issue from a trade point of view.

**NOBOBs**: This is a major issue for the Great Lakes. Some issues include:

- Risk analysis: Significant questions exist about the risk posed by residual slop and sediment in NOBOBs in introducing and spreading nonindigenous species. Very little research has been done on this issue.
- Operational measures: Little has been done to examine short-term approaches to NOBOBs such as “swish and spit” and partial exchange.
- Heat and shoreside treatment: Aside from some preliminary scoping studies, there has not been any realistic studies examining options for shipborn systems to treat ballast water with heat. Given the nature of the Great Lakes system, there may be chokepoints at which ships could be offered shoreside facilities for treating ballast water. The costs for such facilities could be significant.
- Biocides: Studies are underway to examine glutaraldehyde and periacetic acid. There are political issues surrounding this type of option.

**Other initiatives**: This is a catch-all category to capture other efforts to address ballast water. Support for research efforts from the states of Michigan and Minnesota and forums like this one are valuable and are supported by the regulatory agencies. The agencies would also like to see more involvement on this issue from the International Joint Commission (IJC). Wiley encouraged everyone to attend the IJC’s biennial meeting in September in Milwaukee, which will include a series of meetings on exotic species.

*A Challenge to Symposium Participants: Establishing and Meeting Our Research Priorities*  
Eric Reeves, U.S. Coast Guard (Ret.)

Reeves discussed the origin of the Binational Research Strategy, noting that it emerged from political mandates; legal constraints; differing policies, programs and emphases on both sides of the border; and technical and scientific issues. The purpose of the document is to combine these elements to address specific unmet needs, as Chris Wiley discussed. The strategy is based on ten years of scoping studies and extensive documentation is available to support the strategy’s recommendations. With this background, there was a need for a plan, or strategy, to guide our efforts.

Reeves suggested that strategy is about making choices. Currently ballast water management relies exclusively on exchange. However, ballast exchange is not totally effective and also is not safe under certain conditions for many vessels. These vessels will be around for a long time. We need to address NOBOBs as well, including rational consideration of options for chemical treatment. While there is concern about chemical treatment due to potential environmental effects on the lakes, Reeves noted that we are already dumping tons of chemicals into the lakes to treat for zebra mussels and sea lamprey.

Reeves emphasized the need for sound and credible science that proposes hypotheses that can be clearly proved or disapproved. Research is needed that will provide specific information leading to realistic solutions, including designs, cost estimates, and reasonable timelines. Reeves cited several reports and praised them for providing concrete information on costs, outcomes and applicability to existing vessels and operating conditions. Realistic information related to bulk carriers is particularly important for the Great Lakes. Another critical need is an evaluation of the technical and economic feasibility of retrofitting existing vessels.

Reeves cautioned against illogical conceptions in approaching the ballast water issue. For example, just because we are concerned about the safety of exchange and intend to pursue other, long-term solutions, this does not mean we should not seek ways to improve the safety and effectiveness of the current exchange regime. He suggested that the number of potential options for addressing ballast water may be a detriment to solving the problem. If we are continually searching for the perfect solution, we are not accomplishing anything.

Reeves concluded by noting that the Binational Research Strategy may not be the perfect plan for addressing ballast water. He emphasized the need to *have* a plan, however, and suggested that input from the symposium would contribute to this goal and identify opportunities for improving the strategy.

During follow-up questions to the presentations the following issues/points were raised:

- Technologies that appear promising need to be scaled up before you can determine what significant problems may arise with their application. Reeves responded that it is important to scale up in a rational way based on some sort of plan. There must be a rational and scientifically respectable methodology for evaluating potential technologies and addressing the most difficult questions related to them.
- Resources should be applied to developing accurate and realistic cost estimates for different technologies. Computer programs can help, but trained auditors familiar with ship designs and operations also have an important role.
- The need for a firm ballast water research strategy or plan was questioned. Policies are creating a need for research on alternatives to ballast water exchange. Research proposals should be judged by key criteria (e.g., effectiveness and environmental soundness), but should not be further constrained by an overall strategy or plan.
- A mechanism or process is needed for exchanging information on ballast water research, technologies and costs so that entities in different parts of the world can learn from each other and avoid duplicating efforts. There are players in this field besides the U.S. and Canada and someone needs to facilitate communication and interaction among all relevant parties.

### **Setting the Agenda: Ballast Water Research Priorities for the Great Lakes**

Donahue introduced the session and explained that he would use a modified nominal group technique to generate information on the two key questions being posed at the symposium. Attendees were invited to make brief remarks in response to the questions, which were recorded on flipcharts. Following the symposium, a series of draft recommendations would be prepared and distributed to all attendees, who would be asked to both add to and prioritize them. This in turn would be developed into a final ballast water research agenda. The first question posed to the group was:

*What specific priorities for Great Lakes-related ballast water research should be pursued in the context of the Binational United States-Canadian Ballast Water Research Strategy?*

Donahue noted that these priorities did not have to be among those in the Binational Strategy or even necessarily consistent with the strategy. Rather, he invited any priorities that could build upon the strategy.

- Criteria are needed that Great Lakes-related ballast water research would need to meet. This could include universal criteria that all research should meet, as well as criteria specific to the ballast water issue, such as environmental soundness, effectiveness, costs, etc. This would avoid the need to pick “winners and losers” among specific technologies, but, rather, develop some standards that all research in the field would be expected to meet.
- Standards regarding economic costs need to be developed now, with some agreement on how these will be evaluated and distributed.
- Ports, in particular, are concerned about the lack of information and data related to the risk of pathogen introductions from ballast water. More and better information is needed on this issue.
- Information is needed on facility requirements for shore-side treatment (e.g., treatment capacity needs) and the level of usage from vessels.
- New technologies should be given a chance.
- Early “buy-in,” on binational and international level, regarding criteria is needed.
- Focus on the design of new ships (versus retrofitting of existing ships) and set a target date after which all new ships will incorporate designs and technologies that will prevent new introductions.
- Developing criteria other than salinity is important.
- A policy study on existing programs and initiatives is needed to ensure awareness of and needed connections between current efforts.

- Examine U.S. EPA's implementation of the Clean Water Act and the lessons learned from its success in controlling point sources of pollution through technology-based solutions, and the role played by government subsidies.
- Examine trade impacts for various commodities and regions based on ship types and costs.
- A survey is needed to assess the capacity and characteristics of existing on-shore treatment facilities.
- Recognize and address the potential need for different technologies for different types of vessels.
- Hull fouling should be recognized and addressed as an important vector of ANS introductions.
- Total decontamination of ships' ballast tanks must be an immediate goal.
- Pursue and exploit partnerships with high-tech industries to develop solutions to the ballast water problem.
- Immunological testing methods for ballast water are needed to determine the effectiveness of treatment technologies.
- The development of standards should be left to the American Society for Testing and Materials, which has a subcommittee examining this issue and will ensure input from all appropriate stakeholders.
- There are limited legal authorities to require structural changes to ships, but strong authorities to require treatment of discharges. Thus, on-shore treatment is a preferred approach from a legal/regulatory perspective.
- Examine the threat posed by salt water species.
- Research is needed on tools and systems for determining that shipboard treatment has been done; systems for ensuring accountability for effective treatment.
- A system of accountability should ensure that "bad actors" are unable to get away with not treating ballast water and will be held liable. Such accountability will help increase interest among ship owners in ensuring effective treatment of ballast water.
- Examine the costs to the shipping industry if all ships had to stop at a certain point for ballast water treatment.
- Consider establishing a facility, possibly in conjunction with a common treatment facility, for conducting appropriate tests of ballast water.
- Examine and take into account the external costs of ANS invasions to the public and specific groups.
- Focus funding on viable ballast water management solutions and but also encourage funding of basic research.
- Develop effective methods for conducting sampling of ballast water.
- Ensure the effective dissemination of information on the ballast water issue, including use of the Internet.
- It is important from a public accountability standpoint to ensure an effective assessment of human health risks from ballast water.

Donahue next invited brief comments, perspectives and recommendations on the second discussion question:

*How can research, policymaking and funding be better coordinated to strengthen the collective management effort and hasten development and application of cost-effective and environmentally sound ballast water practices?*

- If our goal is to protect the ecological integrity of the Great Lakes as a natural resource, then we must recognize that the Great Lakes are part of a bigger system; that they are both a source of ANS invasions to other regions and a recipient of invasions from those regions. Ultimately, no ecosystem can effectively protect itself by focusing only on itself. We must be concerned about not just what is entering our own ecosystem, but what is being introduced to other ecosystems with which we are connected.
- Many questions and outstanding issues remain to be addressed before we can begin putting technologies on ships. To avoid disillusion within the shipping community, we should avoid implementing solutions until we are fully aware of their costs, environmental impacts and other issues.

- Avoid inflexibility when formalizing a ballast water research agenda that might inhibit a dynamic research and development process.
- Incorporate regional ballast water plans with broader efforts and ensure effective communication and coordination among initiatives underway in different parts of the country.
- Examine social science literature to seek lessons from past efforts to address a challenge like ballast water.
- Meetings/symposia on ballast water are important to coordinate and share information on research and management efforts. Perhaps an annual meeting should be held to convene the community working on the issue.
- Establish an email list serve on ballast water to facilitate interaction and communication among people working or interested in the issue.
- Continued pressure on federal, state and binational agencies to promote action is important for facilitating funding and high-level action on the ballast water issue.
- A strong and specific statement of goal from the executive level is needed to help organize our efforts in the area of aquatic nuisance species. This can provide a benchmark against which solutions can be compared and evaluated.
- It will be important to have formal buy-in to the ballast water research strategy by the U.S. and Canadian governments to ensure proper connection between funding and policymaking.
- Share research results and related information and initiatives from the Great Lakes with regions that are not as advanced on the issue.
- Build relationships with the shipping industry and ensure that structures and organizations developed to address the ballast water issue allow for agencies to work together with the shipping industry.
- The Great Lakes region, and the U.S. and Canada generally, should participate as much as possible in the International Maritime Organization's (IMO) policy work on ballast water management. The IMO can also be a repository for ballast water research being conducted around the world and a mechanism for communicating research findings with the maritime/shipping community. This will also help prevent duplication of effort.
- The ballast water management research strategy must be addressed on politicians' agenda to ensure that funding is provided for its implementation. The ballast water issue needs political champions.
- Broadly publicize the research strategy beyond government to other entities—foundations, industry, maritime associations, etc.—that are involved in research and other efforts related to ballast water.
- The national ANS Task Force and the regional ANS panels have been valuable mechanisms for coordinating a balanced response to the ANS issue. What is needed now are regional ANS Panels for the East Coast and the Gulf of Mexico.
- Seek opportunities to stop talking about solutions and start building them.
- Maintain and strengthen interaction/partnerships between public and private (shipping) entities.
- Work with the shipping industry outside of the Great Lakes and encourage them to “come to the table” and seek solutions to the problem of ANS introductions from ballast water. Avoid disproportionate costs to the Great Lakes shipping industry that are not shared by other regions of the country.

### **Assessing Ballast Water Research Needs: Perspectives from the Research Community**

Following lunch Donahue introduced the afternoon portion of the symposium, which was composed of two panels of experts who were invited to provide perspectives from the “research” and “user” communities. The speakers would be addressing “the bottom line” of how to prioritize ballast water research needs and how to facilitate funding, policies and other resources to address those priorities. Donahue introduced the moderator for the first panel, Gary Isbell from the Ohio Department of Natural Resources and chair of the Great Lakes Panel on Aquatic Nuisance Species.

Isbell noted that the purpose of the panel was to identify gaps and unmet needs in the area of ballast water research that can provide effective and practicable solutions for preventing ANS introductions via ballast water. After hearing about so many different research efforts the previous day, he suggested that it would be

useful to focus on areas with particular promise. Isbell introduced the two panelists and indicated that questions, comments and discussion would follow their remarks.

*Michael G. Parsons, Department of Naval Architecture and Marine Engineering, University of Michigan*

Parsons noted that the panel was somewhat narrow, since he and Allegra Cangelosi had worked together for several years on the ballast water demonstration project. He reviewed his professional background and indicated that he first confronted aquatic nuisance species as director of the Michigan Sea Grant Program in the early 1990s when the zebra mussel, ruffe and spiny water flea were first entering the Great Lakes. He was on the National Research Council's Task Force on Ships Ballast Water Operations that conducted one of the first scoping studies that suggested technologies to be explored. He has worked with the Ballast Technology Demonstration Project since its inception and is the co-principle investigator on the glutaraldehyde project.

Parsons reviewed some key needs based on his experience and what he had heard at the ANS conference.

Establishing standards of acceptability: From an engineering perspective, this often involves weighing risk against costs. You must understand what the risks and costs are and then society must make a judgement about where to draw the line.

Ballast water exchange: A number of questions remain about both flow-through and full exchange that need to be answered, including improving safety, effectiveness and costs. He noted that ballast exchange puts ships through a stress cycle that was not accounted for in the design process. The American Bureau of Shipping is beginning to address ballast exchange in establishing standards for ship design, but safety remains a paramount issue.

Improved methods for measurement, accountability and compliance: Salinity is not an adequate measure of compliance and the Coast Guard and other agencies need mechanisms for evaluating compliance with and the effectiveness of ballast water regulations.

Pathogens: The presence of fish pathogens in ballast water is just important in the Great Lakes as human pathogens. A risk assessment is needed on this issue and improved knowledge generally. Better information is needed so that intelligent decisions can be made about policies and engineering to address the issue.

Glutaraldehyde: The science portion of this effort is well funded but there is a need for a ship-board demonstration.

Filtration: There continue to be issues surrounding scaling, pricing and systems application on vessels.

Secondary treatments: There are many technical options potentially available, but scaling is a significant problem. People need to understand issues such as flow, ship sizes and the footprint available for equipment.

Modal elasticity: This is a sensitive area for the transportation business in the Great Lakes, where everyone is operating very close to the margins. If we push too hard on the shipping community, we may find that there will no longer be ships in Duluth Harbor. Pennies per ton can shift cargoes to different transportation modes. Policies should consider where the "push points" are and what will trigger modal shifts for transporting cargo. He also noted that some modal shifts may have negative environmental impacts in other areas, such as increased air pollution from relying on trains versus ships.

Flags of convenience: Most ships operate under flags of convenience for purposes of cost and convenience. Officers and crews may come from many different countries. This situation will affect the ability of crews to operate and maintain sophisticated treatment systems. We must develop solutions that work with real people on real vessels under real conditions.

Shoreside treatment: This may be a feasible treatment option for certain types of ships with certain operating patterns. This will also require changes to ships, as most currently do not have shoreside connections to their ballast systems.

Cost analyses: Analyses of time-value of money, capital costs, operating costs, pay-back period and related issues are needed.

Information exchange/clearinghouse: Be careful with grey literature, which does not have to go through the same peer review, quality control process required for material published in established scientific journals. Beyond the issue of quality control, established journals are searchable and readily available in libraries, while grey literature can be difficult to track down. Entities sponsoring research should require that results be published in established journals. Web publishing is easy, but it isn't reliable and does not involve a peer review process.

Neutral brokers: Universities and governments labs usually do not have a stake in a particular technology and can provide a neutral broker in evaluating costs and effectiveness and comparing competing technologies. They are an important resource that should be exploited.

*Allegra Cangelosi, Northeast Midwest Institute*

Cangelosi suggested that the symposium attendees could contribute to the ballast water research process by promoting development of criteria to help agencies screen proposals that are less attached to particular technologies and more attached to quality control/quality assurance considerations. Some potential criteria include:

- Does a prospective project build on existing work? Has a literature/project survey been done to confirm that the project represents an unmet need?
- Does the project show promise in terms of biological effectiveness? In some cases answering this question is the primary purpose of the research. Researchers would benefit from a standard, agreed-upon assay or protocol for screening biological effectiveness. An effective protocol may differ for the Great Lakes than for other parts of the country, however.
- Is a proposed technology feasible in terms of operational effectiveness? Marine engineers/architects should be able to come up with a short list of issues that must be considered if a technology is to be operationally effective, including crew safety, maintenance needs, bypass problems, accountability, flow rates, etc.
- Does the project involve a partnership between a resource management agency and shipping entity?
- Does the project examine environmental impacts? This will help evaluate tradeoffs. There may be Great Lakes-specific issues to address, such as contaminated sediments in ballast tanks, fishery impacts, drinking water impacts, etc.
- Can the technology be monitored to ensure accountability?
- Does the project involve sufficient scientific rigor? A peer review process is important.
- Does the project seek to document costs? However, Cangelosi stated that this should not be a screen that excludes technologies if they involve excessive costs to the shipping industry. There may be ways that costs can be shared, and, conversely, partial solutions may involve external costs to society. Ultimately, it is best to consider all costs to society, seek the best solution and then consider ways to finance it that avoid shutting down specific industries.

Cangelosi noted that the need for a risk assessment for pathogens represents a coincidence in interests between the shipping industry and resource management agencies.

Cangelosi closed by urging stakeholders, when discussing costs, to avoid sounding more authoritative than is warranted or making too many judgements early on. There may be opportunities for efficiencies and costs can vary significantly depending on the scenario involved. Also, the question of who will pay is separate from the issue of how much it costs. We ultimately need to consider costs in relation to how much we stand to lose as a society if we do nothing and, as a society, we can be creative about finding ways to offset costs.

Following the panelists' presentations, Isbell invited comments, questions and discussion from the audience.

What about barges operating on the Mississippi River and entering the Great Lakes via the Illinois River? Coast Guard representatives in the audience responded that they are not covered by current ballast water regulations. Cangelosi noted that this raised a good point by emphasizing that there are more "doors" to the Great Lakes than just the St. Lawrence River. Thus, what happens in New Orleans matters to the Great Lakes. Ballast management needs to happen on all coasts.

When will standards of acceptability be developed? Cangelosi responded that her point related to quality standards for research, rather than standards concerning technologies to pursue.

Do we need specific standards concerning effectiveness and when will we get to that stage? Cangelosi stated that she anticipated research from the Smithsonian Environmental Research Center (SERC) defining exactly what ballast exchange does, and this will help the Coast Guard make a judgement about the desired effectiveness of alternatives. But when you consider that ballast exchange cannot be done on all voyages, it does not look so good. Thus, even if some technologies are not 100 percent effective, they may still be better than exchange since they can be used for NOBOBs and coastal shipping.

It was suggested that we should try to scale up as quickly as we can and understand real costs while also doing the research on fully constructed vehicles. Parsons responded that much can be done in the area of applied engineering.

## **Assessing Ballast Water Research Needs: Perspectives from the User Community**

Donahue introduced the second panel and noted that it included representatives from the "user" community, drawn from government, industry and citizen sectors.

Rick Harkins, Lake Carriers' Association, served as moderator for the session. Harkins began by noting that the Lake Carriers' Association is concerned about all environmental issues related to shipping in the Great Lakes and is committed to preventing new ANS introductions. The lake carriers are not the source of the problem, but will be the vehicle by which they are distributed within the Great Lakes. He suggested that, on the marine side, we need to develop a set of tools that we can draw from to address different types of ships in different situations. With that in mind, he introduced the panelists.

*Gary Isbell, Ohio Department of Natural Resources*

Isbell noted that he would not try to identify research needs, but rather provide a perspective from a government, or constituent-based perspective. He addressed unmet needs in three areas:

Research support and cooperation: There appears to be a need for facilities that can allow research to scale up. Government agencies may have resources that can assist in this area. Fisher hatcheries, for example, may provide the type of infrastructure needed for large-scale testing. Shoreside strategies will certainly require cooperation from government agencies. Agencies also have capacity in the areas of sampling, testing and analysis.

Research funding and advocacy: It is clear that a much higher level of resources will be needed to solve the problem of ballast water. A groundswell of support from the public will be needed to generate the resources needed. It is important that constituent groups fully understand the problem and the role they can play as advocates. Grassroots support is critical and will be more effective than advocacy from researchers.

Communication and demonstration: People who are not directly involved in ANS-related research need to know that it is effective, that we are making progress and that there is accountability for the research dollars

being spent. Efforts in the area of ballast water research are not being communicated in an effective way to the people who actually use the resource. We need mechanisms for communicating progress as well as the risks from not addressing the ballast water problem. The lay public need information that can help them visualize the situation. Making some of the research more tangible and visible would help a great deal with advocacy efforts.

In short, Isbell suggested that the major unmet need was funding, and that the broad community needed to figure out how to make that happen. It's unlikely to come from a top-down mandate, but from a groundswell of grassroots support.

*Edward Michael, Great Lakes United*

Michael noted that he did not have a technical background, but would try to represent the environmentalists' concerns on the ANS and ballast water issue. The environmental community considers the control of exotic species to be one of the most serious challenges to our society's efforts to preserve its natural heritage. In terms of research priorities, environmentalists are predisposed against the use of synthetic chemicals and are hopeful that the research community will address an apparent bias in favor of less expensive chemical options. They support greater synthesis of existing research and vigorous and independent peer review research. Human health risk from the chemicals involved are of great interest as well as risks to the broader ecosystem. Realistic environmental risk and cost assessments must be incorporated into all research.

The environmental community is also concerned about our institutional capacity to effectively manage research strategies. This must include clarification of the roles and responsibilities of government agencies and private sector partners.

Downstream impacts from proposed solutions must be examined and understood along with issues such as systemic stress, cascade effects and other theoretical concepts.

*Ray Skelton, Environmental and Governmental Affairs Officer, Seaway Port Authority of Duluth*

Skelton noted that many of the things recommended are both impractical and potentially dangerous. The safety of the ship and crew must be the foremost concern. He expressed concern about the uncertainty surrounding potential costs for implementing solutions. He noted that not only are there environmental impacts from invasive species, but also from the diversion of cargo to other transportation modes. Increasing shipping costs can make American goods less competitive with foreign goods and even risk significant damage to regional economies, such as the Duluth area. We need to be very careful about the economic impacts due to costs to shipping.

Shoreside treatment may be feasible in certain situations. However, these are the exception rather than the rule. Also, existing vessels do not have the capability to pump ballast water over the deck to a shoreside facility and would thus have to be retrofitted. Thus, we need to be very careful in considering this option.

Harkins invited comments and discussion from the audience.

In regard to the issue of chemical control options and other environmental issues, it was noted that the introduction of an exotic species is a permanent change to the ecosystem that cannot be reversed. Chemicals degrade and go away, while exotic species are a permanent change. The two are not equivalent.

## **Wrap Up and Closing Remarks**

*Summary statement on Great Lakes ballast water research needs and the next steps we need to take.  
Michael J. Donahue, Executive Director, Great Lakes Commission*

Donahue reviewed the symposium program and highlighted the major themes presented. He noted that the results of the facilitated discussion have been faithfully recorded on newsprint and on audio tape for future reference. He explained that the symposium was just the beginning for the process of establishing a ballast water research agenda for the Great Lakes. Commission staff will assemble and summarize the ideas presented at the symposium and provide the attendees with this material and invite further comments as well as a general ranking of priorities. This material will be presented to the Great Lakes Panel on Aquatic Nuisance Species for formulation into a policy statement to be formally adopted by the Panel and presented to the national ANS Task Force and others who fund, conduct, manage or utilize ANS-related research and, in particular, research related to ballast water. The document will provide a voice of consensus from the Great Lakes region on priorities and unmet needs in the area of ballast water research. Donahue also noted that the symposium provided an opportunity to make informal connections among different regions of the country and he suggested that there is much we can learn from one another. Information exchange and clearinghouse needs are clearly a major issue and Panel support staff at the Great Lakes Commission will be sensitive to this as it develops and disseminates the ballast water research agenda.

*Closing Remarks*

*Marc Tuchman, U.S. Environmental Protection Agency, Great Lakes National Program Office*

Tuchman stated that the symposium was a very productive exercise, particularly for those who are relatively new to the issue. He looked forward to further developing and refining the input provided and putting it to use in helping to guide research efforts on the ballast water issue. He thanked everyone for participating and recognized the Great Lakes Commission for coordinating the event.

*Gary Isbell, Chair, Great Lakes Panel on Aquatic Nuisance Species*

Isbell thanked the speakers for taking the time to participate in the symposium and the Commission staff for putting on the event. Finally, he recognized the staff from Minnesota Sea Grant Program for doing an excellent job in putting on the ANS conference and making space for the ballast water symposium. He looked forward to working on the issue further within the Great Lakes Panel and urged the symposium participants to continue participating in the process of forming a ballast water research agenda.

Ballast Water Management and Aquatic Nuisance Species:  
Setting a Research Agenda for the Great Lakes

April 29, 1999  
Duluth, MN

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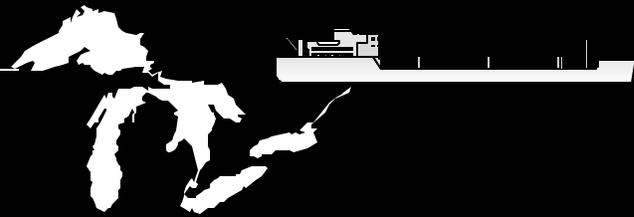
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# Symposium on Ballast Water Management and Aquatic Nuisance Species

## Setting a Research Agenda for the Great Lakes



## AGENDA

Thursday, April 29, 1999 C Split Rock Room C Duluth Entertainment Convention Center C Duluth, MN

*Sponsored by the Great Lakes Panel on Aquatic Nuisance Species  
and Supported by the U.S. Environmental Protection Agency*

**Note:** *Symposium participants are strongly encouraged to attend the ballast water presentations being offered on Wednesday, April 28 as part of the International Zebra Mussel and Aquatic Nuisance Species Conference. These presentations will provide critical background information for the ballast water research symposium. For conference registration information, call 800-868-8776 or visit the conference website at [www.zebraconf.org/](http://www.zebraconf.org/).*

### 8:30 a.m. Welcome and Opening Remarks

Gary Isbell, Chair, Great Lakes Panel on Aquatic Nuisance Species  
Marc Tuchman, U.S. Environmental Protection Agency, Great Lakes National Program Office

### 8:45 a.m. Current Initiatives in Ballast Water Research

*This session will review current ballast water research efforts in the context of the Binational United States-Canadian Ballast Water Research Strategy, as adopted by the Great Lakes Panel on Aquatic Nuisance Species. Questions for consideration during open discussion of Great Lakes research priorities will also be posed.*

*The Binational United States-Canadian Ballast Water Research Strategy: A Framework for Setting Priorities*

Michael J. Donahue, Executive Director, Great Lakes Commission

*Perspectives on Current Initiatives and Unmet Needs in Ballast Water Research*

Christopher J. Wiley, Department of Fisheries and Oceans, Canada

*A Challenge to Symposium Participants: Establishing and Meeting our Research Priorities*

Eric Reeves, U.S. Coast Guard (Ret.)

### 9:45 a.m. Break

### 10:00 a.m. Setting the Agenda: Ballast Water Research Priorities for the Great Lakes

Moderator: Michael J. Donahue, Executive Director, Great Lakes Commission

*Through facilitated discussion, participants will reflect on the perspectives offered by the previous speakers and identify points of consensus on the following items:*

*C What specific priorities for Great Lakes-related ballast water research should be pursued in the context of the Binational United States-Canadian Ballast Water Research Strategy? (This may include new areas of investigation or increased emphasis on current research.)*

*C How can research, policymaking and funding be better coordinated to strengthen the collective management effort and hasten development and application of cost-effective and environmentally sound ballast water practices?*

### 12:00 Noon Lunch

*Individuals registered for the Zebra Mussel and Aquatic Nuisance Species Conference may attend the luncheon. Special arrangements for those attending only the symposium will be provided.*

**1:00 p.m.      Assessing Ballast Water Research Needs: Perspectives from the Research Community**

*A panel of researchers, all familiar with current research initiatives, will identify gaps and unmet needs for ballast water research that can provide effective and practicable solutions for preventing introductions of nonindigenous aquatic nuisance species into the Great Lakes via ballast water.*

Moderator: Gary Isbell, Chair, Great Lakes Panel on Aquatic Nuisance Species

Michael G. Parsons, Department of Naval Architecture and Marine Engineering, University of Michigan  
Allegra Cangelosi, Northeast Midwest Institute

*Questions, comments and open discussion*

**2:00 p.m.      Assessing Ballast Water Research Needs: Perspectives from the User Community**

*A panel of research “users” drawn from government, industry and citizen sectors will identify gaps and unmet needs in ballast water research, and how research must be applied to advance aquatic nuisance species prevention and control efforts in the Great Lakes.*

Moderator: Rick Harkins, Lake Carriers’ Association

Gary Isbell, Ohio Department of Natural Resources  
Ivan Lantz, Shipping Federation of Canada  
Edward Michael, Great Lakes United

*Questions, comments and open discussion*

**3:00 p.m.      Wrap Up and Closing Remarks**

*Summary statement on Great Lakes ballast water research needs and the next steps we need to take.*  
Michael J. Donahue, Executive Director, Great Lakes Commission

*Closing Remarks*

Marc Tuchman, U.S. Environmental Protection Agency, Great Lakes National Program Office  
Gary Isbell, Chair, Great Lakes Panel on Aquatic Nuisance Species

**3:30 p.m.      Adjourn**



*This symposium is made possible through a grant from the  
U.S. Environmental Protection Agency, Great Lakes National Program Office.*