

**MEETING RECORD FOR THE 132nd MEETING OF THE
GREAT LAKES SCIENCE ADVISORY BOARD
HELD IN CONJUNCTION WITH "SCIENCE AND THE AGREEMENT" WORKSHOP**

February 4 - 6, 2004 – Michigan League, Ann Arbor, Michigan

MEMBERS PRESENT

Michael J. Donahue (United States Co-chair)	Great Lakes Commission, Ann Arbor, MI
William Bowerman	Clemson University, Pendleton, SC
John Braden	University of Illinois, Urbana, IL
David Carpenter	University at Albany, Rensselaer, NY
Milton Clark (by teleconference)	United States Environmental Protection Agency, Chicago, IL
Glen Fox	Canadian Wildlife Service, Ottawa/Hull, ON
Allan Jones	Burlington, ON
Bruce Krushelnicki	Ontario Municipal Board, Toronto, ON
Donna Mergler	University of Quebec, Montreal, PQ
Pierre Payment	University of Quebec, Laval, PQ
Judith Perlinger	Michigan Technological University, Houghton, MI
Joan Rose	Michigan State University, East Lansing, MI
Deborah Swackhamer	University of Minnesota, Minneapolis, MN

MEMBERS ABSENT

Isobel Heathcote (Canadian Co-chair)	University of Guelph, Guelph, ON
Scott Brown	National Water Research Institute, Burlington, ON
Lesbia Smith	Toronto, ON
David Stonehouse	Evergreen, Toronto, ON
Jay Unwin	National Council for Air and Stream Improvement, Kalamazoo, MI

COMMISSIONERS ATTENDING

Herb Gray, Canadian Chair	International Joint Commission, Ottawa, ON
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INVITEES/OBSERVERS

Robert Allen	U.S. CG, Cleveland, OH
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Douglas Alley	International Joint Commission, Windsor, ON
Kay Austin	International Joint Commission, Washington, DC
Al Beeton	Ann Arbor, MI
Lori Boughton	Pennsylvania DEQ, Meadville, PA
Marty Bratzel	International Joint Commission, Windsor, ON
Mark Burrows	International Joint Commission, Windsor, ON
Murray Charlton	NWRI, Burlington, ON
Jan Ciborowski	University of Windsor, Windsor, ON
Joseph DePinto	Limno-Tech Inc., Ann Arbor, MI
John Dettling	Great Lakes Commission, Ann Arbor, MI
John Gannon	International Joint Commission, Windsor, ON
Mike Gardiner	U.S. GS, Cleveland, OH
Roger Gauthier	Great Lakes Commission, Ann Arbor, MI
Gary Gulezian	U.S. EPA, Chicago, IL
Nick Heisler	International Joint Commission, Ottawa, ON
Philip Keillor	Madison, WI
Gail Krantzberg	International Joint Commission, Windsor, ON
Craig Mather	Aurora, ON
John McDonald	International Joint Commission, Windsor, ON
Ann MacKenzie	International Joint Commission, Ottawa, ON
Ann McMillan	Environment Canada, Gatineau, PQ
Jan Miller	U.S. Corps of Engineers, Chicago, IL
John Mills	Environment Canada, Downsview, ON
Lewis Molot	York University, Toronto, ON
Paul Muldoon	Canadian Environmental Law Association, Toronto, ON
John Nevin	International Joint Commission, Ottawa, ON
James Nicholas	U.S. GS, Lansing, MI
Victoria Pebbles	Great Lakes Commission, Ann Arbor, MI
Andrew Piggott	Environment Canada, Burlington, ON
Leah Quiring	Transport Canada, Sarnia, ON
Dave Schwab	NOAA, Ann Arbor, MI
Adel Shalaby	Health Canada, Scarborough, ON
Harvey Shear	Environment Canada, Scarborough, ON
Thomas Skinner	U.S. EPA, Chicago, IL
Rebecca Temmer (intern)	International Joint Commission, Windsor, ON

SECRETARY

Peter Boyer	International Joint Commission, Windsor, ON
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1. Background

The Parties are required to "conduct a comprehensive review of the operation and effectiveness of th[e] Agreement" following release of the Commission's 12th biennial report in 2004. The Commission has committed to issue a special report providing advice to the Parties regarding the review and its role in the review. The Commission instructed its Boards / Council to explore the nature of the advice that it could provide. The lead was assigned to the Water Quality Board, with the Science Advisory Board,

International Air Quality Advisory Board, and the Council of Great Lakes Research Managers contributing in their areas of expertise.

The Science Advisory Board is the scientific advisor to both the Commission and the Water Quality Board. To develop the requested advice, the Science Advisory Board held a workshop, Science and the Great Lakes Water Quality Agreement

2. Workshop Purpose

The purpose of the workshop was to help the Board develop sound and objective advice regarding review of the Agreement from a scientific perspective. The Board's scientific advice will complement advice being developed by the Water Quality Board and others within the Commission family.

3. Workshop Structure

- Review the Agreement purpose and annexes, with appropriate reference to the Articles.
- The adequacy of the Agreement to accommodate present and future stressors that impact Great Lakes water quality.
- Suggest specific areas of the Agreement where, from a scientific perspective, provisions might be added, revised, or deleted.

4. Workshop Questions

In their introductory remarks on February 4, the Science Advisory Board Drs. Donahue and Jones described the scientific focus of the workshop and provide insight into the preamble and the first four articles of the Agreement from a scientific perspective. They stated that the fundamental question is whether the stated purpose of the Agreement necessary and sufficient to meet present and future challenges.

The workshop focused on several themes related to the following other questions:

- What is the present state of the science associated with this element of the Agreement? Is the scientific knowledge implicit in the Agreement necessary and sufficient to achieve the purpose of the Agreement? Why or why not?
- If not, what new or additional scientific information is required?
- What new elements might be considered and what is the state of the science to support them?
- Can the existing Agreement accommodate present and future issues, including but not limited to alien invasive species, habitat, land use, climate change, biodiversity, pathogens, new chemicals, and long-range transport of atmospheric pollutants?

Finally, to conclude the workshop, a panel comprising the Board and Council co-chairs addressed the questions:

- Do current institutional arrangements under the Agreement help or hinder the application of science?
- Are current Great Lakes research institutions organized to deliver science in the 21st century? If not, then what organizational changes would be suggested?
- How can science-policy linkages be strengthened?
- How might a detailed scientific review be undertaken by the Parties?

6. Agenda

The agenda for the meeting was as follows:

Wednesday, February 4

6:00 - 6:30 PM Opening Reception
 6:30 - 8:00 PM Dinner at the Michigan League
 7:00 - 8:30 PM Introduction -- Workshop Purpose, Preamble, Articles I-IV & Annex 1:
 Michael Donahue & Allan Jones

Thursday, February 5

8:30 - 8:45 AM Goals & Objectives for Day 1: Michael Donahue & Allan Jones
 8:45 - 9:30 Nutrients & Non-Point Sources -- Annexes 3 & 13 : Craig Mather & Jan Ciborowski
 9:30 - 10:15 Persistent Toxic Substances -- Annex 12: David Carpenter & Milt Clark

 10:15 - 10:45 Break

 10:45 - 11:30 Dredging & Sediment -- Annexes 7 & 14: Joe de Pinto & Jan Miller
 11:30 - 12:15 PM Groundwater -- Annex 16: Andrew Piggott & Jim Nicholas

 12:15 - 1:30 Lunch

 1:30 - 2:15 Airborne Toxic Substances -- Annex 15: Gary Foley & Ann Macmillan
 2:15 - 3:00 RAPs & LaMPs -- Annex 2: Bill Bowerman & Lori Boughton

 3:00 - 3:30 Break

 3:30 - 4:15 "Coast Guard" Annexes -- Annexes 4-6 & 8-10: Mike Gardiner & Leah Quiring
 4:15 - 5:00 Surveillance, Monitoring & Research -- Annexes 11 & 17;

Deb Swackhamer & Harvey Shear
5:00 - 5:30 Wrap Up
5:30 PM Adjourn

Friday, February 6

8:30 - 8:45 AM Goals & Objectives for Day 2 : Michael Donahue & Allan Jones
8:45 - 10:00 Delivery of Science through the Agreement: Articles VII-XV
Glen Fox & Harvey Shear

10:00-10:30 Break

10:30 - 11:45 Integration & Development of Board Advice for the Commission Panel: Board & Council Co-Chairs
11:45 - 11:55 Observations & Workshop Summary: Plan for Moving Forward Mike Donahue & Allan Jones
11:55 - 12:00 Concluding Remarks: Commission Co-Chairs
12:00 Noon Adjourn

5. Workshop Findings and Conclusions:

The Board will develop a report on the outcome of the workshop under separate cover which will include recommendations for the Commission. Since the workshop was also a regularly scheduled meeting of the Science Advisory Board, a set of meeting notes was adopted by invitees and board members and is attached as reflecting an overview of the meeting.

Attachment 1

Science and the Great Lakes Water Quality Agreement Preliminary Summary of Key Points From Sessions

Session #1 Wednesday Evening - Preamble, Purpose, Articles I-IV, & Annex 1

Question: Is the stated purpose of the Agreement necessary and sufficient to meet present and future challenges?

- Should the Agreement be reviewed? There is broad support for review; review will occur after next IJC biennial report; there is a distinction between review and renegotiation.

- Agreement review is required because of perceived inability of the Agreement to be predictive, strategic, and responsible.
- What should be the approach to the review? Strengths and weaknesses need to be addressed – especially, scope. Is it better to have one omnibus agreement or separate agreements? How can ecological integrity be achieved through an Agreement? Any review must include institutional issues, e.g. implementation mechanisms and accountability.
- The Agreement could spell out reporting, interpretation and accountability -- who is responsible?
- The Agreement should provide specific direction but be flexible.
- The Agreement review should focus on both articles and annexes, to avoid the risk of a disconnected document -- each must support the other.
- Are we doing enough to meet existing obligations in the articles and annexes?
- Given new-found science and complexity, should we change future goals?
- What process should be used to accomplish the review? The review process must be coherent, transparent, participatory, and inclusive.
- Preamble question: Is water quality best achieved by managing the ecosystem or through managing water pollution?
- Article I – there is a need to define terms, e.g. “restoration,” “risk,” “watershed” in order to define, for example targets and goals. The definition of watershed or basin should consider ground water.
- Article II – science based planning and best management to ensure an ecosystem approach needs to be reflected in the purpose.
- Article III – General objectives exclusively focus on Great lakes water being “free from” effects of human activities. What additional objectives are needed to support restoration?
- Article IV – in order to keep the Agreement vital and timely, new objectives need to be process based rather than state or target based, while encompassing targets related to integrity goals. If Agreement is process based rather than target based, then how do we reconcile with the present regulatory framework?
- Targets serve a useful accountability function, but we need to understand processes so that targets can be set and adjusted as required.
- Need consistent processes to set targets, e.g. ozone, fish consumption advisories.
- Annex 1 -- refer to previous SAB advice in 1999-2001 priorities report.
- The old agreement can be improved; however chemical contamination is still an important issue.
- A water quality and a water quantity Agreement?
- Invasive species aren't just aquatic – cutting trees because of emerald ash borer also impinges on water quality. Also, some invasive species, such as salmon are perceived by resource managers and the public as desirable.
- What scope is necessary to drive action and influence management? Should human health be more explicitly addressed?
- The objectives call for risk management, which is beyond risk assessment and communication.
- The Agreement needs to be an enabling document that is not restrictive or inflexible. It is one instrument of many, e.g. CEC, Migratory Birds, Fishery Convention, Biodiversity, Kyoto, Great Lakes Charter, Annex 2001. Should the Agreement be the enabling document to deal with issues, or just one thread of many? One tool or an umbrella?
- Role of science -- can science define the problem / explain why problems exist? Can science define the solution and how to achieve it?
- Is there any scientific evidence to indicate that inadequacies with the current agreement prevented appropriate action taking place? Answer: No.
- Is the science / our knowledge sufficient to know how the ecosystem functions?
- Earlier narrow approaches, e.g. P control and target loads have evolved to a broader scope and better understanding of how the natural system operates. Conclusion: Science has outgrown the Agreement. There are two scientific approaches being used – numerical objectives to support planning activities/management goals and process oriented understanding related to how the system works in order to achieve that objective. The development and use of scientific knowledge that links both approaches may need to be recognized more explicitly.

- Our understanding of stresses impacting the Great Lakes has expanded, as has the range of stresses, as well as how stresses interact. The perception of risk changes with time, as knowledge changes.
- The Agreement addresses components but not ecosystem aspects such as pathways and relationships.
- Current water science is based on the watershed, air/water/land interface, and hydrologic cycle. The linkage of water quantity and quality issues extends the need for basin management into the tributaries.
- A process based approach is an opportunity to move beyond simply listing a stressor such as climate change, to one of providing much greater clarity by indicating that the goal is to "understand the effects of climate change by developing a regional atmospheric circulation model to be coupled to dynamic global models".

Session #2 Thursday - Agreement Annexes 2-17

Questions: (1) What is the present state of the science associated with this element of the Agreement? Is the scientific knowledge implicit in the Agreement necessary and sufficient to achieve the purpose of the Agreement? Why, or why not? (2) If not, what new or additional scientific knowledge is required? (3) What new elements might be required and what is the state of the science to support them?

Annex 2

- a process annex, needs a linkage to Annex 14 – contaminated sediment
- need to improve implementation and linkage between basic and applied science, especially sampling and monitoring plans
- RAPs linkage to LAMPs and ecosystem approach needs more clarity
- Define geographic extent of AOCs.
- What is the purpose of a LaMP -- a management tool? LaMPs do not look like what the Agreement called for in 1987 -- do we stay with critical pollutants or adopt a broader ecosystem perspective?
- Add -- area of recovery?
- RAPs / LaMPs -- a "magnet" for environmental activism.
- Is the goal ecosystem management or water quality management through pollution control and remediation?
- The concept and the list of beneficial use impairments satisfactory (but is the list sufficient?) but, as worded, are vague goals -- definitions could be improved.
- There is no universal interpretation / meaning / understanding of a BUI.
- Do BUIs reflect the Agreement purpose, however defined?
- Define delisting criteria. Flexibility to establish targets locally?
- Addressing social and economic aspects could support implementation by identifying benefits and opportunities for public and private investments and partnerships -- ecological economics.

Annex 3 & 13

- It is not essential to amend these annexes unless it will help drive action and implementation.
- Sustainability of current practices e.g. storm water pond cleaning, a future issue
- Climate change will bring a new hydrological regime that will affect the Agreement however it is not addressed in Annex 13.
- A broader understanding of the L. Erie basin is needed, e.g. a P budget for L. Erie that accommodates both total and reactive P would support predictive efforts and could be based on current scientific capabilities and move management well beyond the modest and limited goals of P control. This point could be broadened -- what we lack is an understanding of the current

science (and its complexity) behind the issues, e.g. the processing of phosphorus and other trends and conditions in Lake Erie, and how to link and model. We need to be process oriented rather than reactive.

- The targets need to be revisited based on current science, and Annex 13 is a grab-bag that needs to be more quantitative
- The impact of urbanization on groundwater not reflected in Annex 13
- Implementation and assessment of BMPs by lake basin would enable review and evaluation to occur, and additional measures adopted. The science is sufficient that we know what has to be done. There is a knowledge gap with regard to how well remedial measures work, and no budget to fill that gap.
- Non point problems may need greater emphasis – in urban areas drainage and runoff from tributaries has greater impact than sewage discharges since it affects the nearshore whereas some STPs discharge out into the lake.
- Because current monitoring and loading estimates do not account for significant weather events, the impact of CSOs and storm water runoff is under estimated on the lakes.

Annexes 7 & 14

- Almost everything that is known scientifically about contaminated sediment has been discovered since the Agreement was written. The provisions and implementation of this Annex 14 are very outdated. e.g., rather than chemical based, site assessment could be risk based, both human and ecological, recognizing bioavailability, depth of contaminants and external processes such as benthic mixing, and the probabilities of storm surge events and river flood events that would cause a redistribution of exposed contaminated sediments or breaching of capped sediments in place. Such probabilities are likely to change as the climate changes. Risk-based can mean either risk assessment or risk management. It should mean risk management which requires a strong commitment to monitoring and undertaking corrective action. The source needs to be connected to its impact, and the pathways ranked based on site specific models. Post project monitoring to ensure recovery needs to be included.
- The concept of natural recovery needs to be quantified
- There needs to be more research directed on alternative remediation technologies such as enhanced bioremediation and enhanced capping with sorbent amendments, as well as combination technologies.
- Annex 7 basically fulfilled / completed.
- Relate beneficial uses to contaminated sediment and BUIs to contaminated sediment targets -- how clean is clean? We can do exposure assessment, but we need effects assessment for contaminated sediment.

Annex 12

- Contaminant levels are declining, however scientific understanding of the hazards is increasing. (1) there is a greater public health threat today as a result – in 1978 endocrine disruptors, neurological impacts and the role of pollutants in environmentally induced diseases were not well understood (2) Human health impact from inhalation of air borne pollutants could be very significant (3) contaminant levels are generally perceived to be plateauing as a result of reservoirs, probably sediments, as well as air sources. Prioritization based on risk needs to guide action and implementation in order to protect human health Although the critical issues related to PTSs are well understood, science moves rapidly forward and the Agreement needs updating to be current.
- The Agreement has adequacy with respect to the basin, it doesn't address major pathways from a global or ecosystem perspective, or provide any linkage to other international agreements. This could be a hard row politically.
- Fish PCB levels in open water are over 20X higher than they should be for protection of human health. Great Lakes human exposure is greater than Chesapeake Bay and the Everglades

combined, however if the focus of virtual elimination and zero discharge is reduced in a revised Agreement, the solution will remain a very long term challenge for many future generations.

- Is virtual elimination a realistic goal? The solution must be globalized, not limited to the Great Lakes. Keep as a principle.

Annex 15

- This annex is the most prescriptive in the Agreement and has been very successful in generating scientific understanding of the role of the air pathway. Source-receptor models have enabled atmospheric scientists to understand continental scale processes and loadings.
- Gaps exist such as in understanding the impact of air deposition in land runoff, predicting levels in fish based on load estimates and in developing nested regional, national and global multi media models. Other gaps -- chemical transformation and in-water dynamics.
- Focus on long range transport overlooks local air factors and confounds priority setting processes.
- Annex 15 successful because it is well defined and self contained, however needs greater integration with water quality management.
- A policy obstacle -- the Great Lakes are a source of pollutants to the atmosphere.
- An obstacle for policy setting and action -- relative [and absolute] loadings of contaminants via various pathways, including air, ground water, sediment [both a source and a sink].
- Atmospheric PCBs -- point to political problem to get PCBs out of use -- after all these years!

Annex 16

- Groundwater contribution to stream flow can be quite significant --> points out the need for water budgets. Groundwater can be an important pathway for the delivery of non point source pollutants to surface water. Groundwater is vulnerable to hazards – a single bore hole can expose large aquifers to pollution.
- Groundwater hydrology is a mature science, however there is insufficient information for regional management and decision making e.g. a regional perspective is lacking, the linkage of groundwater with the aquatic ecosystem has not been quantified, and the integrated modeling of groundwater and surface runoff and fluxes is needed.
- Monitoring of groundwater is limited in both countries.
- Annex 16 addresses “pollution from” contaminated groundwater, and is not an annex to provide for groundwater management, or pollution prevention activities such as source water protection or land use management.
- Should also address "pollution to."
- Large scale mapping is needed beyond that indicated in Annex 16.
- There is increasing recognition of the potentially severe implications of non point source groundwater contamination. Non point source contaminants, while typically less concentrated and toxic than point source contaminants, have the potential to be so extensive that remediation of the contaminants would be impossible and that large portions of the groundwater resource of the basin could be lost from use as a water supply.
- There is a linkage between groundwater quantity and quality and water supply and in stream conditions that is not reflected in the Agreement. For example, reductions in groundwater discharge due to land use and climate change may impact the low flow characteristics and assimilative capacities of waters receiving waste water discharge. In another example, if non point source contamination becomes sufficiently extensive that the resource becomes unusable, then it is possible that this will result in water quantity concerns and increasing competition for uncontaminated surface and ground water.

Annexes 4-6 & 8-10

- Fold the Coast Guard annexes into one annex with streamlined reporting, and incorporating standards to protect the Great Lakes from international ships discharging ballast.
- Regulatory regime to support these annexes is "mature." The programs in relation to the annexes have been incorporated into the regulatory regime of both countries and are closely coordinated.
- Scientifically the standard for new AIS introductions should be "0", which is not to say that zero organisms should be discharged
- Undertake a study of the costs and benefits of salt water shipping to include the environmental impact of international ships using the seaway.

Annexes 11 & 17

- Monitoring is fundamental to the Agreement. It should always answer a question, i.e. have a purpose, and the questions have to drive the monitoring, in terms of current science the questions are often expressed as models. The development and use of models needs to be integrated into the monitoring commitments of the Agreement. Linking modeling and monitoring could encourage predictive capabilities currently lacking in the Agreement, but attainable using current science.
- Basic, long term monitoring needs to be institutionalized in the Agreement and should include the commitment to continuous quality improvement utilizing best available technology, such as envisaged by an integrated earth observation and monitoring system for the Great Lakes. Such a system would constitute basic essential scientific infrastructure in order to support binational decision making, coordination and cooperation.
- All of the monitoring requirements in the Agreement could be put in one place, and include a provision to report.
- Data are disconnected -- need linkage among various monitoring efforts, e.g. via modelling, interdisciplinary approach.
- Research listed under Annex 17 is a tacked-on laundry list, mostly related to understanding chemical pollutants and needs to be more broadly defined.
- A research strategy is required -- encompass policy, social, economic -- involve managers and policy makers to ensure that the product is responsive. Clearly articulate priorities.
- Annex 17 -- research and science should be connected to drive action. Lay out role of science and research -- why and how they are beneficial to non-scientists.
- Monitoring should be not only the "what" but also -- through science and research -- provide the "why."
- Need post-project monitoring to track effectiveness of actions, to justify funding, commitment to action and investment, to drive / direct adaptive management.

Session #3 Friday AM – Articles VII-XV; Delivery of Science Through the Agreement

Question: Can the existing Agreement accommodate present and future issues, including but not limited to alien invasive species, habitat, land use, climate change, biodiversity, pathogens, new chemicals and long range transport of atmospheric pollutants?

Scope of Agreement:

- multiple dimensions
- ecosystem wide or water quality focus?
- geographic -- AIS, climate change, air ground water.
- science based, including economics and management science.
- health dimension -- fish, ecosystem and human.
- The articles do not preclude addressing future challenges, and adequately embrace all of the existing and foreseeable scientific issues.
- What should the science capacity be? The possibility of the development of a Research Strategy as a binational approach.

- Great Lakes programs are significantly under funded which impinges on the effectiveness of the Agreement giving the mistaken impression that the Agreement is the problem.
- Science needs better linkage to policy and decision making. This could be accomplished by ensuring that the Agreement drives action and obligates progress.
- Public involvement needs greater emphasis, along with education in order to sustain political will.
- Social science needs greater emphasis.
- There are institutional obstacles to involvement of all the orders of government.
- A bottom line -- science has outpaced the Agreement --> reorganize and consolidate.
- Another bottom line -- benchmarks absent --> need indicators but only if there will be measurable, on-the-ground improvement.
- The Agreement does not recognize the significant links between water quantity, water quality and ecosystem health. These links include the important link between urban infrastructure (lake side and harbour side water treatment plants, wastewater treatment plants, industrial plants, power plants, utilities etc.) and the lake level ranges for which infrastructure performance was designed. The facilities upon which millions of Great Lakes basin residents (and residents outside the basin) depend, are vulnerable to lake levels higher and lower than the historic ranges. This omission is a structural weakness in preparation for future battles over Great Lakes diversions.

Session #4 Integration Panel – Institutional Arrangements to Facilitate Science/Policy Linkages

Questions:

1. *Do current institutional arrangements under the Agreement help or hinder the application of science?*
 2. *Are current Great Lakes research institutions organized to deliver science in the 21st century?*
 3. *How can science/policy linkages be undertaken by the Parties?*
 4. *How might a detailed scientific review be undertaken by the Parties?*
- Institutional arrangements do not hinder science, and most often help, however there are opportunities to go further. The question should be how can it be improved? Define programmatic structure needed for the Agreement, then design the science to inform those needs.
 - Great Lakes research institutions are not currently well organized to deliver science under the Agreement in the 21st century, especially research coordination. Example -- LaMPs do not provide integrated science, Lake Erie Millennium Network does. There are opportunities to go further with existing institutional arrangements, e.g. linkage between research / science community and policy, transfer of scientific knowledge to planning and reporting at the local level.
 - Great Lakes science has driven policy, regionally, nationally and internationally.
 - Any review needs to be open, inclusive and science based. Review of the operation and effectiveness of the Agreement should be ongoing and not just at 6 year intervals.
 - Some institutions and organizations are under utilized, eg. Conservation Authorities, SOLEC, BEC, Binational Toxics Strategy.
 - The Great Lakes region has the potential to lose its international status as a policy innovator if science is unable to sustain policy and progress. There is a science policy disconnect evident when improvement and success are declared so far from our goals. Rewriting the Agreement won't solve the implementation problem.
 - Is the role of the IJC under the GLWQA still relevant, and are the institutional arrangements to support their role adequate?
 - Role for IJC and its institutions -- provide leadership with regard to vision, needs, required research, but how to engage agencies in development of a research strategy -- to garner new focus and energy, absent a crisis?
 - Need to build a Great Lakes constituency -- need social scientists, economists, communications specialists involved to show benefits.

- Institutional arrangements under the Agreement -- an advisory board but also a board of directors as a driver. More broadly -- organizational changes to improve the way we operate -- create policy-resource management linkage.
- Observation -- science and technology historically outpace policy and institutional arrangements.
- Need for coordination among institutions to drive science and policy -- provide vision, coordination, leadership collectively.
- Challenge -- to create a collective vision and to distill issues to instill political focus and will, and to interest and engage the public.
- Reorganize Agreement by issues, e.g. swimmable, to serve as the focus to drive policy, programs, monitoring.

A Few Additional, Overarching Post Meeting Reflections

1. The Agreement is only important if implementation is improved.
2. The relevance of monitoring is important to understanding the state of the lakes and also to evaluate program effectiveness.
3. The current agreement even if out of date and imperfect, does not preclude addressing future challenges.
4. The institutional arrangements in the Agreement do not reflect current practice, and the current arrangements may not necessarily be the only way or the most effective way of accomplishing binational cooperation, coordination and implementation.