

September 9, 1997

EPA-SAB-EC-LTR-97-013

Honorable Fred Hansen
Deputy Administrator
U.S. Environmental Protection Agency
401 M Street, SW
Washington, D.C. 20460

Subject: Report from the Science Advisory Board (SAB) Lookout Panel on
Freshwater Ecosystems

Dear Mr. Hansen:

The purpose of this letter is to summarize the results of the July Lookout Panel on Freshwater Ecosystems. Like the previous Lookout Panel with the Office of Pesticide Programs, this one depended primarily on the expertise of Agency executives and staff. It differed from the previous Panel in that participants came from many different parts of the Agency and in that it included a representative from Environment Canada. This panel also experimented with the idea of using a geographic focus for the discussion, in this case, the upper Mississippi River basin. Representatives from EPA's Region 5 greatly enriched the conversation with their knowledge of this area.

This discussion showed once again that the Agency executives and staff are an excellent source of expertise on emerging issues. The discussion was rich in ideas and knowledge about the problems of the past and those that are beginning to appear or may appear in the near future. It also demonstrated once again the difficulty we all have in thinking several decades into the future. As mentioned in our report of the previous lookout panel, we may need to introduce some new approaches to getting "beyond the horizon". This issue can be taken up by the Executive Committee subcommittee recently established to plan lookout panel meetings. One possible approach is to use the information provided by the lookout panel to build various scenarios that would help take us into the more distant future. Another, raised by one of the EPA participants, is to extend the session into two or more days, allowing more time to develop group dynamics and share background information before brainstorming ideas.

A summary of the Lookout Panel discussions is contained in Attachment A.

Sincerely,

/signed/

Dr. Genevieve Matanoski, Chair
Executive Committee

ATTACHMENT A

SUMMARY OF DISCUSSIONS AT SAB LOOKOUT PANEL MEETING ON JULY 24, 1997

I. Introductory remarks

Dr. Genevieve Matanoski, Chair of the Executive Committee, briefly described the SAB's futures work so far. She pointed out that this meeting includes people from many different parts of the Agency and a representative from Environment Canada.

Ms. Anne Barton, SAB staff, introduced the exercise materials, including short summaries of EPA's past focus on freshwater ecosystems, an introduction to ecosystems services and some material on the upper Mississippi. The objective was to speculate about the services and stressors of freshwater ecosystems that may become increasingly important in the future. The exercise used the upper Mississippi as a model or laboratory for our discussion in the hope that this narrow geographic focus would make it easier to carry our thoughts several decades into the future.

Mr. William Franz, Region 5, described some of the ways the Mississippi has changed as a result of human intervention, especially connected with its use as a transportation corridor. The northern portion was once a broad floodplain river composed of a meandering channel with large expanses of wetlands. The river flooded the plain around it every spring. Now the levees and dams interfere with this connection between the floodplain and the river. When flooding does occur, it is damaging to the human development that has built up on the flood plain. Wetlands and edge habitats have been greatly reduced, thus reducing biodiversity.

II. Issues

A. Drivers

1. Agriculture is currently the most important driver in the Upper Mississippi River Basin and is expected to remain dominant for decades. It is important both as the major land use in the area and because the international market for agricultural products drives the demand for maintaining and using the Mississippi as a transportation corridor.
2. Urban sprawl and population growth are also expected to impact the area, creating some demand for other uses of the river, though not to the extent of replacing agriculture as the dominant driver.

B. Sources and stressors

1. Physical

- a. The levees and dams required to maintain a transportation corridor have been the major sources of change in the river in the past, removing much of the vegetation, wetlands, and edge habitat. Since the demand for transportation is expected to continue or increase, this trend is likely to continue unless actions are taken to restore and maintain some of the original habitat type.
- b. Climate change may impact the area both from increase in catastrophic weather events, making flooding more of a problem and from temperature change, which will change both natural flora and fauna and cropping patterns.
- c. Drainage tiles are used in much of the cropland. This is expected to continue to be the case in the future. These and the expected increase in hard surfaces will continue the trend toward diverting drainage flow from natural streams.
- d. The ecosystem effects of propulsion from the barges are not well understood.

2. Biological

- a. Non-indigenous species have already been a problem in parts of the Mississippi and its tributaries. The expected increase in transportation will increase the opportunities for introducing new non-indigenous species, even though some measures are now being taken to reduce their introduction from ships ballast. Habitat destruction encourages the establishment of these non-indigenous species by disrupting the environment that has accommodated native species. Another possible source of exotic species is the introduction of bioengineered species used in agriculture.
- b. An increase in disease carrying vectors, including those resistant to pesticides, might result from a combination of climate change (warming and flooding) and reduction in control species. Restoration of wetlands could actually contribute to this problem by providing habitat for vector species.

3. Chemical

- a. At present, water quality in the Mississippi itself is fairly good except for some hot spots. Nutrients are a problem in some tributaries and in groundwater. There are also some toxic chemical hot spots.

- b. Non-point sources are already more important than point sources in contributing to chemical stressors. This trend is expected to continue, though some point sources might increase as described in c-e.
- c. The frequency of chemical spills is likely to increase as transportation increases.
- d. Catastrophic weather events could release highly polluted sediments behind dams.
- e. Flooding not controlled by dams and levees could also release chemicals stored in the former flood plain.
- f. Long distance atmospheric transport of chemicals is likely to become an increasing problem in the future.
- g. Changes in land use could introduce new sources of toxic chemicals.

C. Effects

- 1. The major effect of the man-made changes in the ecosystem in the past appears to be a decrease in biodiversity. Most trends indicate that this will continue unless actions are taken to reverse it.
- 2. Increases in vector-borne diseases and new species of pathogenic microorganisms could have important effects on human health.
- 3. Non-indigenous species can become a nuisance to various human activities, in addition to reducing biodiversity.
- 4. Climate change, whether caused by local or global factors, could result in severe economic costs from flooding and from the need to change crop patterns.

D. Services

- 1. The dominant service demanded of the Mississippi is transportation. This is expected to continue, but effects of climate change such as major floods may make it an increasingly expensive service.
- 2. Other services demanded by non-farming residents and Native Americans are increasingly important, though unlikely to rival the agricultural demands in the foreseeable future. In this respect, the Mississippi differs

from other major river basins such as the Columbia, where conflicts already exist between equally strong sectors of the community.

3. Understanding of the relationship of stressors to services is incomplete. It was difficult to list the services at risk from loss of biodiversity, although recreational services involving fish and wildlife would clearly be included. Aesthetics and ecotourism were also mentioned.
4. Because of the changes in the river flow and adjacent land use pattern, flood control is a service that requires constant and increasingly expensive human intervention.

E. Response

1. The Army Corps of Engineers (the major Federal player on the Mississippi River) has begun to manage for multiple use rather than transportation alone.
2. We need better technology for managing drainage and flooding.
3. Ways to manage non-point source pollution are already known and in many cases would actually save money, but they are difficult to implement because of the fragmented nature of the agricultural industry. A trend to mega-farms would make the initial introduction easier, but would not provide the enduring ethic possible with family farming
4. There are economic and political barriers to factoring the cost of maintaining levees and dams into transportation costs.
5. To the extent that transportation costs increase or that pollution controls are costly, the costs would be difficult for agriculture to absorb. The nature of the international market does not allow farmers the same flexibility to pass on their increased costs that other industries have.
6. It is becoming increasingly clear that many emerging issues require management on an ecosystem basis, but there are structural, legislative, and policy barriers to doing so.
7. Restoration of habitat to full functionality is hampered by our limited knowledge of ecosystem processes and dynamics. Furthermore, natural systems are extremely diverse across the landscape, and we have learned that knowledge of or experience in one habitat type is not necessarily transferable to others.

- F. Research and development needed to deal with emerging issues.
 - 1. Methods to manage problems systemically
 - 2. Better understanding of complex ecosystems and field demonstrations of restoration in many different systems.
 - 3. Understanding of long-range transport and its trends.
 - 4. Understanding of the cumulative effects of air pollutants.
 - 5. An answer to the question: “Will restoring wetlands help deal with the nutrient problem?”
 - 6. Understanding of propulsion system effects in rivers.
 - 7. Continued development of GIS models and data bases to show effects of stressors and responses.

III. Evaluation

The group evaluated the session with a view toward identifying what seemed to work and what might improve the process.

There was a general consensus that the group dealt very well with current and emerging issues and that the focus on a specific geographic area facilitated this. Emerging issues came forth very readily and the problems of dealing holistically with an ecoregion were pointed out. The importance of values and demand for multiple uses was brought out, as was the importance of non-point sources of pollution.

Some participants pointed out that they do this kind of thinking in their programs already. This and the previous meeting of the lookout panel show that Agency people are very good sources for the identification of emerging issues. However, the ability to identify the emerging issues is not enough. There are structural, legislative, and other barriers to dealing with the issues once they are identified. Priority attention is frequently diverted from longer term issues to short term imperatives. Agency members of the panel expressed some frustration with these barriers

The discussion rarely got “beyond the horizon” (several decades into the future). Some participants thought that the geographic focus, although very gripping, may have actually helped keep the discussion to the overwhelming current and emerging issues that demand attention now. Some participants suggested it might be helpful to have futurists and experts on drivers as part of the panel.

PARTICIPANTS IN SAB LOOKOUT PANEL MEETING ON JULY 23, 1997

SAB Chair

Dr. Genevieve Matanoski
Professor of Epidemiology
Johns Hopkins University

SAB Participants

Dr. Richard J. Bull, Senior Scientist
Battelle Pacific Northwest Laboratories
Molecular Biosciences

Dr. Kenneth Cummins
Florida Center for Environmental Studies
Florida Atlantic University

Dr. William Glaze, Interim Director
Carolina Environmental Program
University of North Carolina

Dr. Alan Maki
Environmental Advisor
EXXON Company, USA

Dr. M. Granger Morgan, Head
Department of Engineering & Public Policy
Carnegie Mellon University

Dr. William Randall Seeker
Senior Vice President
Energy and Environmental Research Corp.

EPA Participants

Mr. David G. Davis, Deputy Director
Office of Wetlands, Oceans, and Watersheds

Mr. Barry DeGraff, Associate Director
Water Division
Region 5

Ms. Frances M. Eargle
Wetlands Division,
Office of Wetlands, Oceans, and Watersheds

Mr. William Franz
Team Manager for Upper Mississippi River
Water Division, Region 5

Mr. James Hanlon, Deputy Director
Office of Science and Technology
Office of Water

Dr. Carl Mazza, Science Advisor
Office of Air and Radiation

Dr. Albert McGartland, Director
Office of Economy and Environment
Office of Policy, Planning, and Evaluation

Dr. Jay Messer
National Exposure Research Laboratory
Office of Research and Development

Mr. Cliff Rader
Office of Federal Activities

Mr. Larry Reed, Deputy Director
Office of Emergency and Remedial Response

Dr. Mary Ellen Weber, Director
Economics, Exposure, and Technology Division
Office of Pollution Prevention and Toxics

Environment Canada
Participant

Dr. Rod Allan, Director
Aquatic Ecosystem Restoration Branch
National Water Research Institute

NOTICE

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