Upper Mississippi River Water Quality Initiative

REPORT of the SEDIMENTATION WORKSHOP

February 3-4, 1993

Blackhawk Hotel

Davenport, Iowa

Sponsored by the
Upper Mississippi River Basin Association

Report of the Sedimentation Workshop

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BACKGROUND

The member states of the Upper Mississippi River Basin Association have long recognized the need for enhanced efforts to protect the water quality of the Upper Mississippi River. While there are many established regulatory and land treatment programs, there is no coordinated plan for maximizing their benefit to the Mississippi River. In May 1992, the first step toward addressing this need was taken when the states committed themselves to designing an integrated regional water quality protection strategy and set forth the goals and primary components of what is called the "Upper Mississippi River Water Quality Initiative." The states further agreed that the primary emphasis of such an effort should be on sedimentation and toxic pollution.

The Water Quality Initiative includes a planning process that will provide the foundation for future action. For both sedimentation and toxic pollution, the Association identified a series of strategic steps necessary for ultimately fashioning a regional water quality protection program. Each of these parallel processes begins with the establishment of specific reduction goals followed by the identification and prioritization of sources of pollution. The Association reasoned that agreement must first be reached on these questions before an effective action plan could be devised. (A copy of the Association's draft Water Quality Initiative Vision and Strategy is included as Appendix A.)

On February 3-4, 1993, the Association sponsored a workshop on sedimentation in the Upper Mississippi River. The purpose of the workshop was to gain the assistance of scientists, managers, and regulators in refining and more fully describing the initial strategic steps of the regional planning process. In addition, workshop participants were asked to reflect more generally on the efficacy of the Association's proposed approach. Specifically, the workshop was devoted to the exploration of the following strategies:

1) Establish quantifiable tributary and mainstem loading goals.

2) Prioritize areas and watersheds to target for sediment reduction.

3) Identify monitoring needs to support development, implementation, and evaluation of sediment reduction goals.

WORKSHOP PARTICIPANTS AND FORMAT

The Sedimentation Workshop was attended by 37 people, including 2 Association staff members and 2 facilitators. There were representatives from each of the five states' water quality agencies, as well as other key state agencies. The federal agencies represented included the Army Corps of Engineers, Environmental Protection Agency, Fish and Wildlife Service, Geological Survey, and Soil Conservation Service. In addition, the workshop also included attendees from county government, environmental groups, and state universities. Participants included planners, program managers, biologists, hydrologists, and geologists with a wide range of expertise and experience. (A complete list of attendees is included as Appendix B.)

The workshop had four major components. The initial session consisted of presentations by scientists currently involved in research on Mississippi River sedimentation and its impacts. The subsequent information exchange session provided an opportunity for those in attendance to share their perspectives on the primary sources of sediment in the Upper Mississippi River. In addition, participants reviewed current state and federal efforts to address sedimentation on the Upper Mississippi. The third portion of the agenda included breakout discussion groups designed to elicit participants' views on each of the Association's first three sedimentation strategies. The final wrap-up session allowed for discussion of the breakout session results, the general conclusions of the workshop, and additional recommendations to the Association. (A complete workshop agenda is included as Appendix C.)

CAVEATS

The following report provides a summary of the conclusions and recommendations of those in attendance at the Sedimentation Workshop. While there is clearly room to expand and refine these conclusions and recommendations, this summary is limited to the ideas and perspectives actually expressed at the workshop. Given the diversity of perspectives represented by participants, the report reflects a blend of both professional judgement and the results of scientific investigations. Except where explicitly noted, references to specific sources, tributaries, or reaches of the Mississippi River are illustrative only and are not intended to suggest special priority or significance. Similarly, the data and research results cited are simply some of those discussed at the workshop and do not necessarily reflect the full body of scientific investigations with bearing on the issue. Because a consensus did not readily emerge on every issue, all major conclusions and perspectives are discussed, together with sufficient background to understand the context in which the discussions unfolded.

SOURCES OF SEDIMENT

Sedimentation is both an inevitable natural process and also one of the most vexing problems facing managers of the Upper Mississippi River. Sedimentation is a classic nonpoint source pollution problem, and the sources of sediment entering the Upper Mississippi River are as wide ranging as the river basin itself. In fact, the sources of sediment delivered to the Upper Mississippi River could be described simply as the lands and streams of the Upper Mississippi River Basin, an area of almost 120 million acres.

The movement and storage of sediment in rivers preceded the very existence of the Upper Mississippi River Basin, much less the presence of a large human population in the region. Associated with fundamental geomorphic processes, sediment delivery to the river can be reduced, but not halted. However, juxtaposed against events that unfold across geologic time is a host of much more immediate concerns with the sources and impacts of sediment. It is with regard to these sources and impacts that the potential exists to develop management responses.

The factors that contribute to sedimentation are highly variable and dependent upon local conditions. However, workshop participants offered the following general observations about the Upper Mississippi River's sediment sources.

Upland land use practices have been generally identified as the primary cause of erosion and sedimentation in the region. In one of the most agriculturally productive areas of the world, soil loss from farm fields is of particular concern and is thought to be the leading source of sediment delivered to the Upper Mississippi River. Other significant sources of sediment include silviculture, urban construction, and highway construction. This is not to say, however, that these activities are unavoidably linked with high erosion rates. For example, it is estimated that 10 percent of the agricultural producers may be responsible for as much as 90 percent of the erosion problems associated with farming.

Stored sediment can remobilize and contribute significantly to sediment delivery to the Mississippi River. Erosion associated with upland land use practices does not typically result in the immediate delivery of sediment to the Upper Mississippi River. Instead, there is a tremendous sediment storage capacity throughout the basin, often creating a lag time of years or even decades before eroded soil is delivered to a major waterbody. As a result, water quality improvements would not necessarily follow in the short-term from the widespread implementation of best management practices (BMPs). In fact, "cleaner" water has more erosive energy and could actually accelerate the remobilization of stored sediment. At least half of the sediment that will be delivered to the river over the next several decades has already eroded from upland sources and is stored in the system.

Streambank erosion is generally thought to be a significant source of sediment for some reaches of the Mississippi River, but estimates vary widely as to its relative contribution. Some studies of small watersheds have suggested that bank erosion is responsible for as

much as 80 to 90 percent of sediment delivery. However, it appears likely that the relative contribution from bank erosion is generally overestimated, in part because monitoring is often done at sites where there is high bank erosion. The actual contribution from streambank erosion may be closer to one-third. It is important to note that much of the material eroded from streambanks is deposited on point bars downstream and is only carried to the Upper Mississippi River by high flows. However, fine grain or sandy alluvium eroded from streambanks is not necessarily retained on point bars during normal flows.

Gully erosion is highly variable, but is a significant source of sediment in some areas.

Resuspension of bottom sediment can also be a significant problem. Resuspension is generally greatest on the Mississippi River in March with the spring snow melt and on the tributaries during June, but can be a problem anytime and is highly dependent upon wind energy and sediment type. During high flows, sediments resuspended from the main channel may be deposited in backwater areas. Sediment resuspension is particularly difficult to model. Compared with sediment loading from tributaries, relatively little is known about resuspension on the Mississippi River, though it is known to be related to wind fetch and wind magnitude in backwaters and inundated areas.

Flood events play a very significant role in the delivery of sediment to the Upper Mississippi River. Sedimentation does not occur at a constant rate, but instead is strongly correlated with high discharge events, when large amounts of sediment stored in the system may be conveyed to the Mississippi or large amounts of sediment stored in backwater areas may be remobilized.

Small, bluffland watersheds can contribute a significant portion of the sediment delivered to the mainstem. For example, during the 1988 drought, approximately 70 percent of the sediment entering Peoria Lake was coming from the small watersheds immediately adjacent to the lake. Even in a wet year, this figure might be as high as 50 percent for Peoria Lake.

Several specific tributaries were identified as significant contributors of sediment to the Upper Mississippi River. While this list is by no means exhaustive, these tributaries are widely recognized as major sediment sources.

The **Minnesota River** contributes only one-third of the combined flow of the Mississippi and Minnesota at their confluence, but carries six times as much sediment as the Mississippi River at that juncture.

Among Wisconsin's rivers, the **Chippewa River** delivers the largest bed load to the Mississippi at approximately 1 million tons per year.

The **Wisconsin River** and **Black River** contribute annual bed loads estimated at 550,000 and 275,000 tons per year, respectively.

LOADING GOALS

(Strategy 1: Establish quantifiable tributary and mainstem loading goals.)

In order to establish sound tributary and mainstem loading goals, it is first necessary to articulate clearly the reasons for setting those goals. Fundamental questions must be answered.

Is sediment a problem? Sedimentation is an inevitable process. Given this fact, should we attempt to modify the rate at which it occurs or alleviate the adverse impacts that it has?

By including sedimentation in the Upper Mississippi River Water Quality Initiative, the UMRBA has implicitly answered this question affirmatively. However, the vision statement does not clearly state the purpose(s) behind this decision to address sedimentation.

Why is sediment a problem? How does it affect the beneficial uses for which the system is being managed? If there is a desire to intervene in the sedimentation process, what are the ultimate purposes of such intervention? Are the concerns primarily with the impacts of sedimentation on the backwater habitat of the Upper Mississippi River? What about the water quality impacts of contaminated sediments? Are there concerns with the economic costs of sediment accumulation in the main channel? What about the impacts of sediment on tributaries? How do we manage soil fertility? Is soil erosion *per se* a problem, or only if it results in sediment being delivered to the Upper Mississippi River or its tributaries?

The answers to these questions are critical to the development of loading goals. If, for example, the degradation of high quality backwater habitats is of the greatest concern, then targeting small watersheds that empty directly into such backwaters may be a very sound option. If, on the other hand, the primary concern is with contaminated sediments, such a strategy might have little utility.

While the clear articulation of reasons for reducing sediment is a necessary starting point, it is not by itself sufficient to guide the establishment of sound loading goals. Significant challenges remain due to our limited knowledge about sedimentation on the Mississippi River. For example, if we decide that we want to protect a given backwater area, we do not currently know precisely by how much we need to decrease the sediment delivery rate in order to achieve the desired effect. Nor do we know to what extent erosion must be reduced or stored sediment must be controlled in order to achieve a given sediment delivery rate. The understanding of these tremendously complex interrelationships is quite limited.

While these limitations are undeniable, so too is the practical reality that complete understanding of sediment delivery and movement is unlikely to be achieved. In attempting to establish reasonable goals, the following considerations should be addressed.

- Sedimentation can be reduced, but not eliminated.

- Given the imperfect state of our knowledge, any sediment reduction effort is likely to be an iterative process. Interim reduction goals that could be reviewed and adjusted may best suit this process.

- Perspectives vary along the river on what are acceptable and achievable river conditions. For this reason, it may be desirable to establish different goals for different reaches of the river. This could be done through ecosystem sediment loading criteria that the states would implement.

- At the same time, political and public support rests in part with the articulation of a clear direction for the initiative. In this regard, it may be important to have a single system-wide reduction goal.

- It is important to relate reduction goals to technology-based goals. For example, the reduction of sediment to a backwater area may require the implementation of best management practices on farmland in the watershed and/or the diversion of main channel flows away from the backwater during floods. Such measures are the means for achieving the reduction goal. Technology-based goals can be pursued for their own merit, but support for them is likely to be higher if they can be related to specific reduction benefits.

- Goals need to be set with reference to a timeframe. A short timeframe would suggest measures such as diverting mainstem high flows from backwater areas and treating selected small watersheds. On the other hand, a long-term commitment to reducing overall sediment delivery to the Mississippi would almost certainly involve the widespread implementation of best management practices.

In recognition of the considerations discussed above, the following interim qualitative goal was offered as a possibility:

Minimize sedimentation rates to sustain and improve human, fish, and wildlife resources for the foreseeable future.

Such a goal might have many advantages. It is flexible and yet would provide a central focus for the initiative in its early stages. It clearly allows for the development of different goals for different reaches of the river. However, it lacks the precision necessary to direct the implementation of reduction measures and quantitatively evaluate achievements. Further work would be needed to develop more specific goals.

PRIORITY AREAS AND WATERSHEDS

(Strategy 2: Prioritize areas and watersheds to target for sediment reduction.)

Given the need to articulate further the purpose and goals of the water quality initiative in addressing sedimentation, it is premature to prioritize specific areas and watersheds to target for sediment reduction. However, some general considerations should be addressed when such priorities are established.

- A dual focus approach should be employed that addresses both upland treatment and the management of sediment in the floodplain.

- An interagency, interdisciplinary approach should be used in setting priorities that also reserves a reasonable degree of autonomy for the states.

- The timeframe over which results need to be demonstrated will, to some extent, dictate the selection of priorities.

- The linkage between erosion rates and sediment delivery rates is strongest in small watersheds. Sediment storage and remobilization reduces this link in larger watersheds. As a result, targeting soil erosion in large watersheds is a long-term proposition.

- There may be some benefit to planning in larger areas while actually implementing measures in smaller watersheds. This allows for a consistent planning approach while also taking advantage of the fact that success may be more readily demonstrated in smaller scale projects. A watershed in the range of 10,000 to 30,000 acres is most conducive to demonstrating results. The effectiveness of best management practices implemented on a limited basis in larger watersheds may be difficult to establish. At the same time, significantly smaller watersheds may be difficult to monitor and results tend to be driven by flood events. If 100 percent landowner participation is desired, watersheds in the range of 1,000 to 1,500 acres are needed.

- The following factors should be considered in evaluating the suitability of a particular area for priority status: likelihood of success, degree of landowner cooperation, adequacy of existing data, existing political constituencies, and current projects or programs that would complement or contraindicate the contemplated action.

- Enhanced models could optimize the selection of priorities. Specifically, pollution potential indexes that quantify not only soil erosion but sediment delivery are needed.

MONITORING

(Strategy 3: Identify monitoring needs to support development, implementation, and evaluation of sediment reduction goals.)

Current monitoring information is inadequate to support optimal decision-making. Enhanced monitoring and/or modeling should be a part of any effort to address sedimentation on the Upper Mississippi River. However, there is not a clear consensus regarding what is most needed in the area of monitoring, nor on how those needs should be balanced against the need and desire to proceed with an action program. The following considerations are offered for further reflection.

- A system-wide model could be quite valuable in increasing our understanding of sediment transport and our ability to identify problem areas. Because the Upper Mississippi River is neither an open river system nor a fully impounded system, developing such a model would require new, innovative approaches. In addition, some of the basic pool volume and flow pattern data required to develop such a model are not available. A system model would require the investment of substantial time and money, presenting obvious tradeoffs between modeling and implementation.

- It is important to distinguish between monitoring of the mainstem and major tributaries, which is needed to understand sediment transport in the system, and monitoring of watersheds, which is needed to evaluate the effectiveness of land treatment. With cost estimates ranging from $10-20,000 per station per year, a system to monitor the major tributaries of the Upper Mississippi could cost as much as $500,000 annually. It is not clear whether the benefits to be derived from such a monitoring system would justify its costs. Even the more modest costs associated with standard pre- and post-project monitoring for watershed projects are often a significant portion of project costs.

- There is generally little political support for monitoring, either on a system-wide or project-specific basis. Such funding is particularly difficult to maintain over a long period of time. But data over an extended period of record are precisely what are most important for sound decision-making.

- Because of the lag time between the implementation of land treatment measures and the reduction in sediment delivery rates, it may be desirable to monitor interim measures such as erosion rates as well as sediment delivery rates over the longer term.

- There is significant potential for enhanced coordination of current monitoring efforts, on both an intra- and interagency basis. It is possible that valuable additional data could be

gathered in conjunction with ongoing monitoring efforts at a relatively low marginal cost. In addition, duplicative efforts should be redirected to eliminate overlap.

- Monitoring should not be limited to the measurement of sediment delivery and transport. Other types of monitoring relevant to addressing sedimentation on the Upper Mississippi River include biomonitoring, chemical monitoring, and stream bathymetry.

- It is important to work out issues related to monitoring in advance of any project implementation.

ADDITIONAL RECOMMENDATIONS AND OBSERVATIONS

MANAGED SYSTEM — The Upper Mississippi River is an enormously complex managed system. The locks and dams and channel training structures have significantly altered the riverine ecosystem, creating a series of pools and extensive backwater areas while also impairing the river's ability to adjust to the current sediment load. The accumulation of sediment in the navigation pools and backwaters is an inevitable process as the river attempts to reestablish itself. This is a process that can be slowed through further intervention, but it is not one that can be halted.

TOXIC POLLUTION — Sediment is an important transport and storage mechanism for many toxic substances. Floods and human-caused disturbances may release toxics that have accumulated in sediments. At the same time, clean silt and sand entering the river may actually serve to dilute contaminated sediments. The presence of contaminated sediments in the river presents special management challenges that might best be met by the development of specific strategies for the in-place treatment or removal of contaminated sediments where appropriate.

NEW APPROACHES — The full range of alternatives for addressing sedimentation should be considered. The Environmental Management Program's habitat projects represent one innovative alternative for managing sediment in the floodplain. Similarly, upland efforts should not necessarily be restricted to soliciting voluntary participation in the cost-shared implementation of best management practices. Other alternatives that might be considered include demonstration projects, financial and tax incentives, education and networking efforts, and enforcement of mandatory land use controls.

WORK GROUPS — There are numerous technical, practical, and strategic issues that cannot be effectively addressed by a group as large as the one that participated in the Sedimentation Workshop. If the sedimentation initiative is to move forward, it will be necessary to form some smaller, more focused work groups. The following groups were suggested:

- research and monitoring,
- implementation,
- policy and information, and
- strategy.

The precise number and focus of the groups, as well as their integration and coordination, would need to be considered further.

FUTURE EFFORTS — Significant resources and effort are required to proceed further with the development of a sediment reduction and management strategy for the Upper Mississippi River. While the approaches employed in other major watersheds, such as the

Great Lakes and the Chesapeake Bay, are not completely applicable to the Mississippi River, the experiences in these areas certainly indicate that such an undertaking cannot be accomplished successfully in an ad-hoc fashion. Substantial commitments of staff resources will be required and an explicit expression of purpose is necessary. There are a number of federal-level opportunities for support that could be pursued, including reauthorization of the Clean Water Act and the 1995 farm bill. However, federal support is not likely to be forthcoming absent a strong expression of state commitment. It is therefore recommended that the next step in the Upper Mississippi River Water Quality Initiative be to secure from each basin state a clear and definitive commitment to this effort, at the highest policy level.

Appendix A

UPPER MISSISSIPPI RIVER WATER QUALITY INITIATIVE

VISION STATEMENT AND STRATEGIES

UPPER MISSISSIPPI RIVER WATER QUALITY INITIATIVE

The Vision

Recognizing the Upper Mississippi River as a unique and nationally significant ecosystem, the five member states of the Upper Mississippi River Basin Association are committed to ensuring the long-term viability and balanced multiple use of the river as a sustainable, diverse, and healthy resource for the benefit of the nation's and the region's economy and ecology. Toward this end, the Basin states will work cooperatively with both the public and private sectors to maintain and enhance the river's water quality based on an understanding of the Upper Mississippi River's integral relationship to its tributaries and surrounding lands.

Priority Water Quality Problems

In an effort to realize this vision for the river, the member states of the Upper Mississippi River Basin Association have identified two priority water quality problems on which to focus their initiative. These two problems, **sedimentation** and **toxic pollution**, endanger the future of the the Upper Mississippi River as a diverse and healthy ecosystem able to support a variety of natural resource and human needs.

Sedimentation is widely regarded as one of the most significant threats to the long-term health of the Upper Mississippi River ecosystem. Erosion is widespread throughout the basin, with sediment sources including the region's extensive agriculture and forest products industry, its urban areas, and the banks of the river and its tributaries. The Upper Mississippi River is particularly vulnerable to sedimentation not only because it drains such a vast land area but because its system of locks and dams inhibits the river's natural sediment transport capacity. As a result, the river's extensive network of backwater lakes, ponds, and sloughs, which provide invaluable habitat for fish and wildlife, is suffering from significant sediment accumulation. Sedimentation in these backwater areas has already resulted in substantial loss of habitat diversity. In addition to the damage caused in backwaters, sediment also accumulates in the main channel of the river, requiring significant annual expenditures on dredging to maintain the 9 foot navigation channel.

Toxic pollution is the other priority focus of the Upper Mississippi River water quality initiative. The list of toxic compounds found in the river is long and includes substances that come from specific point sources as well as from both urban and rural nonpoint sources. Some toxics, such as heavy metals associated with wastewater treatment discharges, are introduced to the river on an almost continuous basis, while organic pesticides and some others follow seasonal patterns of residential and agricultural chemical use. Still other pollutants, such as PCBs, have been banned for years and yet are still found in the river, often adsorbed to suspended and bed sediments. Toxic pollution can cause immediate health and environmental damage in acute cases. More often, however, the threat to both the river's fish and wildlife and to humans is from prolonged exposure to sub-lethal concentrations. The actual impacts from chronic exposure to a multitude of contaminants are largely unknown.

Strategies for Addressing the Priority Problems

The Upper Mississippi River is a vast and complex ecosystem, thus requiring a comprehensive, coordinated approach to successfully address its water quality problems. At the same time, such an approach is itself a major undertaking, requiring innovation and cooperation by all levels of government as well as by industry, agriculture, environmental groups, citizens, and other interested parties. In addition, it is essential that this approach reflect a careful balancing of costs and benefits in order to ensure that limited resources are utilized in a cost-effective manner.

Outlined below are several strategic steps for beginning to address the priority problems of sedimentation and toxic pollution. These steps are designed to involve the relevant management agencies, interest groups, and private sector concerns in crafting an action strategy to reduce both sedimentation and toxic pollution. Clearly this planning process is only the first phase in a comprehensive water quality initiative. Upon completion of the planning phase, the greater challenge of implementing and achieving the goals set forth will remain.

Sedimentation Strategies

1) Establish quantifiable tributary and mainstem sediment loading goals.

2) Prioritize those areas and watersheds to target for sediment reduction.

3) Refine and coordinate monitoring as necessary to support development, implementation, and evaluation of sediment reduction efforts.

4) Coordinate, integrate, and focus existing programs in order to maximize the sediment reduction benefit realized by the river from such programs.

5) Gain agreement among public agencies, industry, agriculture, environmental groups, and other interested parties on how to implement sediment reduction in the targeted areas. This might include coordination of existing programs as well as new initiatives.

6) Conduct a public information and education campaign. This will be an on-going effort throughout the planning phase and will be tailored to the demands of each step. It will also be coordinated with the outreach and education efforts related to the toxic pollution component of the initiative.

Toxic Pollution Strategies

1) Reach agreement on a critical list of toxic pollutants and prioritize that list.

2) Set quantifiable toxic pollutant reduction goals.

3) Prioritize those areas and sources to target for toxic pollutant reduction.

4) Refine and coordinate monitoring as necessary to support development, implementation, and evaluation of efforts to prevent, reduce, and control toxic pollution.

5) Coordinate, integrate, and focus existing programs in order to maximize their contribution to the prevention, reduction, and control of toxic pollution in the river.

6) Gain agreement among public agencies, industry, agriculture, environmental groups, and other interested parties on how to implement toxic pollution reduction in the targeted areas. This might include coordination of existing programs as well as new initiatives.

7) Conduct a public information and education campaign. This will be an on-going effort throughout the planning phase and will be tailored to the demands of each step. It will also be coordinated with the outreach and education efforts related to the sedimentation component of the initiative.

Appendix B

LIST OF ATTENDEES
at the
SEDIMENTATION WORKSHOP

List of Attendees

Upper Mississippi River Water Quality Initiative
Sedimentation Workshop

February 3-4, 1993
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Appendix C

AGENDA
for the
SEDIMENTATION WORKSHOP

February 3 - 4, 1993

Blackhawk Hotel

Davenport, Iowa

UPPER MISSISSIPPI RIVER
WATER QUALITY INITIATIVE

SEDIMENTATION WORKSHOP

AGENDA

Wednesday, FEBRUARY 3

Background (Gold Room East)

9:00 a.m. • Welcome and Introductions

9:10 • Overview of the Upper Mississippi River Water Quality Initiative

9:20 • Purpose of the Sedimentation Workshop

9:30 • Presentations by Scientists and Researchers

- *Long-Term Movement and Storage of Sediment* — Jim Knox, University of Wisconsin, Madison
- *Perspectives on Movement and Storage of Sediment in an Engineered River System* — Bob Meade, U.S. Geological Survey
- *Watershed Management: The Habitat Component (Lessons from a Pilot Project on the Whitewater River)* — Tex Hawkins, U.S. Fish and Wildlife Service

10:45 • Break

Information Exchange (Gold Room East)

11:00 • Identification of Primary Sources of Sediment Delivered to the Upper Mississippi River (UMR)
- land use practices
- bank erosion and resuspension
- natural features and processes
- critical watersheds
- impact of various government programs

12:00 noon • Lunch (Empire Room)

1:00 p.m. • Review of Current State and Federal Efforts to Address Sedimentation in the UMR
- nonpoint source pollution programs
- remediation
- potential for enhanced coordination
- limitations of existing programs

2:00 • Break

Discussion/Brainstorming (Breakout Sessions) (Gold Room East and Bix Room)

2:15 • Sedimentation Strategy #1 - *Establish quantifiable tributary and mainstem loading goals.*
- What data are necessary to identify tributary loadings? How might an integrated system for securing and evaluating that data be established?
- How should tributary-specific sediment reduction goals be formulated?
- Recommendations for further action

3:15 • Sedimentation Strategy #2 - *Prioritize areas and watersheds to target for sediment reduction.*
- What factors should be considered in setting sediment reduction priorities?
- What constraints limit our ability to prioritize specific areas or watersheds?
- Recommendations for further action

4:15 • Sedimentation Strategy #3 - *Identify monitoring needs to support development, implementation, and evaluation of sediment reduction goals.*
- Is the coverage and coordination of current monitoring efforts adequate?
- What are the most significant unmet monitoring needs?
- Recommendations for further action

5:00 • Adjourn for the Day

5:15-6:30 p.m. • Informal Reception and Cash Bar (Empire Room)

Thursday, FEBRUARY 4

Final Recommendations and Wrap Up Discussion (Gold Room West)

8:30 a.m. • Summary of February 3rd Breakout Sessions

9:00 • Integration of Sedimentation and Toxic Pollution Components of the UMR Initiative
- What are the critical linkages between these two resource problems?
- How should the strategies for each be integrated?
- What fundamental distinctions must be observed?

10:00 • Next Steps for the UMR Water Quality Initiative
- How can the specific recommendations under Strategies 1-3 best be integrated?
- Should any working groups be established at this time?
- How should the input, perspective, and support of the broader range of interested parties (e.g., industry, environmental groups, citizens, and local governments) be sought?
- Are there additional recommendations that the workshop participants would like to make to the Upper Mississippi River Basin Association?

11:15 a.m. • Closing Remarks