



**US Army Corps
of Engineers**
Rock Island District

United States Department of Defense

US Army Corps of Engineers - Rock Island District

UMR-IWW Navigation Study 1994 Public Meetings

Interim Product Report, November 1995

"Response to Issues Raised at the Public and NEPA Scoping Meetings of November 1994"

Issue Statements (Part 2 of 6)

ENVIRONMENTAL

10. The Corps of Engineers needs to explain how they intend to determine and evaluate the environmental impacts which will be caused by increasing lock capacity and navigation traffic on the Upper Mississippi River - Illinois Waterway System (UMR-IWW system). This study also should explain how the Corps of Engineers intends to protect fish and wildlife habitat.

Response: Any environmental impacts of increased navigation on the Upper Mississippi River System - Illinois Waterway (UMR-IWW) system can be divided into two headings: system-wide and site-specific impacts.

System-wide impacts are those impacts which are identified and associated with increasing the amount of navigation traffic using the river system. An assortment of scientific studies are being undertaken to examine these impacts. The results of these studies will allow the Corps to identify environmental impacts which will likely occur throughout the entire UMR-IWW system.

The system-wide impacts of increased navigation are being evaluated through field studies, laboratory studies, and available data and literature. Field and laboratory studies are under way to assess the effects of navigation traffic on sediment resuspension and deposition, fish, freshwater mussels, bank erosion, backwaters and side channels, and aquatic plants. The effects of recreational traffic also will be assessed. Other issues, like waterfowl hazing, macroinvertebrates, and barge fleeting, will be analyzed using available data, literature, and professional opinion. This examination of the impacts of increased navigation will result in a clearer understanding of the relationship between commercial traffic and the environment in order to make a reasoned choice among alternatives being considered to reduce delays. Risk-based assessment techniques will be used to assist in determining the significance of impacts. If significant impacts are identified, the first course of action will be to begin avoidance and minimization (A&M) planning. In cases where the resulting A&M plans are not sufficient to reduce impacts, compensatory mitigation planning will occur. All planning will be done in coordination with appropriate State and Federal agencies.

Site-specific impacts are those localized impacts which result from navigation improvements made to lock and dam facilities. As specific improvement alternatives are being studied at each site (16 sites in all), so are the localized environmental impacts associated with those alternatives.

A special work group has been formed to assess site-specific impacts at the locks and dams being considered for further expansion. This work group, the Habitat Assessment Team (HAT), is comprised of personnel from the U.S. Fish and Wildlife Service (USFWS) and the Corps of Engineers. State resource agencies also participate by providing information and input on sites and potentially impacted species. This team is using the USFWS Habitat Evaluation Procedures to assess the localized environmental impacts associated with proposed small- and large-scale enhancements. In the event that significant impacts are identified at a site, mitigation plans will be developed. Potential site-specific habitat restoration and enhancement opportunities also are being explored.

Comments:

- How will the Corps of Engineers be assessing the impacts to fish and wildlife habitat? What will you be doing to protect fish and wildlife habitat? (25)
- How will the ecological impacts caused by the projects be examined? (4)
- What environmental problems will be caused by increasing lock size and barge traffic? (8)
- Increasing barge traffic will increase the impact on the environment. (4)
- The cost to natural resources should be included. (1)
- Is the Corps considering the limits to what the river can handle in regards to commercial traffic? (2)

11. Implementing measures leading to increased commercial navigation could lead to impacts on local communities by affecting tourism, recreation, and hunting. How is the study addressing these issues?

Response: As part of the study effort, the economic and environmental impacts of alternative plans are being examined. The economic analysis will include an assessment of both national and regional benefits. The potential conflicts between recreational and commercial vessels at lock sites also are being examined. Appropriate mitigation for fish and wildlife will be addressed where justified. The secondary social effects of any recommended improvements on tourism, hunting, and related business will be addressed as part of the NEPA process. These will be examined using available information and professional opinion. (See Issues 10, 32, 36, 60, and 68.)

Comments:

- Barge traffic jeopardizes recreation uses, which have been increasing in the UMR system, adding substantially to local economies. (1)
- Expansion of navigation is not worth the risk of damaging a tourist attraction. (2)
- Will the impacts of barge traffic on fish and wildlife, sportsmen, tourism, and related businesses be examined? (10)
- Shouldn't spend large sums of money on construction that will negatively impact tourism, sports and recreational fishing, and environment. (1)
- How will the study positively impact landowners and hunters? (1)
- If fish and wildlife are affected, should evaluate the impacts on tourism and recreation industries. (3)
- What will be the economic impact on the fisheries? (1)
- The navigation channel and pools of the lock and dam system have made recreation possible. (1)

12. The Corps of Engineers has long overlooked the environment in decision making. The recommendations to Congress resulting from the Navigation Study must consider the environment equally with navigation and water control issues.

Response: The Corps of Engineers is required under Federal law (Water Resources Development Act of 1990, Section 316; Endangered Species Act of 1973; Fish and Wildlife Coordination Act of 1958) to consider the environment in decision making. As directed by law, the Corps of Engineers shall include environmental protection as one of its primary missions in the planning, designing, constructing, operating, and maintaining of water resources projects. The National Environmental Policy Act of 1969, Section 102 (B), also states that all Federal agencies shall identify and develop methods to ensure that unquantified environmental amenities and values be given appropriate consideration in decision-making along with economic and technical considerations. The environmental studies included in the UMR-IWW System Navigation Study are designed to satisfy these laws. The final report for the UMR-IWW System Navigation Study will evaluate a host of alternatives and make recommendations to Congress which consider environmental concerns. These recommendations will have been made in concert with the results of the environmental studies, existing literature, and best professional judgment. These results will have included the Corps of Engineers best available assessment of the consequences of increased navigation traffic on the environment and the impacts of any recommended construction. The environmental results then will be weighed along with the engineering and economic results to formulate a recommended plan.

Comments:

- Environmental concerns and impacts must receive the same attention as navigation and water control issues. (26)
- Concern that the information obtained will not be used in decision making. (4)
- Are impacts of expansion on the environment going to be studied prior to expansion? (1)
- Biologists will not be listened to. (2)

13. The UMR-IWW system has been the focus of study for many years. Why is an Environmental Impact Statement (EIS) being prepared and will it address areas not covered by previous studies?

Response: This study is assessing the need for navigation improvements on a system that has 29 locks on the Upper Mississippi River System and 8 locks on the Illinois Waterway, and the incremental impacts of additional traffic. When completed, this study will have evaluated the appropriate location and sequencing of any recommended navigation improvements on the UMR-IWW system for the 50-year planning horizon based on forecasts of traffic growth. As part of this analysis, a system-wide Environmental Impact Statement (EIS) is being prepared to comply with the requirements of the National Environmental Policy Act (NEPA). Preliminary investigations of specific sites recommended for navigation improvements also will be undertaken. Each site that is recommended, authorized, and for which funds are appropriated, will have a NEPA document prepared during subsequent study and design work, with the exception of the first set of recommended improvements. The EIS for this first set will be included in the Navigation Study EIS.

In the 1970s, each of the three Corps of Engineers districts with responsibilities on the UMR-IWW system completed an EIS to address continued operation and maintenance of the navigational pools. The GREAT (Great River Environmental Action Team) project and the Upper Mississippi River Basin Commission Master Plan, both done in the late 1970s, also examined environmental impacts associated with maintaining the 9-foot channel. These documents and others are being used as a source of data and information for the Navigation Study EIS.

In 1988, an EIS for the construction of a second lock at Melvin Price Lock and Dam (formerly Lock and Dam 26) was completed, largely based on existing impact data. The document identified the lack of data and methodology to predict with certainty the incremental impacts of increased tow traffic. Based on this, a Plan of Study (POS) was created in conjunction with the USFWS, the U.S. EPA, and the five study area state resource agencies (Illinois, Iowa, Minnesota, Missouri, and Wisconsin). This document identified studies considered appropriate for quantifying impacts of traffic increases on the UMR system. The essential elements of this POS served as the basis for the environmental studies undertaken in the Navigation Study.

Comments:

- Will an EIS be completed for this project? (3)
- Has an EIS been done in the past? (2)
- Are there data gaps in the previous EIS? (1)
- What is the basic reason for this EIS? (1)

14. The Corps of Engineers, as part of the Navigation Study, needs to include a long- range plan for the protection and restoration of the Upper Mississippi River System's natural resources. This planning should be completed at full Federal expense.

Response: The Corps of Engineers stands willing, within current authorities and funding constraints, to cooperate with State and Federal agencies to conduct related resource studies or develop a long-range integrated resource management plan for UMRS fish and wildlife resources. It is the Corps of Engineers position that those efforts, while of considerable merit, are not required for NEPA compliance for this study and should not be funded at full Federal expense with Corps of Engineers appropriations.

At the December 1992 Reconnaissance Review Conference, Acting Assistant Secretary of the Army for Civil Works, Dr. G. Edward Dickey, explained the requirements of non- Navigation Study cost sharing established as part of the Water Resources Development Act (WRDA) of 1986 (Public Law 99-662). Section 105 of this act establishes that feasibility studies are cost-shared at 50 percent with a non-Federal sponsor, except for projects with the purpose of navigational improvements on inland waterways. Dr. Dickey offered to participate, at a 50 percent cost-share, in natural resource studies. At present, no such efforts have been initiated by potential cost-sharing agencies.

Comments:

- Long-range plan for protecting the resources under the Corps of Engineers stewardship should be developed in conjunction with navigation improvements. (15)
- Will Corps stick to authorized study or expand it to meet all kinds of environmental concerns? (1)

15. The length of time presently allotted to complete the Navigation Study is insufficient to do a complete and credible environmental assessment. The Corps of Engineers needs to increase the study timetable so additional time is available to assess impacts.

Response: The UMR-IWW System Navigation Study was designed as a 6-year study culminating in a Feasibility Report and Environmental Impact Statement (EIS) in March of 1999. Since that initial timeline, the study has been extended 9 months, shifting the scheduled public notice of study completion to December of 1999. This extension in the timeline was a result of the additional time that the Corps of Engineers determined was necessary to expand some studies and adequately complete the document. The Corps of Engineers has concluded that the study timeline, as now outlined, is satisfactory to complete a technically sound study and environmental impact analysis, allowing for a reasoned and informed decision among alternatives. The resulting recommended alternatives, along with the completed EIS, will then be recommended for congressional action.

Comments:

- More time needs to be allotted to complete the study. The time is insufficient. (8)
- Do not expand study beyond the present 6-year time schedule. (9)
- The Navigation Study timetable should be altered such that recommendations to Congress include the EIS results. (3)

16. An objective and independent group, like the National Academy of Science, should evaluate the UMR-IWW System Navigation environmental study plans.

Response: In the Initial Project Management Plan (IPMP), three distinct groups or committees were proposed to provide oversight on the environmental plan.

The Navigation Environmental Coordination Committee (NECC) is composed of environmental professionals from the Corps of Engineers, the USFWS, the U.S. EPA, and the five Upper Mississippi River states (Missouri, Illinois, Wisconsin, Minnesota, Iowa). This committee was created and functions to review and provide technical comment on proposed and ongoing environmental studies. The NECC holds four to six meetings each year. All meetings are open to the public. Minutes of these meetings are available upon request from the Corps of Engineers, Rock Island District.

Technical work groups, composed of members with expertise particular to a specific study or task, have also been formed. These committees, comprised of both Corps of Engineers and outside expertise, assisted with development of detailed study designs for each environmental study. These draft study designs were then reviewed by the NECC and their comments were considered in finalizing the study designs.

A third committee, the Technical Coordinating Committee (TCC), was originally included in the initial project management plan. This 3- to 5-person committee was to be composed of technical experts in areas of river hydraulics, ecological system modeling, Geographic Information System (GIS), data management, and aquatic biology. This committee was to provide technical oversight of the development of contractual scopes of work with additional responsibility for recommendations on the feasibility and design of proposed studies. Considerable time was spent attempting to recruit qualified experts to serve on this committee, with little success. Following failed attempts to recruit regional experts, the Corps of Engineers approached the National Academy of Science to determine if they had the capacity and desire to perform this function. The Academy indicated that the technical review of the environmental study package was an underutilization of their capabilities and could be adequately done by a locally formed panel. The Academy thought that their involvement, if any, should be to evaluate the total planning process associated with the Navigation Study. This went beyond the original intent of the TCC, as outlined in the IPMP, and the authority of the Rock Island District, and resulted in a mutual conclusion that the Corps of Engineers should look at other options for the environmental technical review.

While the search for qualified technical experts continued, the technical work groups, also composed of recognized technical experts, continued to develop detailed study designs. As these study designs were completed, they were presented for review to the NECC and the Environmental Work Group (Corps of Engineers environmental professionals who work on the Navigation Study). As part of this process, an ecological math modeling workshop was held with national experts in hydrology, fish, mussels, and aquatic plants. In the absence of the TCC, the technical experts at the modeling workshop and on the technical work groups, the NECC, and the Environmental Work Group have been able to competently assess the completeness and feasibility of the proposed studies. Given the fact that most of the study designs are now completed, studies are under way, and that other avenues were found to evaluate these study approaches, the need for the TCC has diminished.

Comments:

- Why was National Academy of Science denied an opportunity to comment on the Navigation Study? (6)
- The National Academy of Science, or some other agency, should evaluate the study. (9)
- How many biologists are on the committees? (1)
- Where are the Navigation Environmental Coordination Committee and other meeting results available? (2)

17. Methods and procedures for protecting the UMR-IWW system from increased navigational traffic need to be addressed in the EIS.

Response: If any improvements are recommended, upon completion of the environmental studies and identification of the impacts of increased navigation on the UMR-IWW system, mitigation planning will begin. Mitigation planning will first examine ways to avoid or minimize identified impacts to the UMR-IWW system. All three study area Corps of Engineers districts (Rock Island, St. Paul, St. Louis) are currently working to incorporate Avoid and Minimize (A&M) measures into their channel maintenance programs. In 1988, in conjunction with construction of the second lock at Lock and Dam 26, an A&M team was formed in the St. Louis District, U.S. Army Corps of Engineers, to determine how to reduce the impacts of increased navigation resulting from the construction of the second lock. This team, formed of Corps of Engineers, USFWS, and State officials, has developed and is implementing eight measures which have the potential to reduce the navigational impact on the environment. Potential mitigation resulting from the Navigation Study could include development of additional A&M measures. In the event that compensatory mitigation is necessary, the Corps of Engineers, in coordination with the USFWS, the U.S. EPA, and the five study area states, will develop an appropriate mitigation plan. Appropriate mitigation for any recommended plan will be addressed in the EIS and an estimate of costs will be included in the feasibility report. At this time, the public notice of study completion is scheduled for December 1999, and no studies are currently scheduled beyond that date.

Comments:

- How does the Corps of Engineers plan to protect the river (methods, procedures, and commitment) while maintaining barge traffic? (2)
- How will the Corps of Engineers deal with unexpected and unforeseen consequences of increased river traffic? (1)
- Concern that proper environmental protection will not be given. (1)
- How does the Corps of Engineers plan to compensate for natural resources lost to expansion? (2)
- Avoiding and minimizing future impacts must be a part of the study. (1)
- Will the Corps of Engineers follow up study results with actual results 5 or 10 years from now? (1)

18. Mitigation planning for the second lock at Melvin Price Lock and Dam needs to be completed and included in the Navigation Study.

Response: In 1988, an Environmental Impact Statement (EIS) was completed prior to construction of a second lock at Melvin Price Lock and Dam (formerly Lock and Dam 26). This document identified data gaps concerning the incremental impacts of increased tow traffic. Based on these gaps, a Plan of Study (POS) was created which identified areas of environmental concern where information was lacking. The Record of Decision (ROD) for the second lock EIS committed the Lower Mississippi Valley Division of the Corps of Engineers to develop a POS and submit it to Headquarters, U.S. Army Corps of Engineers, for approval and funding subject to the budget process. The essential elements of this POS served as the basis for the environmental studies undertaken in the Navigation Study. Based on the results of these studies, the Corps of Engineers is prepared to formulate and implement mitigation plans for the second lock project if impacts are determined. While the information required for determining the need for mitigation will come from the results of the Navigation Study, any mitigation planning efforts for the second lock project will be funded separately from those of the Navigation Study and will be initiated if and when significant impacts are determined.

Comments:

- Will the Corps of Engineers complete the second lock Plan of Study before new navigation construction? (1)

- Second lock mitigation planning must be completed and included in present study impact analysis. (4)
- Why wasn't the second lock EIS completed prior to construction? (1)
- The Corps of Engineers is not honoring the spirit of the second lock agreement. (2)

19. The navigation industry's degree of fiscal involvement in the mitigation of environmental losses resulting from future UMR-IWW system improvements needs to be clearly outlined.

Response: Major rehabilitation and navigation improvements projects completed on navigable inland waterways are required by law to be cost-shared 50 percent with the Inland Waterways Trust Fund. The revenue for this fund is generated by the commercial navigation industry through a \$.20 per gallon fuel tax levied on vessels. Mitigation costs are considered part of the total project cost and, as such, would be cost-shared with the navigation industry through the Inland Waterways Trust Fund. Many of the improvements being considered in the UMR-IWW System Navigation Study fall under the heading of major rehabilitation or capital improvement projects. (See Issue 58.)

Comments:

- Does the barge industry contribute to mitigation? (1)
- Who will pay the costs of mitigating environmental damage? (1)

20. The Navigation Study needs to address increasing sedimentation in backwater areas, protecting backwater habitats, reducing sediment resuspension, and reducing dredged material placement.

Response: Backwaters and side channels represent the most biologically productive habitats in the river system. These areas, typically consisting of low-flow or standing water connected to the river channel by an inlet, are susceptible to sediment deposition. Flows into these areas are believed to carry in and deposit sediment resuspended by river flow, recreational and tow traffic, and from upland and streambank erosion. While these areas are not degraded on the Mississippi to the level they have been on some other rivers, they are increasingly threatened. Other agencies, including the Natural Resources Conservation Service and the Consolidated Farm Service Agency, have implemented programs to address and control the problem of upland erosion and stream runoff (a problem which falls outside the Corps of Engineers authority to regulate). However, the Corps of Engineers has the authority to and will evaluate the impacts of tow traffic on sediment resuspension and recommend steps to minimize significant effects. Within the Navigation Study, several studies are being undertaken to examine the impacts of traffic on backwater sedimentation and to assess its effects.

The Sedimentation of Backwaters and Side Channels study will attempt to provide an analysis of sedimentation influence in these biologically important areas. The majority of this work will concentrate on computer and laboratory modeling of sediment resuspension after tow passage and deposition in backwater and side channel areas. These models will be calibrated with measurements obtained from several locations on the UMR-IWW system. Completion of these tasks will involve physical characterization and field data collection for at least one backwater and one side channel area. Included in this analysis will be recorded data on actual tow passage events. Using all this information and data supplied by the Environmental Management Technical Center (a research center of the National Biological Service), models will be developed to predict the impact of increased navigation traffic on sediment resuspension and transport. These models will be able to assess sedimentation at different levels of flow and through a range of tow traffic volumes.

The impacts of recreational traffic on sediment resuspension and bank erosion are also being examined. Using both computer and map analysis, backwater habitat areas will be classified by their physical characteristics. This study will evaluate, using wave gages and suspended sediment sampling stations on the river, the impact of passing recreational vessels on riverine habitats. By combining the results of backwater classification and collected recreational vessel physical effects data, the effect of recreational vessels on the riverine environment will be discussed.

The issues and impacts examined in the aforementioned studies are related to increases in navigation and recreational traffic. Other Corps of Engineers programs are also examining ways to decrease backwater sedimentation while creating, enhancing, and restoring backwater areas. The Upper Mississippi River System - Environmental Management Program (EMP), authorized in 1985, was created to ensure monitoring, rehabilitation, and enhancement of system resources. Since its inception, Federal and State agencies have used this program to develop and test new and inventive ways to reduce backwater sedimentation. Inventive designs, like low-level levees with water control gates and selective clamshell dredging, are being investigated and implemented as tools to create or maintain backwaters while decreasing sedimentation.

The avoid and minimize program also presents opportunities to address these types of issues. For example, the program being implemented by the St. Louis District of the U.S. Army Corps of Engineers is examining ways to rehabilitate backwater and side channel areas. Present areas of emphasis include notching the closing structures behind islands to reopen side channels, creating scour holes, creating stream meanders, and diversifying aquatic habitat. Other projects are also under way to reduce open water dredged material placement and, consequently, to reduce sediment resuspension by using dredged material to create beaches and wetlands. Projects like these offer options to the cost-prohibitive alternative of off-site placement of dredged material and can be used to create valuable and often otherwise limited side channel and backwater fish and wildlife habitat.

Comments:

- How will the Corps of Engineers be assessing the impacts to water quality? (8)
- How will the Corps of Engineers be assessing the impacts of sedimentation in the backwaters? What do you plan to do about sedimentation? (26)
- How will the proposed navigation expansion affect backwater habitat? (6)
- There needs to be more focus on the backwaters. (3)

- The Corps of Engineers has created backwaters by building dams but has not maintained these areas. Will the Corps of Engineers show the same lack of interest in the future? (1)
- Will modeling assess sediment transport into backwaters? (1)
- Can street and farm runoff be controlled? (6)
- Does the Corps of Engineers work with other organizations to decrease sediment delivery in the basin? (2)
- Will a no till law be passed within 5 miles of the river? (2)
- Why doesn't the Corps of Engineers selectively dredge in the backwaters to facilitate flow and prevent siltation? (1)
- Why can't dredged material be hauled inland to avoid sedimentation in the backwaters? (2)
- Is long-term sediment data available? (1)
- Save river from silt closure. (1)
- Is the Mississippi being degraded like the Missouri? (2)
- What role will the Corps of Engineers play in maintaining shorelines, stabilizing streambanks, closing side channels, and enhancing fish habitat? (1)

21. The Navigation Study should address dredging and dredged material placement activities in the UMR-IWW system, specifically the creation of dredged material beaches.

Response: The purpose of the UMR-IWW System Navigation Study is to assess the need for navigation improvements at 37 locks on the river system and the incremental impacts of additional traffic. Some additional channel maintenance measures may be required, but it is not anticipated that there would be major changes in current operation. Therefore, dredging and dredged material placement planning is not part of the Navigation Study, the exception being an assessment of the cumulative impacts of dredging to maintain the present system (see Issue 27). Dredging and dredged material placement activities are typically addressed in the navigational pool operation and maintenance NEPA compliance documents completed by each Corps of Engineers district. The avoid and minimize program under way in the St. Louis District has initiated, as part of reducing open water dredged material placement, a program to create dredged material beaches. Creation of these islands should keep this sediment from returning to the river channel, provide previously unavailable recreational opportunities, and create shallow water fish habitat. The Rock Island District is in the process of preparing long-term Dredged Material Management Plans (DMMPs) for recurrent dredging sites, and the St. Paul District has prepared a draft channel maintenance management plan for its portion of the river.

Comments:

- This study should address dredged material placement activities, especially the formation of beaches. (2)
- Are ways to more efficiently dredge and maintain the channel being sought to deal with increased cost of dredged material placement? (1)
- What is being done with dredged material? Where will it be placed? At what cost? (3)
- Is the Corps considering doing dredging to help businesses and industries impacted by sediments? (1)

22. The Navigation Study needs to address the issue of contaminated sediments, resuspension of these sediments, and the effects on wildlife species.

Response: There is concern that contaminated sediments are resuspended by navigation traffic and dredging activities. The highest levels of contaminants are found in fine particulate sediments. These types of sediments are generally associated with the main channel border and backwater areas. Materials in the main channel are generally coarser particulates which do not readily accumulate contaminants. Consequently, actions like dredging in the main channel are of less concern than actions which stand to increase sediment resuspension in the main channel border and backwaters. The impact of resuspended contaminants will be examined through existing studies, data on contaminant "hotspots," and available literature. Using the sedimentation resuspension results obtained in other studies (Issue 20), the amount of sediment that is resuspended by passing tows can be estimated. A subsequent evaluation of the environmental risk caused by contaminated sediment resuspension will be performed. If unacceptable risks are identified, appropriate steps to mitigate those impacts will be discussed in an EIS.

Comment:

- Will the study address suspended sediments with toxic contaminants and the effect of these sediments on wildlife species? (2)

23. The UMR-IWW system is presently experiencing bank erosion problems which could increase with higher levels of tow traffic. The Navigation Study EIS should address bank erosion concerns as they relate to tow traffic and forecast increases in traffic levels.

Response: Changes in river hydraulics, tow operation, traffic increases, and channel modifications can all result in increased or relocated bank erosion. The Bank Erosion Study will attempt to evaluate the effects of traffic increases and tow operation, resulting induced or changed shoreline erosion patterns, and how these factors affect natural resources. A systematic five-step approach to address the impact of tow traffic on shoreline erosion has been outlined.

Step 1 involved a comprehensive literature search for pertinent data, research, and opinions regarding the process of bank erosion along large rivers like the Mississippi and Illinois. Since erosion is a function of flow velocity, flow quantity, secondary currents, bank materials and covers, and wave energy, all of these factors were included in the literature search. The results of Step 1 established the relative significance of each factor in the process of bank erosion.

System-wide site inspections were made as part of Step 2. A team of experts in the fields of geomorphology, hydrologic engineering, and geotechnical engineering collected data on site location, conditions, soils, cover, bank geometry, and erosion state. Estimates of the present amount of bank erosion attributable to each influencing factor were made and a qualitative estimate of the cultural significance of the shoreline areas was obtained. A classification system of riverine banklines and a corresponding GIS data base is being developed. Erosion rates, due to vessel wakes waves, will be studied at selected sites using unconsolidated

bank materials.

Step 3 will incorporate the results of the earlier steps to address present conditions. Based on these results, a decision will be made whether the influence of commercial navigation on bank erosion can be separated from other sources, such as normal flow velocities or wind-generated waves.

If Step 3 concludes that the effects of navigation can be separated from other causative factors and that the impacts may be significant, Steps 4 and 5 will be completed.

Steps 4 and 5 will predict the without-project and with-project future conditions. This analysis will include configurations typical of the UMR-IWW, such as straight reaches and the inside and outside of river bends. Based on available data and field experiments, predictive tools will be developed for the tow-related forces influencing bank erosion. These will attempt to develop quantitative predictions of total erosion along the river system and create ranges of values for site-specific erosion.

The results of this study will then be incorporated into the EIS, along with recommendations for decreasing bank erosion from incremental traffic increases, and be used to address other concerns like the impact of habitat changes on use and availability to fish and wildlife.

Comments:

- Will the study be examining shoreline erosion caused by the larger wakes created by tows? (11)
- Need to consider the impacts of barge and lock and dam created erosion on home owners along the river. (2)
- Corps should address streambank erosion and protection of private property along the river. (2)
- Corps should move markers away from shore to help reduce erosion. (2)
- Are costs of land erosion being included in the study? (1)

24. The additional studies proposed by the Navigation Environmental Coordination Committee need to be completed and included in the EIS.

Response: The UMR-IWW System Navigation Study, like other Corps of Engineers projects, is required to comply with the National Environmental Policy Act of 1969 (NEPA). This act states that all Federal agencies shall identify and develop methods to ensure that unquantified environmental amenities and values be given appropriate consideration in decision-making along with economic and technical considerations.

As a necessary facet of NEPA compliance, the Corps of Engineers is coordinating the Navigation Study efforts with public, private, State, and Federal interests. From these efforts, concerns have arisen that the environmental studies are not sufficient for NEPA compliance. These concerns resulted in the formulation of a group of conceptual study plans to address additional effects of navigation traffic, cumulative effects of continued operation of the present system, and forecasting the future river environment. Specifically, these plans addressed concerns about macroinvertebrates, induced development, contaminated sediments, wildlife hazing, navigation structures, impoundment and river regulation, fish passage, cumulative impacts of channel maintenance, and forecasting the future environment. Subsequent Corps of Engineers review and consideration of these study plans and of NEPA compliance requirements resulted in the conclusion that additional effort was needed to address the cumulative effects of channel operation and maintenance as it relates to forecast the future without-project condition to make a reasoned choice among alternatives for reducing delays on the system. This review also concluded that no other additional studies were required to be in compliance with NEPA.

During this review, the merits and feasibility of each proposed study were examined. The final decision not to conduct the studies as proposed was based on several factors. It was felt that the direct and secondary environmental effects of any increased traffic on macroinvertebrates, wildlife, resuspension of contaminated sediments, and induced development could be adequately addressed using existing information in combination with an enhanced understanding of the physical effects associated with vessel passage. This position was based in part on the assessment that nearly \$14 million of the \$20 million currently allocated for the environmental component of the Navigation Study was being spent on direct effect studies and a belief that the highest priority data gaps identified to date were being addressed by the current studies. Within the study, \$200,000 has been reallocated to consolidate existing information on direct and secondary effects to address these issues.

It was determined that the cumulative effects of continued operation and maintenance of the UMRS 9-foot channel project as it relates to forecasting the future-without condition was not adequately scoped in the original study plan. To remedy this deficiency, \$1.3 million has been reallocated within the current study to assess the cumulative effects of sedimentation, dredging, and training structures on the environment. Existing information on historic and planned dredged material placement and channel maintenance activities will be consolidated. Using this information, experts in the fields of river dynamics, geomorphology, and ecology will be consulted to arrive at an informed professional opinion on the cumulative impacts of channel maintenance activities. The information will be considered in making a reasoned choice among alternatives being considered in the Navigation Study.

Available historic river bathymetry and riverbed sediment core data combined with additional selective backwater sediment coring and other relevant sedimentation data will be consolidated and reviewed in reaching a professional opinion on the cumulative effects of sedimentation on the environment. This information will be used in forecasting the future river condition in order to choose from among the alternatives for the study. The level of detail and expenditures projected for new data gathering activities proposed in the conceptual study plans were considered cost prohibitive and beyond the needs of the Navigation Study. The time necessary to complete these studies would have caused unacceptable delays in concluding the study as well.

A number of studies outlined, while of considerable merit, were considered to be beyond the scope of the Navigation Study. These include alternatives to improve fish passage and alternative river regulation strategies for environmental enhancement. It is important to note that the Environmental Management Program -

Long-Term Resource Monitoring Program has initiated pilot studies in both of these areas.

In order to fund the above efforts, the following reductions in study efforts were made to the study:

Environmental Study of the Impacts of Recreational Craft	\$200,000
Environmental Math Modeling	\$300,000
Environmental Technical Coordinating Committee	\$100,000
Engineering Large-Scale Measures Analysis	\$100,000
First Detailed Site-Specific Efforts	\$800,000
 Total	 \$1,500,000

Comments:

- Will fish movement through the locks and dams be examined? (3)
- The add-on studies proposed by the Navigation Environmental Coordination Committee should be completed. (6)
- Will the add-on studies be funded? (1)
- The study is inadequate to generate the required information to quantify systemic impacts. (4)
- Explain the NEPA scoping process and the extent of the Corps of Engineers obligation. (2)

25. The Navigation Study should examine the impacts of increased navigation traffic on macroinvertebrates.

Response: In 1988, an EIS was completed for the construction of a second lock at Melvin Price Lock and Dam (formerly Lock and Dam 26). This document identified the need to determine the incremental impacts of increased tow traffic. Based on this, a Plan of Study (POS) was created identifying studies considered appropriate for quantifying impacts of traffic increases and providing a more full understanding of navigation traffic effects on the UMR system. The essential elements of this POS served as the basis for the environmental studies undertaken in the Navigation Study. A study of the effects of commercial traffic on macroinvertebrates inhabiting rock substrates was included in this original POS but was not included in the environmental studies undertaken in the Navigation Study. This decision was based on the increased availability of applicable data from other environmental studies and the relatively low priority given the study in the original POS. The impacts of navigation traffic on macroinvertebrates will still be addressed in the EIS, but will not be the focus of intense field studies. The POS identified two perceived navigation related effects on macroinvertebrates. These effects, displacement through increased velocity and habitat modification from increased suspended sediments, can be examined through other studies. Velocity changes will be estimated using the results from the numerical modeling of the hydraulic effects of navigation traffic in the Physical Effects Study. The results of the Sedimentation of Backwaters and Side Channels Study will be used to identify the impacts of changes in suspended sediments. Using this information, and existing literature on the threshold levels for macroinvertebrate disturbance, the impact of navigation traffic on macroinvertebrates will be discussed and included in the EIS.

Comment:

- What will be the impacts of increased navigation on macroinvertebrates? (1)

26. The Mississippi Flyway plays a very important role in the life history of many waterfowl and neo-tropical migratory birds. The Navigation Study needs to examine the impacts that increased commercial traffic will have on these species.

Response: The impacts of increased commercial traffic on waterfowl and neo-tropical migratory birds will be examined through the use of existing literature. For waterfowl, the biggest concern appears to be that passing tows haze ducks and disrupt feeding activity. This issue will be examined through published research on recorded time-activity budgets, energetics, and flushing rates of waterfowl. Conclusions will be drawn based on available literature. Similarly for neo-tropical migrants, existing literature will be used to identify potential impacts, though few terrestrial impacts are expected as a result of the proposed expansion.

Site-specific habitat assessments are being performed at each site under consideration for improvements. The potential for project impacts to neo-tropical migrants is greatest in these locations. At these sites, the USFWS Habitat Evaluation Procedures are being used to determine impacts. Species selected for this evaluation will likely include both waterfowl and neo-tropical migrants. In addition, the system-wide project impacts to federally threatened and endangered species will be examined in the Biological Assessment required under Section 7 of the Endangered Species Act of 1973, as amended. (See Issue 34.)

Comment:

- Will the study be assessing the impacts to waterfowl and other nesting birds? (5)

27. The Corps of Engineers needs to address the cumulative impacts of both the present and future navigation system in the UMR-IWW system study. This assessment should include an evaluation of the future without-project condition, an analysis of the long-term cumulative impacts of ongoing operation and maintenance (O&M) of the existing 9-foot channel, and a retrospective examination of the river from pre-impoundment to present day.

Response: As a result of coordination with State and Federal agencies, reinforced by public input at the eight Navigation Study public meetings held by the Corps

of Engineers in November of 1994, it became evident that further effort was required to adequately identify the cumulative environmental impacts of the proposed project alternatives on the UMR-IWW system. Specifically, the need to increase the effort to evaluate the future without-project condition and the long-range impacts of any recommended improvements on the future river environment were identified. Completion of these assessments will be required to make a reasoned choice among the alternatives presented in the UMR-IWW System Navigation Study. Three areas of focus have been identified for consideration (backwater sedimentation rates, dredging and dredged material placement, training structure placement).

Backwater sedimentation will be examined using core sampling techniques. The amount of sedimentation that has occurred since impoundment can be measured using soil profile samples taken at backwater sites created by river impoundment. This measurement, averaged over the time since impoundment, produces an annual rate of sediment accrual. This information, coupled with available long-term data on sediment inflow into the UMR-IWW system, will allow estimation of the rate of change in sediment accrual through time and can be used to forecast future sedimentation rates. This work will be supplemented with existing literature and information collected in the sedimentation work underway in other studies. (See Issue 20.)

Existing information and professional judgment will be used to examine the cumulative impacts of dredging. Professional judgment, along with past records of dredged material placement, existing placement sites, long-term placement plans, historic dredge cut sites, historic dredge trends, and ongoing studies, will be employed to estimate future dredging requirements and placement sites. Given these projections, the cumulative impacts of continued dredging to maintain the navigation channel (the future without-project condition) will be evaluated. Although some additional maintenance measures may be required, major changes are not anticipated.

Projections of the future without-project condition will include an examination of the cumulative impacts of navigation structures (wing dikes, closure structures, revetments). A Geographic Information System (GIS) coverage of the navigation structures present in the UMRS is being created. This coverage will contain information on structure type, construction date, modification dates, and rock sizes and amounts. The placement and nature of future structures will be estimated using the professional opinion of Corps of Engineers river engineers. Habitats related to these structures will also be characterized and successional changes will be estimated. This information will be used to predict the cumulative impacts of existing and future navigation structures.

The UMR-IWW System Navigation Study was authorized to assess the need for navigation improvements at 37 locks on the river system and the impacts of these improvements. Changes in channel maintenance practices are not anticipated as a result of increasing capacity expansion on the UMR-IWW. As such, examination of operation and maintenance practices on the UMR-IWW system, other than that which is necessary to assess the cumulative impacts of increasing navigation traffic on the river, does not fall within the scope of this study. Each of the three Corps of Engineers Districts located on the UMRS has a completed Operation and Maintenance (O&M) EIS which was completed in the 1970s. (See Issue 24.)

Comments:

- Why are the cumulative impacts of present system operation not being examined? (5)
- The Corps of Engineers should examine the impacts of present operation and maintenance practices to the navigation system. (19)
- How can you expand when don't know impacts of the present lock and dam system? (2)
- Why does the Corps keep putting rock in the river? (1)
- How can Corps of Engineers justify expansion in light of the ecological destruction at present levels of traffic and dredging? (4)
- The study should examine river from pre-impoundment stage to present day. (7)
- Concern that the riverine ecosystem is being replaced by a lake system. (3)
- Update the EISs from the 1970s. (2)

28. Water control and water regulation issues should be addressed in the Navigation Study.

Response: The Engineering Work Group is addressing the hydraulics impacts of new lock construction on existing discharge and water level regulation patterns. If a plan is recommended that would involve a measure impacting water levels or release rates at a dam, compensating changes would be made so that the water level would remain relatively unaffected. Should significant changes in existing discharge and water level be likely to occur, the results of those changes on the environment will be assessed and included in the EIS.

Currently, the most extreme fluctuations occur below the lock and dam structures as more or less water is released, based on river flow, so that the navigation pool is maintained. Most of the issues related to water level control and regulation fall outside the scope of the Navigation Study. However, individual Corps of Engineers districts have been exploring the concept of alternative water level regulation. The St. Louis District of the U.S. Army Corps of Engineers is presently working within its existing authority to improve riverine habitat conditions. This effort, a result of meetings between the Corps of Engineers, the Missouri Department of Conservation, the Illinois Department of Conservation, and the U.S. Fish and Wildlife Service, culminated in an extended summer drawdown (>20 days) of UMRS Pools 24, 25, and 26 in 1994 and 1995. This drawdown resulted in facilitated vegetation growth, created fish and wildlife habitat, and did not negatively impact navigation operations. Working within the constraints of existing authorities and the timing of natural flow events, the Corps of Engineers will continue to examine and implement these and other environmentally sensitive water level management techniques and strategies. The Rock Island District and St. Paul District are working with State and Federal agencies to develop similar programs. (See Issue 9 on flood control.)

Comments:

- The Corps of Engineers should examine past and future water level regulation. (3)
- Are the pools created by the locks and dams an asset or a detriment to fish and wildlife? (1)
- The study should consider changing the pool control points. (1)

- Has any consideration been given to a drawdown to allow vegetation to grow? (2)
- Why does the water level fluctuate so much? (4)
- The impacts of future water level regulation, caused by the navigation dams on the river's natural hydrologic regime, must be evaluated. (1)
- Will changes to locks affect river levels? (2)
- Won't navigation improvements result in increased flooding? (3)

29. Projected traffic increases for the UMR-IWW will undoubtedly be accompanied by the development of barge fleeting terminals and other facilities on the river system. The EIS should address the impacts these navigation-related areas and activities are likely to produce.

Response: As part of the study, consideration will be given to incremental effects of any additional fleeting and its secondary impacts (e.g., scenic beauty). In support of work being done by the Environmental Work Group, the Economic Work Group will be forecasting barge fleeting requirements. Both historic and existing fleeting facilities will be investigated to identify location, usage, and current fleeting capacity. A GIS data base will be created from this information to facilitate further analysis and extrapolation. Based on this information, a predictive relationship between future traffic and fleeting will be developed. Fleeting projections for both with- and without-project improvements will be estimated. Using with-project projections, the ability of present facilities to accommodate future fleeting needs and the likely location and size of future fleeting sites will be evaluated. This projection will be made in consultation with the waterways industry. Initial examination of fleeting suggests that new facilities would likely occur near presently developed facilities and in combination with previously disturbed areas. Developing in these types of areas would allow new facilities to take advantage of existing infrastructure. (See Issue 36 on conflicts with recreational craft.)

Comments:

- Are increased barge fleeting concerns a part of this study? (1)
- There is already too much barge traffic and parking. (4)
- Should look at the impacts of barge fleeting on scenic beauty, tourism, and environment? (2)

30. The Navigation Study needs to include an economic and environmental evaluation of transportation alternatives other than barge traffic.

Response: As part of the Navigation Study effort, the Economic and Environmental Work Groups are evaluating projected increases in navigation traffic on the UMR-IWW system. This evaluation includes a comparison of the economic and environmental costs of shipping the increased levels of commodities by barge, rail, truck, or by a combination of these modes. The Economic Work Group, as part of their evaluation, will be examining alternative modes of transportation in both the with- and without-project future. Using existing air pollution and fuel usage data and literature supplied by the Tennessee Valley Authority for the study, the Environmental and Economic Work Groups will create a predictive model which will supply fuel use and emissions values for each unit of commodity moved. This model will take into account the mode of transportation and the type of commodity being transported. The pollution created and fuel used by increasing barge traffic will then be compared to the values created by other transportation industries given the equivalent number of rail cars and trucks needed to transport the commodity in the absence of increasing barge traffic.

The Environmental Work Group will then utilize this information to estimate the pollution effects of each mode, or combination of modes, on the environment. These results will be compared, incorporated into the EIS, and used to help formulate final recommendations.

Comments:

- The EIS should include an economic and environmental evaluation of other alternatives to barge traffic. (9)
- The positive environmental benefits of the barge industry should be accounted for (e.g., less pollution and fuel efficiency). (10)
- Will benefits of more efficient fuel usage and lower emissions by barges per weight shipped be identified as environmental benefits? (2)
- Barge transportation is the most cost effective, efficient, and environmentally friendly method. (5)

31. Increased navigation will increase the chances of accidents and hazardous substance spills on the UMR-IWW. The EIS should address safeguarding procedures to avoid and minimize the impacts of accidents and spills.

Response: Many safeguards are already in place to reduce the potential and consequent impact of accidents and hazardous spills. In 1990, Congress passed the Oil Pollution Act (PL 101-380) which requires the phasing out of all single hull oil tankers and prohibits the operation of those tank vessels weighing less than 5,000 gross tons by the year 2015. Most of the oil tankers presently in operation on the UMR-IWW system are already of the double hull construction type. In addition, the U.S. Coast Guard, as the Federal agency charged with monitoring commercial vessel safety and traffic control issues on the inland waterways system, has developed lighting and radar requirements for commercial vessels. Changes in these requirements are beyond the authority of the Corps of Engineers and scope of the Navigation Study.

To lessen the impact of a hazardous pollution spill, contingency measures are already in place. All vessels carrying hazardous cargo in excess of 10,500 gallons are required to develop a vessel response plan. This plan must be Coast Guard approved and is implemented immediately after a spill occurs. The Coast Guard has also developed a hazardous spills response plan which is executed in event of major spills. Should a spill occur, the responsibility of cleanup and costs associated with that cleanup are those of the individual or organization responsible for the spill. If the spill costs exceed the capacity of the responsible party, the Oil Pollution Fund, contributed to by oil companies, covers the remaining cost. In addition, all companies hauling more than 10,500 gallons are required to have accidental spill insurance coverage. Given the extent of present Coast Guard spill procedures and precautions, the EIS will not examine these issues in depth.

The Economic Work Group will be studying accidental spills and their relation to incremental increases in traffic. Using historical data, the location and reason for past spills will be analyzed. From this information, a risk analysis model will be developed and calibrated to forecast the likelihood of future spills based on traffic levels. The Environmental Work Group will then take this analysis and use it to assess the incremental environmental consequences, as they relate to increasing levels of barge traffic.

Comments:

- Can double hulled barges be used to ship hazardous and oil products? (2)
- Will clean up procedures and precautions for spills be addressed in the EIS? (5)
- Who will pay for navigation spills? (1)
- How will the study address concerns about pollution? (4)
- Statistically barges are the safest mode. (3)
- How are the issues of safety being addressed? (3)
- Should look at better lighting on barges to increase visibility. (1)
- Who is in charge of controlling traffic and how fast do barges go? (1)
- Do tows have radar? (1)
- Will a cost/benefit analysis include increased likelihood of toxic spills? (1)

32. How will the Navigation Study consider the effects of increased navigation on fisheries resources of the UMR-IWW?

Response: Ten tasks have been outlined to assess the impact of increased navigation on fisheries resources of the UMR-IWW. These tasks will result in a risk-based assessment of the impacts of increased traffic on the early life stages of fishes, small fishes, and large fishes. This data and information gathered from modeling studies will be used to project the impacts of navigation on present and future fish populations. This information will be used in the development of the Navigation Study EIS and to provide information for development of a mitigation plan, if one is required. The ten tasks are briefly discussed below.

Task 1. Selection of Species for Assessment. A preliminary list of species to be considered for detailed study will be created using the following criteria: commercial or recreational importance, special status, ecological significance, availability of data, life history characteristics, and spawning characteristics. Based on available data, data collection expectations, and comments provided by the NECC and Corps of Engineers biologists, a final list of selected species to be studied will be formulated.

Task 2. Initial Model Selection. To assess the system-wide impacts of increased navigation of fishes in the UMR-IWW, four models have been proposed. These four models (Proportional Mortality Model, Equivalent Adult Loss Model, Recruitment Foregone Model, Production Foregone Model) all estimate various measurements of population losses in terms of adults. During the course of the study, these models will be expanded to include other information of significance like tow configuration, hydrodynamic information, traffic patterns, and fish distributions.

Task 3. Model Evaluation. Using the preliminary species list identified in Task 1 and the Equivalent Adult Loss Model (EALM), screening calculations will be performed to determine which species should continue to be studied. These calculations will be performed using available UMRS data, professional judgment, and in the absence of complete data, conservative parameter values (presumes maximum impact of navigation). Also included in the task will be a test of each model's sensitivity to individual parameters of interest and an examination of correlated parameters.

Task 4. Sampling Design for Entrainment Studies. To ensure interpretable and representative results, a number of key design points must be included. These design points, including season, tow direction and load, and study area, originally numbered 192. This task will reduce that number to a manageable level while considering other factors like towboat configuration and logistic and safety problems.

Task 5. Entrainment Effects on Early Life Stages. Through both field and modeling studies, this task will estimate the number of eggs and larvae of selected target species which are killed per kilometer traveled by a tow. In addition, the effect of vessel passage and subsequent drawdown impact on fish eggs and larvae in the shallow littoral zones will be estimated.

Task 6. Entrainment Effects of Small Fishes. Similar to Task 5, the number of small fish (2.5-15 cm) killed per kilometer traveled by tow will be estimated by field sampling behind passing barges.

Task 7. Entrainment Mortality of Large Fishes. Field studies will be initiated to assess the mortality of large fishes (greater than 15 cm) per kilometer traveled by tow. These results, along with the results obtained in Tasks 5 and 6, will be used to calculate risk-based assessments to fish of increased navigational traffic.

Task 8. Effects of Increased Navigation on Overwintering Fish. At lower water temperatures, many river fishes require low velocity habitats for overwintering. Laboratory studies will assess the effect of barge-related fish displacement from overwintering habitat. Field studies also will be conducted to develop a relationship between vessel distance and the effect on overwintering habitat. These studies will be used in conjunction with mathematics models to assess the impacts of increasing traffic on overwintering fish.

Included within Task 8 is an objective to identify known or likely areas of spawning habitat for fishes in the UMR-IWW. Using available information which defines suitable spawning habitat for fishes selected in Task 1, field surveys, and remote sensing information, a map of suitable spawning habitat will be created for each species. These areas will then be compared to areas of increased tow activity to estimate spawning habitats at risk.

Task 9. Data Analysis and Risk Characterization. Using the acquired data and aforementioned modeling approaches, the distributions of mortality and equivalent adult loss will be determined. These distributions will then be used to estimate the risk of various degrees of impact of navigation on present and future mortality. Mitigation requirements, if any, will be based upon these results.

Task 10. Data Quality. To assure technical consistency across the many studies under way in the Navigation Study, a standard methodology will be used. For this study, it was determined that the sampling and data management methodology outlined by the Long- Term Resource Monitoring Program (authorized under the Water Resources Development Act of 1986 as an element of the Environmental Management Program, EMP) would be used.

Comments:

- What will be the impact of increased navigation on larval fish? (2)
- What will be the impact of increased navigation on fishing? (7)
- What effect will large towboats have on fish populations? (1)
- What will be the impact on fish spawning due to loss of fish habitat? (2)
- Will modeling assess fish entrainment through boat props? (1)

33. The Navigation Study needs to address the impacts of increased navigation traffic on mussels and needs to examine the effect on the spread of zebra mussels.

Response: As a result of the EIS prepared for the second lock at Melvin Price Lock and Dam, personnel from the U.S. Fish and Wildlife Service and the Corps of Engineers determined that a monitoring program should be initiated to assess the impacts of projected traffic levels on the federally endangered mussel *Lampsilis higginsii*. Since *L. higginsii* is a rare species, surrogate species and mussel community indices are being evaluated. This study, started in 1988, is in accordance with the Endangered Species Act, Section 7. This field study is examining changes in water velocity and suspended solids originating from navigation traffic on biological factors like mussel species richness, density, diversity, and growth. Long-term monitoring of five selected mussel beds will continue until the year 2040. The results of this study are presently released annually.

This work is directly applicable to the Navigation Study, and the data and conclusions derived from this continued monitoring will be used in the study to assess impacts of future navigation traffic. Within the Navigation Study there is a laboratory study being conducted (with field verification of results), the Environmental Effects of Movements of Commercial Navigation Vessels on Mussels. This study will examine the effects of elevated turbulence and suspended solids on selected mussel species. Using this field verified laboratory data, other field data, and GIS information, a model will be developed which forecasts the navigational effects on mussels resources of the UMRS.

Since their initial invasion, zebra mussels have been the focus of extensive study and research. Using the published results of this research, the relationship between increasing navigation traffic and the potential spread of zebra mussels will be discussed in the EIS.

Comments:

- How will navigation increases affect the mussel industry? (2)
- What will be the impact of increased traffic on zebra mussels? (2)

34. The impacts of future improvements on endangered species need to be examined and included in the Navigation Study EIS.

Response: In order to be in compliance with Section 7 of the Endangered Species Act of 1973, as amended, the Corps of Engineers has requested and received a list of federally threatened and endangered species and a list of species proposed for Federal listing. These lists, furnished by the U.S. Fish and Wildlife Service, include those species which occur in the vicinity of the UMR-IWW System Navigation Study area. Using these lists as a guide, the Corps of Engineers will prepare a Biological Assessment to determine the potential for impact of the proposed project on each species. This Biological Assessment will be completed in coordination with the USFWS and included in the EIS. In the event that a species is found to be negatively impacted by a potential project, the Corps of Engineers will make every effort to avoid and minimize that impact.

Comment:

- How will future improvements impact endangered species? (1)

35. The study should examine the impact of increased navigation on aquatic vegetation.

Response: Aquatic plants in the UMR-IWW serve as shelter and nursery areas for fish, provide food and cover for water birds, and influence water quality. Changes in current velocity, increases in suspended sediments, and navigation-induced waves can all potentially impact aquatic plants. As such, it is important that the impacts of increased navigation on aquatic plant communities be examined. Based on the recommendations of a technical work group formed of river hydrologists and aquatic biologists, three tasks were outlined for study.

Task 1 assessed the impact of changes in current velocity and navigation-induced waves on aquatic plants. This laboratory experiment was conducted using a

large hydraulic flume in which water velocities and waves were created at the same scale as those waves and currents generated by passing recreational and commercial traffic. Live plants representative of UMR-IWW species were placed in the flume and exposed to a variety of wave and velocity regimes to determine thresholds of currents and wave energies that induce adverse impacts, like uprooting and fragmentation. For comparison, tensile strength measurements were taken on both test plants in the laboratory and wild plants in the field.

Passing tows and recreational watercraft often will resuspend sediment. This resuspension may hamper plant survival. Task 2 will assess the impact of sediment resuspension on aquatic plants. Through both laboratory and field experiments, the effects of sediment deposition and changes in light availability, resulting from suspended sediments, on aquatic plants will be determined.

Task 3 will assess the impacts of velocity, waves, and suspended sediments on the ability of plants to propagate. The effects of these navigation-induced forces on fragmentation, seed dispersal, and propagule dispersal will be examined.

Should adverse effects of navigation on aquatic plants be demonstrated, steps to avoid and minimize these impacts could be undertaken. These steps could include efforts such as acquiring aerial photography of representative reaches and habitats of the UMRS, transferring this information to GIS, and outlining existing concentrations of aquatic plants likely to be negatively impacted by increased traffic. System-wide strategies could then be developed to decrease impacts in these types of areas.

Comments:

- What has happened to vegetation growth on the river? (3)
- What effect will sediment resuspension have on primary productivity and food chain? (1)
- What effect will sediment resuspension have on plants? (1)

36. The impacts of recreational boating on the UMR-IWW system should be examined. This examination should include the increased potential for conflicts and safety concerns between recreational boat and navigational traffic using the system.

Response: The Economic Work Group will be addressing navigational conflicts between commercial and recreational craft at the locks. Two issues in particular, boater safety and lockage delays, will be examined. Impacts of any expected user conflicts will be identified (based on existing conditions and projections of future conditions) and potential measures to reduce or minimize impacts will be considered and included in the EIS.

Using data collected from public safety, law enforcement, and recreation management officials, the Economic Work Group will determine the probability of increased accidents and safety conflicts between commercial traffic and recreational boaters. Measures to reduce safety-related conflicts will be identified and included in the EIS. Potential commercial and recreational user conflicts at the locks will also be examined using previously collected data and historical trends. If future conflicts or delays are identified, measures to reduce these conflicts will be recommended in the EIS.

The impacts of recreational traffic on riverine habitat also are being examined. The impact of passing recreational vessels on selected habitats will be determined in the field using wave gages and suspended sediment sampling stations. By combining the hydraulic classification of aquatic areas, forecasts of future boating activity, and model vessel physical effects data, math models will be developed to predict the effect of recreational vessels on the riverine environment. (See Issue 29 on fleeting and Issue 68 on measures to address recreational craft conflicts.)

Comments:

- The Navigation Study should address potential increase in conflicts and safety concerns between commercial navigation and recreational users. (11)
- Will information/impacts of recreational boating be examined? (6)
- Most accidents are caused by careless boaters. (1)

37. The Corps of Engineers needs to completely examine all alternatives to lock capacity expansion. This examination should include removing the present lock and dam system as an alternative.

Response: The Corps of Engineers is assessing the need for navigation improvements in consideration of delays to commercial navigation traffic at locks on the Illinois Waterway upstream through the Thomas J. O'Brien Lock and Dam and on the Upper Mississippi River upstream of the Melvin Price Lock and Dam. The study team will examine the removal of the present lock and dam system. However, data available from the reconnaissance studies show that there are significant national benefits in operating the navigation system. These benefits are based on the tremendous national economic benefits lost if commercial navigation traffic is eliminated and the high cost of removing the lock and dam infrastructure. Due to the existence of these benefits and costs, the removal of the present system does not appear to be a feasible alternative and only limited study resources will be directed to studying this alternative. In addition, the Federal interest in the waterways system has been demonstrated by Congress' ongoing commitment to maintaining the current system through appropriations for major rehabilitation work and operation and maintenance.

Comments:

- The study should consider removing the locks and dams as an alternative. (6)
- Can computers be used to illustrate what the Mississippi would look like without levees and dams? (1)

- The baseline for the study should be the river without locks and dams. (3)
- Consider phasing out traffic. (1)

38. The Navigation Study needs to address the impacts of increased navigation on wetlands.

Response: Wetland habitat is an important and limited resource along the UMR-IWW system. As such, the effect of increasing navigation traffic on wetland habitat will be addressed in the Navigation Study. The greatest potential for impact to riparian wetlands will occur as a result of construction-related activities associated with large-scale enhancements (see Issue 72). The impacts of potential enhancements to riparian wetlands are being examined by a special work group, the Habitat Assessment Team (HAT), which consists of personnel from the U.S. Fish and Wildlife Service (USFWS) and the Corps of Engineers. This team, with input from state resource agencies, has developed a list of resources of concern (which includes wetlands) and a list of important species (which includes species which use or require wetland habitat). This team has begun conducting site visits to determine whether wetlands are located on the potentially impacted areas. Using data collected at these sites, the USFWS Habitat Evaluation Procedures will be used to gauge the environmental impacts associated with potential enhancements. In the event that significant impacts to a wetland are identified, efforts will be made to avoid or minimize those impacts. If impacts cannot be avoided, a mitigation plan will be developed.

Comment:

- Will you be assessing the impact on wetlands? (5)

39. The use of risk assessment techniques in the navigation studies needs to be clearly explained.

Response: Risk assessment is a statistical technique used to determine the probability of the occurrence of any specified event. This probability is conditionally based on the current or anticipated state of the UMR-IWW system and our incomplete understanding of this system. Uncertainties that could enter into our environmental assessment include incomplete data, incomplete understanding, natural variability, and imprecisely known parameter values. Risk assessment examines these uncertainties and includes them in the quantification of impacts. The risk-based approach also preserves the distributional nature of the data to assist decision makers in understanding the uncertainties related to the occurrence of an event.

Risk assessments techniques, while relatively new to the ecological disciplines, are commonly used in other disciplines like construction, insurance, engineering, and medicine. This study will be using a framework for ecological risk assessment similar to that produced by the U.S. Environmental Protection Agency (EPA). Briefly stated, there are four basic components to risk assessment: problem formulation, exposure analysis, effects analysis, and risk characterization.

In the problem formulation stage, the specific ecological resources at risk and the nature of the impacts that pose the potential risks are identified (i.e., what is the probability that a 50 percent increase in commercial navigation will result in a local extinction of any freshwater mussel species in the UMRS?).

The purpose of exposure analysis is to quantify, to the greatest extent possible, the range of factors which could impact the resources of concern. For example, when examining potential impacts to fish, different tow/propeller designs, direction of travel, and season, in varying combinations, would all provide different levels of impact. Exposure analysis helps identify these differences.

The purpose of effects analysis is to develop a relationship between the magnitude of the potential disturbance and the expected ecological response. For the Navigation Study, this relationship would be developed as a function that quantifies the impact on a resource (e.g., fish, in relation to a measure of disturbance and the anticipated number of tows).

The final step is risk characterization. This step integrates the exposure and effects analyses and produces probability estimates for the concerns identified in the plan formulation stage. In addition, in this step the uncertainties associated with the risk assessment, and a relative importance of these contributing factors, are described and quantified. This step allows us to put bounds of confidence on our environmental impact assessments. Using the example from above, this step could result in a conclusion of this form: There is 5 to 15 percent chance of a freshwater mussel extinction occurring in the impact area with a 50 percent increase in navigation traffic.

Much of the impact assessment work being done for the Navigation Study will use risk assessment techniques. This decision was based on the belief that risk assessment, with its consideration of uncertainty, provides one of the most technically defensible approaches to impact assessment in situations, like the UMR-IWW system, where an incomplete understanding of the system and sparse data is the case and is likely to remain the case. Rather than bypassing this fact, these techniques will allow us to optimize our utilization of the information that does exist.

Comment:

- Risk assessment is only being used as a way to bypass fact that not enough information exists. (1)

40. Many areas of concern about the river cannot be fully addressed as part of the Navigation Study. How are environmental, multiple use, and long-term management issues being addressed outside of the Navigation Study?

Response: The UMR-IWW System Navigation Study was authorized to assess the need for navigation improvements at 37 locks on the river system and the

incremental impacts of additional traffic. While this scope limits the topics and areas addressed as part of the study, the Corps of Engineers is involved in a number of other programs and partnerships that are looking at the river system in a broader, more environmental management context.

The Upper Mississippi River System - Environmental Management Program (EMP) was authorized by the Water Resources Development Act (WRDA) of 1986 (Public Law 99- 662). The program includes Long-Term Resource Monitoring, Habitat Rehabilitation and Enhancement Projects, Navigation Traffic Monitoring, and assessment of Economic Impacts of Recreation. The mission of the Long-Term Resource Monitoring Program is to provide decision makers with the information needed to maintain the Upper Mississippi River System as a sustainable large river ecosystem, given its multiple use character. The long-term goals of the program are to study the system, examine resource trends and impacts, develop management alternatives, manage information, and develop useful products. The Habitat Rehabilitation and Enhancement Projects are proposed and prioritized by the U.S. Fish and Wildlife Service and State resource agencies. They primarily address backwater and side channel sedimentation problems. The Corps of Engineers, in cooperation with these agencies, plans, designs, and constructs these habitat projects.

As part of the WRDA of 1986, Congress created the Section 1135 Program. This program authorizes structure changes or operational modifications at completed Corps of Engineers projects that improve the quality of the environment through the restoration of fish and wildlife habitat. The Corps of Engineers is actively pursuing projects under this authority. Projects have included efforts such as mast tree plantings at locations along the Upper Mississippi River, a water control structure for improved habitat management, and wetland enhancement to increase the quantity and quality of habitat for waterfowl, fish, and other wildlife.

Section 306, WRDA of 1990, authorized the Secretary of the Army to include environmental protection as one of the primary missions of the Corps of Engineers. The Act supports the Corps' pursuit of opportunities to protect and restore existing ecological resources and their values in conjunction with planning for new projects and in the operation of existing projects. Within the Civil Works Program, priority will be given to projects which restore degraded ecosystem functions and values, including hydrology, plant and animal communities, to a less degraded ecological condition.

The Upper Mississippi River Summit, although in its preliminary stages, is an initiative to bring various "stakeholders" of the Upper Mississippi River System together to lay out a course for sustaining the integrity of the river system. The draft objective for the summit is:

Design a multi-interest strategy to evaluate alternatives, educate the public and decision makers, and implement the actions necessary to assure the long-term sustainability of multiple river users. Such a strategy should include both realignment of existing programs and studies, as well as new initiatives to address unmet needs.

The Corps of Engineers, along with representatives from the U.S. Fish and Wildlife Service, the U.S. Environmental Protection Agency, the Upper Mississippi River Basin Association, the Upper Mississippi River Conservation Committee, the Midwest Area River Coalition (MARC) 2000, American Rivers, and others, are involved in planning this initiative. The Upper Mississippi River Summit meeting currently is scheduled to be held in February of 1996.

At the Navigation Study Reconnaissance Review Conference on December 9-10, 1992, the Acting Assistant Secretary of the Army for Civil Works indicated that the Corps of Engineers also would be willing to conduct additional environmental study efforts, beyond NEPA requirements for the Navigation Study, at a 50/50 cost share with interested sponsors. As of this writing, that opportunity is still available to a non-Federal sponsor.

In view of issues outside the scope of the UMR-IWW System Navigation Study raised to date and similar issues raised in other areas of the country, initial discussions are taking place within the Corps of Engineers to evaluate the need for and benefits of initiating a Large River Research and Development Program as part of the Corps research and development efforts. The focus of the initiative would be to further identify and research large river ecological issues.

Although the scope of the Navigation Study is limited in focus, the Corps of Engineers is actively involved in a number of other initiatives and programs which address more specifically the broader multiple use issues and environmental management of the river system. The majority of these efforts involve extensive coordination with other agencies and interests and should complement those of the Navigation Study.

Comments:

- How will the Corps of Engineers address environmental issues not covered by the navigation study? (1)
- What should really be evaluated and decided is what is the priority for this river (e.g., navigation, environmental preservation, recreation)? (2)
- How do we make comments on big picture issues of the river that go beyond just navigation? (1)
- USFWS, NBS, EPA, USDA, and the State's DNRs should join forces to develop a true multi-purpose approach to managing the Mississippi River. (1)
- River should be managed as a multiple use asset. (8)
- Study should not progress until results from LTRM studies of Mississippi Master Plan have been completed. (1)
- Managed as a multiple use asset and money spent on repairing the damage done by erosion and siltation of backwaters not on new locks. (1)
- Should not let this resource be controlled by one industry's needs; need better management before traffic is expanded. (1)

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[Last modified 7 Aug 1997]