

# Interim Report

## for the Restructured Upper Mississippi River - Illinois Waterway System Navigation Feasibility Study

*“To seek long-term sustainability of the economic uses and ecological integrity of the Upper Mississippi River System ”*



**US Army Corps  
of Engineers®**



## Executive Summary

The Upper Mississippi River and Illinois Waterway (UMR-IWW) System Navigation Study has been restructured to give equal consideration of fish and wildlife resources and navigation improvement planning consistent with recommendations from the National Research Council and the Federal Principals Group. This Interim Report summarizes the results of the navigation feasibility study to date and provides a framework for completing the study as restructured to ensure the UMR-IWW system continues to be a nationally significant ecosystem and a nationally significant commercial navigation system. The restructured study will address the navigation efficiency needs of the UMR-IWW, the ongoing cumulative effects of navigation, and the ecosystem restoration needs with a goal of attaining an environmentally sustainable navigation system. This Interim Report is not a decision document. The full economic and environmental evaluations necessary to support a potential recommendation for construction of navigation improvements and implementation of ecosystem restoration measures will be contained in the final feasibility report scheduled for completion in 2004.

A collaborative process has been applied in restarting the restructured navigation study and preparing the Interim Report. An important aspect of this collaboration is the Federal Principals Group that was established to assist the Corps in formulation of guidance and oversight. In addition to the U.S. Army Corps of Engineers, the Principals Group consists of senior level representatives of the U.S. Department of Agriculture, U.S. Fish and Wildlife Service, Environmental Protection Agency, and the Maritime Administration. The Federal Principals Group has endorsed the framework for the restructured study and a Federal Principals Group Position paper is attached to this executive summary. Collaboration has also been emphasized on the regional level to include other Federal agencies, state agencies, the public, and economic and environmental non-governmental organizations. A listing of these participating agencies and organizations is also attached to this executive summary.

Initial plan formulation activities outlined in this report include the establishment of goals and objectives, scenarios of future conditions, identification of navigation improvement and ecosystem restoration measures, description of the evaluation process, and identification of implementation issues.

**Goals and Objectives.** Successful adaptive management of the UMR-IWW will require stakeholder participation in establishing basic goals and objectives for the system. Stakeholders have agreed that the over-riding goal is to develop a plan for sustainable communities, economies, and ecosystems. The definition of sustainability was collaboratively developed and reads:

**“The balance of economic, ecological and social conditions so as to meet the current, projected and future needs of the Upper Mississippi River System without compromising the ability of future generations to meet their needs.”**

The stakeholders of the system will be engaged in further development of the goals and objectives for the system in the feasibility study.

**Scenarios of Future Conditions.** A scenario-based approach has been employed to address the uncertainty of forecasting transportation demand 50 years into the future. This approach was suggested by the Federal Principals Group and represents a range of plausible alternative views of the future demand for waterway traffic on the system. A set of drivers was developed including world trade, crop area, crop yield, and consumption. These drivers were varied with respect to trends, policies, conditions, and events that could impact the U.S. agricultural sector export markets. Each of these scenarios represents a “without project” condition that will be used in evaluating alternative plans in the feasibility study.

**Navigation Improvement and Ecosystem Restoration Measures.** This report outlines those navigation improvement and ecosystem restoration measures that will be carried forward for evaluation. These include nonstructural measures such as congestion fees and traffic management, and structural measures such as guidewall extension, lock extensions, and new locks. Ecosystem restoration measures include those beneficial adjustments to system operation and maintenance, ecosystem restoration opportunities, and environmental enhancement opportunities related to the navigation system. Examples of these measures include traffic impact prevention and reduction; channel modifications; systemic fish passage and water level management; backwater, secondary channel, and island rehabilitation.

**Evaluation Process.** Alternative plans will be developed by combining measures representing progressive levels of navigation investment in both nonstructural and structural measures and progressive levels of investment in environmental restoration measures to meet identified restoration goals and objectives. The Interim Report describes a process of combining these navigation and environmental measures into alternative plans and evaluating the economic and environmental performance of these plans using the scenarios and environmental goals and objectives. This process will provide decision makers the information needed to make an informed recommendation on implementation of modifications to the Upper Mississippi River and Illinois Waterway System. Criteria that would be used by decision makers include the degree to which the alternative plan or combination of alternative plans contribute to national economic development and national ecosystem restoration under a range of scenarios, the relative risk of selecting or not selecting the plan, the degree to which the plan is supported by a wide range of interests, and the flexibility and adaptability of the plan.

**Implementation Issues.** Implementation issues related to authorization, funding and cost sharing, integrated management, scenario development, economic modeling, and adaptive management have been identified in this report. Preliminary conclusions on these issues are provided, although final conclusions and recommendations will be provided in the feasibility report.

1 July 2002

## **INTERIM REPORT FOR THE UPPER MISSISSIPPI RIVER AND ILLINOIS WATERWAY SYSTEM RESTRUCTURED NAVIGATION STUDY**

### **FEDERAL PRINCIPALS GROUP POSITION**

1. This document reflects the position of the Federal Principals Group on the status of the restructured navigation study and the framework for completion of the feasibility study as outlined in the Interim Report. These positions do not in any way limit the prerogatives of any of the member Federal agencies or preclude the agencies from providing additional comments on the Interim Report.
2. The Principals Group finds that the framework for completion of the feasibility study presented in the Interim Report is consistent with the Principals Group 25 June 2001 guidance for restructuring the navigation study. Pursuant to that guidance, the Interim Report does not present recommendations to Congress for consideration in the Water Resources Development Act of 2002 and is not a decision document. The full economic and environmental evaluations necessary to support a potential recommendation for construction of navigation improvements or implementation of ecosystem restoration measures have not been completed.
3. The Interim Report provides a framework for addressing the cumulative environmental effects of navigation and the needs for ecosystem restoration as an integral part of the restructured navigation study with a goal of an environmentally sustainable navigation system. The Principals Group endorses adding ecosystem restoration as an authorized purpose of the Upper Mississippi River and Illinois Waterway Navigation System and supports the concept of developing an implementation plan for ecosystem restoration which incorporates both 100% Federal and cost-shared components.
4. The Principals Group endorses the scenarios presented in the Interim Report as capturing a plausible range of future navigation system traffic over a 50-year horizon. The Principals Group recognizes that the Interim Report commits to integrating an adaptive management concept in formulating and implementing navigation improvement and ecosystem restoration plans. The Principals Group supports continued monitoring and analysis of environmental and economic conditions and responses to assure that the plans for navigation improvements and environmental restoration are efficient and effective and appropriately modified and adjusted to meet changing conditions and emerging science.
5. The Principals Group is aware of the controversy surrounding the development of a spatial equilibrium model for the economic evaluation of navigation improvements. The Principals reviewed the findings of the National Research Council and, while endorsing these findings, concluded that a fully developed and tested spatial equilibrium model was unlikely to be

achieved in a reasonable timeframe for feasibility study completion consistent with stakeholder and congressional expectations. The Principals support use of existing economic models while research and development on improved models moves forward but within the context of an adaptive management process that would review study results as new models are developed, tested, and accepted. The Principals also note that the recommendation development process for the feasibility study will recognize the high level of uncertainty surrounding projections of navigation system traffic and anticipate that decision makers will seek alternative plans that are justified under a wide range of future system traffic conditions and enjoy a broad level of stakeholder support.

6. The Principals Group approves the process of developing a range of measures representing progressive levels of navigation investment in both nonstructural and structural measures. The Group also concurs with the process of formulating environmental restoration measures to reflect progressive levels of investment in meeting identified restoration goals and objectives. The Interim Report describes a process of combining these navigation and environmental measures into alternative plans and evaluating the economic and environmental performance of these plans using the scenarios and environmental goals and objectives. The Principals Group believes that the successful implementation of this process should provide decision makers the information needed to make an informed recommendation on implementation of modifications to the Upper Mississippi River and Illinois Waterway system. Criteria that would be used by decision makers include the degree to which the alternative plan or combination of alternative plans contribute to national economic development and national ecosystem restoration under a range of scenarios, the relative risk of selecting or not selecting the plan, the degree to which the plan is supported by a wide range of interests, and the flexibility and adaptability of the plan.

7. The Principals Group applauds the collaborative process in restarting the restructured navigation study and preparing the Interim Report and encourages continued collaboration in the completion of the feasibility study and implementation of the resulting recommendations.

8. Assuring the continuation of the Upper Mississippi River and Illinois Waterway Navigation System as a nationally significant transportation system and ecosystem resource will necessitate the involvement of all the Federal agencies making up the Principals Group. The opportunities and approaches for leveraging the authorities and programs of all the involved Federal agencies should be explored as the study progresses.

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American Rivers  
American Waterway Operators  
Audubon Society  
Illinois Department of Natural Resources  
Illinois Department of Transportation  
Iowa Department of Agriculture  
Iowa Department of Natural Resources  
Iowa Department of Transportation  
Midwest Area River Coalition 2000  
Minnesota Department of Agriculture  
Minnesota Department of Natural Resources  
Minnesota Department of Transportation  
Mississippi River Basin Alliance  
Missouri Department of Conservation  
Missouri Department of Natural Resources  
Missouri Department of Transportation  
National Corn Growers Association  
The Izaak Walton League of America  
The Nature Conservancy  
U.S. Army Corps of Engineers  
U.S. Department of Agriculture  
U.S. Department of Transportation, Maritime Administration  
U.S. Fish and Wildlife Service  
U.S. Geological Survey  
U.S. Environmental Protection Agency  
Upper Mississippi, Illinois and Missouri River Association  
Upper Mississippi River Conservation Committee  
Upper Mississippi River Basin Association  
Wisconsin Department of Natural Resources  
Wisconsin Department of Transportation  
Wisconsin Governor's Office

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# 1 INTRODUCTION

## 1.1 Purpose.

This document is an interim report of the Upper Mississippi River and Illinois Waterway System (UMR-IWW) Navigation Study. The Study has been restructured to give equal consideration of fish and wildlife resources along with navigation improvement planning. The new study will be comprehensive and holistic as it considers the multiple purposes of this system, and will thus seek a robust strategy that will work well under a variety of scenarios. This Interim Report provides a history of past study activities, the purpose of the restructuring, initial plan formulation activities including establishment of goals and objectives, and identification of implementation issues. This report provides a blueprint for moving forward with the feasibility study to ensure the Waterway System continues to be a nationally treasured ecological resource as well as an efficient national transportation system by seeking ways to:

- Provide an efficient National Navigation System,
- Achieve an environmentally and economically sustainable system,
- Address ecosystem and floodplain management needs related to navigation, and
- Operate and maintain the System to ensure economic, environmental, and social sustainability.

The restructured study and this Interim Report are being accomplished under a new spirit of collaboration among the stakeholders of the Upper Mississippi River and Illinois Waterway System.

The guidelines for the development of this Interim Report provided the opportunity to identify short-term measures that could be recommended for implementation prior to completion of the Feasibility Study. This document does not, however, contain recommendations for moving forward with short-term measures. The economic and environmental evaluations are not sufficiently complete to recommend measures for navigation or ecosystem improvement measures.

## 1.2 Study Authority.

Authority for the Upper Mississippi River-Illinois Waterway System Navigation Study (the Navigation Study) is contained in Section 216 of the Flood Control Act of 1970 (Public Law 91-611) which states:

“The Secretary of the Army, acting through the Chief of Engineers, is authorized to review the operation of projects the construction of which has been completed and which were constructed by the Corps of Engineers in the interest of navigation, flood control, water supply, and related purposes, when found advisable due to significantly changed physical or economic conditions, and to report thereon to Congress with recommendations on the advisability of modifying the structures or their operation, and for improving the quality of the environment in the overall public interest.”

### **1.3 Description of the Study Area.**

The study area comprises the upper and middle portions of the Mississippi River and the entire Illinois Waterway (Figure 1). More specifically, it is defined as the segment of the Mississippi River from the confluence with the Ohio River, River Mile 0.0, to Upper St. Anthony Falls Lock in Minneapolis-St. Paul, Minnesota, River Mile 854.0. The Upper Mississippi River (UMR) has a length of 663 miles, extending from north of Minneapolis, Minnesota to the confluence with the Missouri River north of St. Louis. There are 28 dams with locks on the Upper Mississippi reach. The Middle Mississippi River, approximately 195 miles from the mouth of the Missouri River to the mouth of the Ohio River, is also in the study area, but contains only one lock facility, Locks 27 in the Chain of Rocks Canal near St. Louis. The Illinois Waterway extends from its confluence with the Mississippi River at Grafton, Illinois, River Mile 0.0, to T. J. O'Brien Lock in Chicago, Illinois, River Mile 327.0. There are eight dams with locks on the Illinois Waterway. The study area includes approximately 1,200 miles of navigable waterway in total. The study area lies within portions of Illinois, Iowa, Minnesota, Missouri, and Wisconsin.

The UMR ecosystem includes the river reaches described above, as well as the floodplain habitats that are critically important to large river floodplain ecosystems. The total acreage of the river-floodplain system exceeds 2.6 million acres of aquatic, wetland, forest, grassland, and agricultural habitats. The Mississippi Flyway is used by more than 40% of the migratory waterfowl traversing the United States. These Trust Species and the threatened and endangered species in the region are the focus of considerable Federal wildlife management activities. In the middle and southern portions of the basin, the habitat provided by the mainstem rivers represents the most important and abundant habitat in the region for many species.

The total Illinois Waterway and Mississippi River Navigation System contains 37 lock and dam sites (43 locks), over 650 manufacturing facilities, terminals, and docks, and provides valuable habitat and recreational opportunities. The system provides:

1. A means for shippers to transport millions of tons of commodities within the study area—122 million tons on the Mississippi River and 44 million tons on the Illinois Waterway in 2000,
2. Food and habitat for at least 485 species of birds, mammals, amphibians, reptiles, and fish (including 10 federally endangered or threatened species and 100 state listed species),
3. Almost 285,000 acres of National Wildlife and Fish Refuge,
4. Water supply for 22 communities and many farmers and industries,
5. A multi-use recreational resource providing more than 11 million recreational visits each year, and
6. Cultural evidence of our Nation's past.

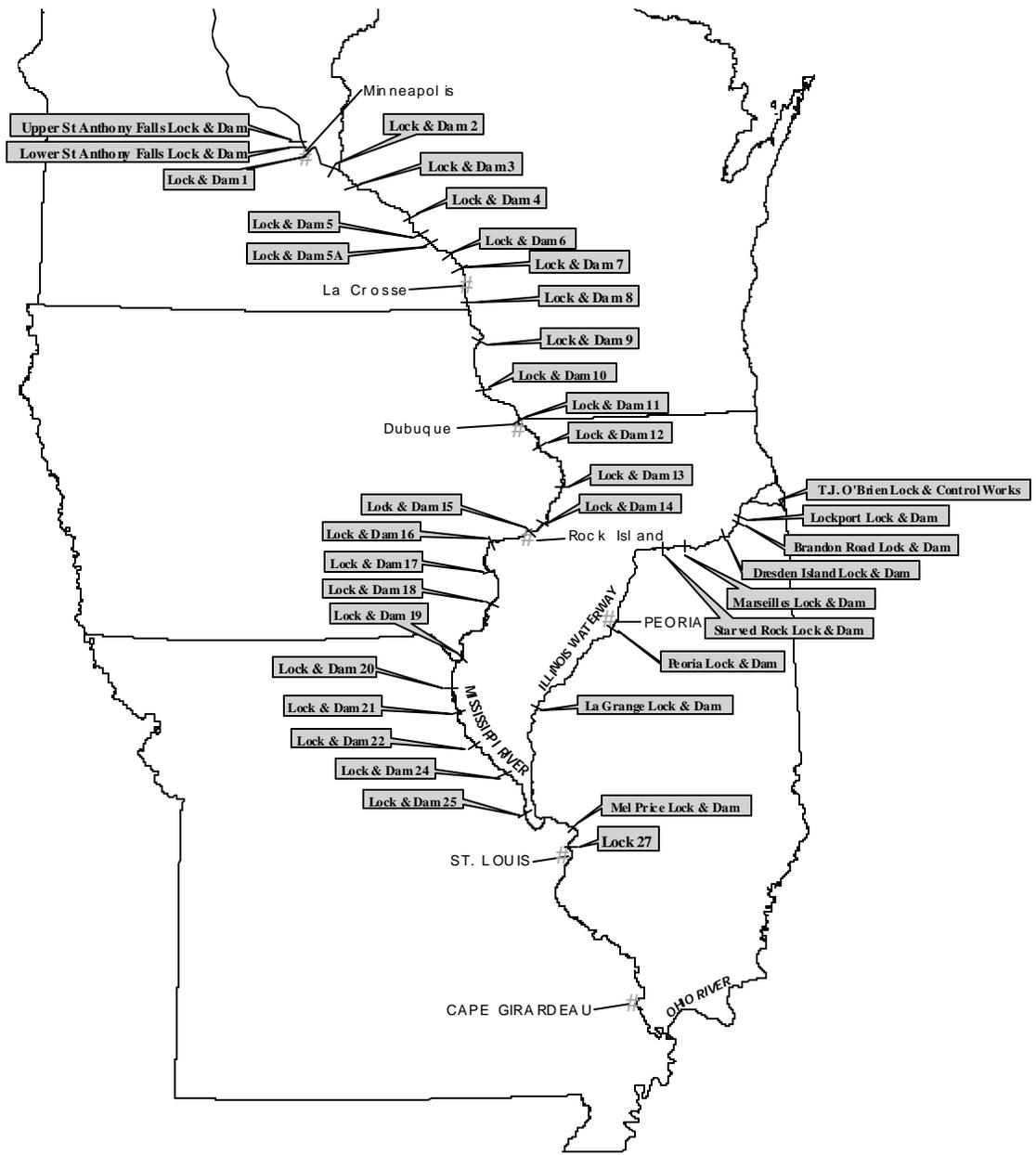


Figure 1. Upper Mississippi River Navigation System.

Section 1103 of the Water Resources Development Act of 1986 (WRDA 86; Public Law 99-662) recognized the Upper Mississippi River system “as a nationally significant ecosystem and a nationally significant commercial navigation system.” The Mississippi River locks and dams are listed on or are eligible for listing on the National Register of Historic Places in recognition of their significance to the Nation’s historic development.

#### **1.4 Historical Overview of the Upper Mississippi River Navigation System.**

##### 1.4.1 Navigation

The UMR provides more than 850 miles of navigable river extending from Minneapolis-St. Paul to the confluence with the Ohio River at Cairo, Illinois. The Federal Government began constructing navigation improvements on the Upper Mississippi as early as the 1820’s. These initial efforts consisted primarily of removing snags, shoals, and sandbars; excavating rock ledges; and closing off meanders, sloughs, and backwaters to confine flow to the main channel. In 1878, Congress authorized the first comprehensive project on the UMR—a 4-1/2-foot channel. In 1907, Congress authorized a 6-foot channel. In the next two decades, Locks and Dams 1 and 2 and what is now Lock and Dam 19 were authorized. Since 1927, when Congress authorized the 9-Foot Channel Navigation Projects, the remaining 26 locks and dams were constructed between Minneapolis, Minnesota, and St. Louis, Missouri. Below St. Louis, Missouri, “open channel” techniques, such as stone dikes, bank revetment, and dredging, are used to maintain the channel. The 9-Foot Channel Navigation Project has been in operation since 1940.

Traffic is generally greater on the downstream end of the system. Over 50% of the traffic on the system is export grain, often on its way to New Orleans (the Nation’s largest port in terms of tonnage) for transfer to ocean-going vessels. Grain enters the system from multiple terminals along the rivers, resulting in increasing tonnage at the lower locks. Upbound shipments are primarily coal, fertilizers, and petroleum moving into the study area from other regions. These commodities are delivered to the various terminals along the river, again resulting in less tonnage and fewer tows at upstream locks. Most locks on the system are 600 feet long. Exceptions include Lock 19, which has a 1,200-foot lock, and Melvin Price Lock and Dam (Lock 26 replacement) and Locks 27, which both have a 1,200-foot and a 600-foot chamber at each site. Lock 25 is the most downstream lock with a 600-foot chamber on the Mississippi, while the La Grange Lock is the most downstream 600-foot lock on the Illinois Waterway. Above Melvin Price Lock, the Illinois River enters the Mississippi, adding its traffic to that from the upstream reaches of the Mississippi to create the higher traffic levels and tonnage at Melvin Price Lock and Locks 27.

A study was conducted during the 1960's to evaluate replacing Locks and Dam 26 in Alton, Illinois (which consisted of one 600-foot lock and a 300-foot auxiliary lock located 15 miles downstream from the confluence of the Illinois River) because of increasing congestion at the facility. In 1978, in Section 102 of the Inland Waterways Authorization Act (Public Law 95-502), Congress authorized the construction of a new dam with a single 110-foot by 1,200-foot lock chamber. Construction was initiated in 1979. This facility, eventually named the Melvin Price Locks and Dam, was completed in 1990. The authorization required to build that lock and dam also directed that a study be completed to assess further navigation capacity needs. That study, the *Comprehensive Master Plan for the Management of the Upper Mississippi River System*, recommended construction of a second 110-foot by 600-foot lock at the new facility (Upper Mississippi River Basin Commission 1982). This "Second Lock" was authorized by the Supplemental Appropriation Act of 1985 (Public Law 99-88, chapter IV) and the Section 1103 of WRDA 1986, Public Law 99-662 (see also 33 U.S.C. Sec. 652, the Upper Mississippi River Management Act of 1986) and construction was completed in 1994.

The Illinois Waterway is a major tributary of the UMR. It provides navigation from Lake Michigan and Chicago to the UMR, linking the Great Lakes with the inland waterway system. The term "Illinois Waterway" is used in place of the Illinois River, since navigation between the UMR and Great Lakes includes all or portions of the Illinois River, Des Plaines River, Chicago Sanitary and Ship Canal, Cal-Sag Channel, Little Calumet River, and Calumet River. The Illinois Waterway has been continuously developed for navigational purposes since 1822. In 1927, Congress approved legislation authorizing a 9-foot by 200-foot-wide channel on the Illinois River from Utica, Illinois, to Grafton, Illinois. This project was to complement a similar project then under construction by the State of Illinois extending from Utica to Lockport, Illinois. In 1930, Congress enacted legislation enabling the Federal Government to assume responsibility of the Utica-to-Lockport segment, already about 75% completed. Three years later, the Corps of Engineers completed the project, and combining it with the earlier authorized Federal project between Utica and Grafton, opened the Illinois Waterway to navigation in 1933. Navigation on the waterway was further improved with the construction of locks and dams at Peoria and La Grange from 1936 to 1938, and the addition of the Thomas J. O'Brien Lock and Controlling Works on the Calumet River in Chicago in 1960.

The system is a vital part of the national economy. The navigable portions of these rivers and the locks and dams that allow waterway traffic to move from one pool to another are integral parts of a regional, national, and international transportation network. The system is significant for certain key exports and the Nation's balance of trade. For example, in 2000, approximately 52% of the Nation's corn and 41% of the Nation's soybean exports were carried on the UMR-IWW. Corn and soybeans are shipped via the waterway at roughly 60% to 70% of the cost of shipping over the same distance by rail. Other commodities shipped on the system include coal, chemicals, petroleum, crude materials (sand, gravel, iron ore, steel, and scrap), and manufactured goods. The system provides full or part time employment for over 400,000 individuals in the basin, including 40,000 manufacturing jobs.

The importance of the Upper Mississippi River-Illinois Waterway as a shipping artery is underscored by the increases in tonnage shipped on the system. Waterborne commerce on the Upper Mississippi River has more than tripled over the past 40 years—growing from about 27 million tons in 1960 to 83 million tons in 2000. On the Middle Mississippi River over the period 1960 to 2000, tonnage has grown from 30 million tons to 122 million tons. On the Illinois Waterway, the nearly 23 million tons shipped in 1960 roughly doubled over that same timeframe, growing to 44 million tons in 2000.

#### 1.4.2 Environment

There have been Federal efforts to protect environmental resources in the river system for almost as long as there have been efforts to improve conditions for commercial navigation. The U.S. Fish Commission enacted fish “rescues” during low water periods to move fished trapped in isolated backwaters back into the rivers. One of the first inland fisheries research stations was established in Fairport, Iowa, in 1908 to provide information to effectively manage commercial fishing and clamming in the region. Fish and wildlife market hunting was curbed and fish and game harvest management were established as the region’s population grew (Carlander 1954, Rahn 1983). Habitat protection began, in earnest, in 1924 with the establishment of the Upper Mississippi River Wildlife and Fish Refuge between Minneapolis, Minnesota, and Clinton, Iowa—a refuge that has expanded to 268,465 acres currently. Several other refuge units have been established farther south on the Mississippi and on the Illinois River since then, and new land acquisitions from willing sellers are being sought. The Corps purchased approximately 270,000 acres of land for the 9-Foot Channel Navigation Project. These lands are currently managed for natural resources, recreation, and navigation by the Corps or other entities.

In the 1970’s, the Corps established the Great River Environmental Action Teams (GREATs) in each UMR-IWW Corps district. The GREATs were composed of government and non-government environmental and economic interests, including many of the collaborators of the current study, charged to evaluate a range of environmental and economic issues. A recommendation of the GREAT studies was the completion of a *Comprehensive Master Plan for the Management of the Upper Mississippi River System* for the commercial and environmental interests of the UMR-IWW. The Master Plan recommended completion of the Second Lock at the Melvin Price Dam as mentioned previously, but also recommended the establishment of the Upper Mississippi River System - Environmental Management Program (EMP) to monitor and restore the river, funded at an amount equal to the cost of the second lock at the dam (\$300 million). The EMP was first authorized under Section 1103 of WRDA 1986 (Public Law 99-662). It was reauthorized in 1999 with broad stakeholder support at an annual level exceeding \$33 million. It remains an important science and restoration program, as well as a mechanism to coordinate natural resource management interests on the river.

The states of Minnesota, Wisconsin, Illinois, Iowa, and Missouri also have a long-standing and strong commitment to the balanced management of the UMR as a multi-purpose system. In 1997, a Joint Governors’ Proclamation, committed the states to the “pursuit of unified economic and environmental policies” and management of the river “to ensure the needs of present generations are met without compromising the ability of future

generations to meet their needs.” States actively manage about 140,000 acres (state owned or General Plan lands). State departments of natural resources spending for environmental management on the mainstem rivers is less than \$3 million (Upper Mississippi River Conservation Committee 2000). States are also responsible for: water quality management, drinking water, floodplain management, water use, transportation coordination, emergency response, historic property, and many other activities either individually or in coordination with Federal or local agencies and individuals.

#### 1.4.3 Cultural and Social Setting

The Upper Mississippi River System and associated environments have a rich record of human history, spanning over 12,000 years, which is increasingly being documented as one of the most archeologically and historically significant regions in the country. The UMR-IWW study area is now home to more than 30 million people. Nearly 80% of this population lives in urban areas such as Minneapolis-St. Paul, La Crosse, Dubuque, Quad Cities, Quincy, Hannibal, St. Louis, Cape Girardeau, Chicago, and Peoria. Economic activities revolve around machinery manufacturing, food and beverage processing, and crop, dairy, and livestock production. Regional industries produce canned, frozen, and dairy foods and manufacture broadcast equipment, construction equipment, agricultural machinery, ammunitions, chemicals, and aluminum sheet. Many of those industries rely on the network’s waterborne commerce routes.

Waterway transportation provides an efficient and safe means of freight movement that pollutes less than other modes of transport. The efficiency stems from the capacity of barges where a standard 15-barge tow may carry the equivalent of 225 jumbo hopper train cars or 870 large semi trucks. The ability to utilize inland waterways alleviates congestion on railroads and highways. The environmental benefits of waterborne transport stems from the lower fuel consumption and resultant emissions that a single towboat has over large numbers of train engines and tractor trailers. The safety of waterborne transportation is exhibited by the foregone accidents that may occur at train crossings and on highways if commodities were shipped by alternative modes. These generalizations are detailed in a report prepared for the initial Feasibility Study (Tolliver 2000).

The river and waterways also provide boating, camping, hunting, trapping, birdwatching, hiking, tourism, and other recreational opportunities that provide revenue to the region. An assessment of recreation related spending published in 1993 identified more than \$1 billion (1990 dollars) in economic benefits (USACE 1993). Recent surveys document more than 11 million recreational visits annually (Black et al. 1999) which exceeds most refuges and national parks, including Yellowstone National Park.

### 1.5 Study Background.

Aspects of the Upper Mississippi and Illinois Waterway System Navigation Feasibility Study have been underway for many years. The size and complexity of the system, uncertainty regarding economic forecasts and environmental impacts, and ultimately, the temporary halt of the study have contributed to this lengthy process. The initial appraisal for the study started in 1988, and actions have progressed through the Corps planning process since then.

## 1.5.1 Initial Study Background (1988 - 1999)

### *1.5.1.1 Initial Appraisal*

An initial appraisal regarding potential navigation traffic capacity increases on the UMR and the IWW was developed in May 1988. The initial appraisal recommended developing a plan of study to investigate a long-term solution to meet increased navigation demand and reduce delays for commercial traffic on the system.

### *1.5.1.2 Reconnaissance Studies*

In August 1989, a Plan of Study for the Upper Mississippi River and Illinois Waterway navigation feasibility investigation was completed. This document recommended undertaking two separate navigation reconnaissance studies for investigating potential navigation improvements—one for the Illinois Waterway and the other for the Upper Mississippi River. Specific investigations were recommended to define the base condition, analyze congestion problems, determine system benefits, and examine environmental impacts. The reconnaissance-level investigation was to begin the process of establishing prioritized, waterway-specific, capital investment recommendations, including efficiency measures, required to meet future traffic demand.

The Illinois Waterway Navigation Reconnaissance Study (USACE 1991a;

<http://www2.mvr.usace.army.mil/umr-iwwsns/documents/Final%20Reconnaissance%20Rpt.pdf>

concluded that there was economic feasibility for major capital improvements at the La Grange and Peoria Lock sites and the canal upstream of Marseilles Lock. The study findings are contained in a 3-volume reconnaissance report completed in October 1990 (USACE 1990a, b, and c). Following a 15-month investigation, the 2-volume Upper Mississippi River reconnaissance report was completed in June 1991 (USACE 1991a; <http://www2.mvr.usace.army.mil/umr-iwwsns/documents/Final%20Reconnaissance%20Rpt.pdf>). The Upper Mississippi River Reconnaissance Study concluded, based on preliminary economic analysis, that navigation improvements may be justified for Locks and Dams 25 through 11 between the years 2000 and 2050. Both documents recommended performing more detailed systemic feasibility level environmental, engineering, and economic studies.

### *1.5.1.3 Guidance and Decisions Prior to Start of Original Feasibility Study*

In October 1991, the two studies were combined into one feasibility study providing a system approach in solving navigation problems common to both rivers. This systems approach was to include, as appropriate, environmental studies proposed by the Lock and Dam 26 (Melvin Price), Second Lock, Alton, Illinois *Plan of Study* (USACE 1991b) that were needed to address navigation traffic impacts.

On December 9-10, 1992, a Reconnaissance Review Conference was held in Chicago, Illinois. Representatives of the five UMR-IWW states, the U.S. Fish and Wildlife Service, the U.S. Environmental Protection Agency, and various groups representing a spectrum of interests met with Corps of Engineers staff to discuss conclusions and recommendations from the Upper Mississippi River Reconnaissance Study. In addition, discussions also

covered material described in the Initial Project Management Plan (later renamed the Project Study Plan or PSP) outlining the scope, cost, and schedule for executing the feasibility study (USACE 1994).

The general conclusion of the Reconnaissance Review Conference was to approve and institute portions of the recommended study plan that were not the subject of diverging views, and that the resolution of other issues would likely be resolved over a period of several months. In addition, the Corps of Engineers determined that the focus of 100% Federal funded environmental studies would be to assess the effects of incremental increases in traffic associated with any navigation improvements. A broader multi-purpose environmental study proposed by a number of agencies and organizations would require 50/50 cost sharing by the states or other sponsors because they would address issues beyond the scope of the Federal navigation project improvements. It also was determined that the study would not be multi-modal (e.g., not consider possible theoretical approaches that would potentially reduce river traffic such as grain pipelines, magnetic levitation trains, etc.), but that the evaluation would consider the use of other existing alternatives such as traditional rail. Further, as with other Corps transportation feasibility studies, an assumption was made that rail and highway systems have or would have the capacity to move goods not accommodated by the navigation system.

On March 1, 1993, the Reconnaissance Study Report and the Initial Project Management Plan (IPMP) were approved, subject to modifications in response to various concerns raised at the Reconnaissance Review Conference. The study boundary was expanded to the mouth of the Ohio River in the IPMP. It also included flume construction and analysis work by the Corps' Waterways Experiment Station (WES) to determine physical effects of navigation and additional environmental studies to evaluate impacts to mussels, impacts to fish spawning habitat, effects of sediment resuspension on plants, and environmental impacts of recreational craft. The IPMP also included \$7.5 million to provide for increased engineering detail to accomplish the site-specific feasibility study and report, assuming that the study would demonstrate justification for improvements. These efforts were to be initiated when the system feasibility study was sufficiently complete to support the timing, size, and justification for the first large-scale improvements. In regard to this item, the guidance acknowledged that several projects may have to be designed concurrently and that this need would be considered later in the study process.

Based on the approval of the Reconnaissance Study Report and Project Study Plan, the feasibility study was initiated in April 1993.

#### *1.5.1.4 Guidance and Decisions Subsequent to Start of Original Feasibility Study*

The study was initially developed as a 6-year effort, but due to the complexity of the study and comments from the public and coordinating agencies, modifications to the scope and timeframes were necessary.

As a result of strong interest and concerns expressed by state agencies, interest groups, and the public after the initial series of public informational meetings in 1993, public involvement efforts were enhanced to substantially increase the opportunities for the public

to be informed about and react to the study throughout the study process. Updates included allowing increased public interaction with the study team through a wider variety of meetings, workshops, and conferences. A toll-free telephone number information line was developed, and the newsletter mailing list was expanded to include nearly 10,000 individuals and groups.

On August 15, 1994, the study was modified to include a constrained budget scenario, consider risk and uncertainty using a probabilistic risk-based analytical framework, and evaluate the relationship between the condition and capacity of locks and potential reduced capacity related to the aging of existing structures. While efforts were undertaken to consider risk and uncertainty, the need for a constrained budget scenario was ultimately not required, and the ability to evaluate condition versus capacity, while attempted, was determined to be beyond the state of the art at that time.

In 1995, funding was increased for environmental studies associated with commercial traffic physical effects and ecological modeling and more comprehensive assessments of fish, plants, and mussel impacts. The additional efforts required by the work added 9 months to the schedule, moving the expected completion date from March 1999 to December 1999. As a result of feedback given at the fall 1994 public meetings, a Regional Economic Development (RED) analysis and assessment of the cumulative effects of the navigation system on the environment were added, along with increased efforts on innovative lock design.

In the spring of 1998, study efforts were delayed due to the fact that some economic, environmental, and engineering efforts were taking longer to complete and review than initially anticipated. During the summer of 1998, the Corps focused efforts on conducting technical reviews of the innovative, yet untested, economic model when it was realized how sensitive the model output was to certain inputs. An effort was then undertaken from November 1998 to February 1999 to gather data on the transportation demand characteristics of the commodities shipped on the rivers. In total, these efforts delayed the study an additional year, moving the projected completion date to December 2000.

The completion was further delayed in January 2000 during a Corps policy review of data and methodologies used on the study. In general, the review found that the study was conducted in consonance with the Principles and Guidelines. However, the draft study results and conclusions were determined to be sensitive to certain parameters and assumptions. Accordingly, additional information and explanation was required in five subject areas including: quality management, engineering, economics, environmental analysis, and plan formulation. The overall effect of the review was to further delay study completion until March 2001.

#### *1.5.1.5 Study Organization*

The study boundaries cross three Corps of Engineers Districts (Rock Island, St. Paul, and St. Louis), five states (Illinois, Iowa, Minnesota, Missouri, and Wisconsin), 77 counties, and 38 major river communities. In addition, a large number of agencies, interest groups, and the general public have an interest and stake in the study outcome.

The study required coordinating the efforts of multiple disciplines as well as the gathering and sharing of information from others. This section summarizes the general organization and mechanisms used to facilitate the original study and involve the public and other agencies and organizations.

The study efforts were conducted by organizing efforts within five Corps work groups (Project Management/Plan Formulation, Economics, Engineering, Environmental/Historic Properties, and Public Involvement). Work group activities included the support and involvement of research facilities, universities, other agencies, and independent contractors when necessary. The following paragraphs provide a brief description of the purpose and responsibilities for these five work groups.

**Project Management/Plan Formulation** - This group assured that work group elements and activities were completed on time and within funds allocated. It was charged with facilitating information sharing between work groups, ensuring efficient study progress, and leading and coordinating plan formulation efforts.

**Economics** - This group conducted economic evaluations to assure that system-wide effects of specific alternative plans were estimated and prepared the economic and social analysis section of the feasibility report.

**Engineering** - This work group evaluated the current navigation system and anticipated without-project operations and maintenance, rehabilitation, and replacement needs. It also conducted engineering and cost estimating efforts to develop and evaluate potential measures and assure that estimates and recommended solutions were identified within reasonable limits.

**Environmental/Historic Properties** - This group collected, analyzed, and interpreted environmental data and developed adequate tools to assess the impacts of the various alternative plans over the without-project condition. It also developed the mitigation requirements and costs associated with various alternatives. It coordinated and prepared the environmental and historic properties portions of the feasibility report, assured project compliance with environmental statutes, executive orders, and memoranda, and started to prepare an Environmental Impact Statement (EIS) in compliance with the National Environmental Policy Act (NEPA) requirements.

**Public Involvement** - This group's role was to facilitate efforts to identify and include all potentially affected public interests in the study process, and provide opportunities to inform, educate, and solicit feedback. The public's comments and concerns were collected and identified from newsletter comment sheets, incoming correspondence, input at meetings, and messages left on the toll-free number. In addition, an internet web site was developed which facilitated the sharing of interim reports and other study information with the public.

Work group activities were also performed in coordination with the interagency coordination committees described below:

**Governors' Liaison Committee (GLC)** - The GLC consists of designated representatives of the governors of the five study states (Illinois, Iowa, Minnesota, Missouri, and Wisconsin). The goal of establishing the GLC was to assure that study recommendations would merit the support of the people of each state. The purpose of this key committee is to build consensus among the study area states and to provide the Corps with the position of the governor of each state on Navigation Study matters. A total of 23 GLC meetings have been held to date.

**Navigation Environmental Coordination Committee (NECC)** - The NECC consists of members from state natural resource agencies, the U.S. Fish and Wildlife Service, and the U.S. Environmental Protection Agency. This committee was established to facilitate coordination for study compliance with the National Environmental Policy Act (NEPA), Fish and Wildlife Coordination Act, Endangered Species Act, and other environmental statutes requiring interagency coordination. The NECC has met more than 30 times to help refine environmental modeling procedures and to provide comments on environmental studies conducted as part of the overall study.

**Economics Coordinating Committee (ECC)** - The ECC consists of representatives from each of the five states, and one representative each from the Maritime Administration, the U.S. Department of Agriculture, Midwest Area Rivers Coalition (MARC) 2000, and the Corps of Engineers, who chaired the group. The purpose of the ECC is to provide the state and agency views on economic matters pertaining to the study, to facilitate efforts to arrive at a consensus on those matters among the members, and to engender a shared set of goals and expectations for the economic position of the study among all committee members and the public. The ECC has met 19 times to review key economic assumptions, and provide their input to the study.

**Engineering Coordinating Committee (EnCC)** - The EnCC consists of representatives from each of the five states in the study area and the Corps. They met three times during the study to discuss key engineering assumptions and findings. The EnCC met with navigation industry technical experts and representatives on several occasions to review the practical and logistical application of both small-scale and large-scale engineering alternatives. The Engineering Work Group also conducted several expert elicitation forums by inviting experts from construction and engineering firms to recommend and review conceptual designs and delay figures associated with construction and operation activities.

**Public Involvement Coordinating Committee (PICC)** - The PICC consists of representatives from each of the five states in the study area and the Corps. The PICC was established in 1993 to assist in the revision of the public involvement plan. Since then, the PICC has worked to create a shared set of goals and expectations regarding public involvement matters among all committee participants, the navigation industry, and the public.

### 1.5.1.6 Work Completed to Date

The majority of the work completed between 1993 and February 2001 was for the determination of future navigation improvement needs and environmental impacts. Through February 2001, the expenditures for the original study approached \$55.6 million. The breakdown of these expenditures among project management, environmental studies, historic property evaluations, economic analyses, engineering assessments, and agency and public coordination study components of the study completed prior to the halt in the study are illustrated below (Figure 2). A listing of each of these work group's activities is outlined below.

#### 1.5.1.6.1 PROJECT MANAGEMENT/PLAN FORMULATION.

- Provided overall management to the multi-District study team.
- Managed study funds and schedules.
- Led plan formulation efforts in the evaluation of measures and alternatives.
- Served as spokesman for the Corps on all study related activities.

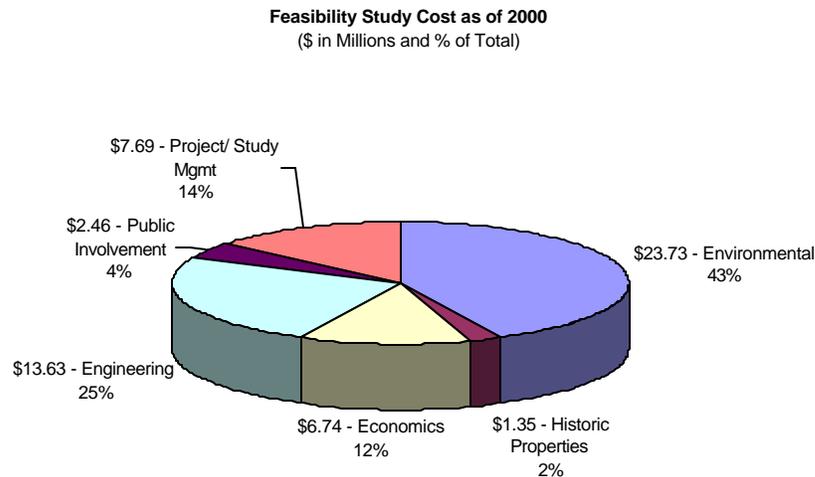


Figure 2. Distribution of Upper Mississippi and Illinois Waterway Navigation Feasibility Study expenditures through February 2001 for six study areas (\$ in millions and percent of total).

#### 1.5.1.6.2 ECONOMICS.

- Developed description of historic traffic in terms of tonnages, average delay times at each lock, and a breakdown of the various commodity groups that are transported on the system.
- Developed waterway traffic forecasts to the year 2050 including the eight major commodity groups: grain and soybeans, agricultural chemicals, prepared animal

feeds, coal, industrial chemicals, petroleum products, construction materials, and steel/steel sector raw materials.

- Developed a new economic benefit model.
- Helped establish the without-project condition.
- Performed sensitivity analysis for key parameters.
- Performed transportation rate analysis.

#### 1.5.1.6.3 ENGINEERING.

- Determined the future physical condition and investments needed to maintain the current system at an acceptable level of performance.
- Evaluated efficiency improvements that could be considered in the without-project condition.
- Evaluated the feasibility of a universe of 92 small-scale structural and nonstructural measures to reduce lock congestion.
- Evaluated the feasibility of large-scale navigation improvements at 16 sites to include lock extensions and new locks. Developed several innovative techniques for construction of lock extensions or new locks.

#### 1.5.1.6.4 ENVIRONMENTAL.

- Through an extensive scoping and coordination process, identified biological, special concern, cultural/historic, socioeconomic, and recreational resources of concern for the UMR-IWW.
- As part of the initial screening process for large-scale improvement measures, completed preliminary assessments of site-specific construction impacts.
- Oversaw the completion of over 40 technical studies/reports conducted in support of the overall environmental impact analysis.
- Developed state-of-the-art impact assessment tools to predict hydraulic forces generated by tows, and resultant assessment of biological effects.
- Facilitated or participated in supporting studies on alternative modes impacts and cumulative effects.
- Developed a landform sediment assemblage database, and completed draft programmatic agreement documentation, as part of the cultural resources/historic properties analysis.

- Developed an initial strategy for implementation of identified mitigation requirements.

#### 1.5.1.6.5 PUBLIC INVOLVEMENT.

- Distributed 19 newsletters from 1993 to February 2001 to a distribution of nearly 10,000 subscribers.
- Conducted Public Meetings
  - Oct-Nov 1993 – Public Informational Meetings (14 locations)
  - Nov 1994 – Public meetings and NEPA Scoping Meetings (8 locations)
  - Nov-Dec 1995 – Public Open Houses (5 locations)
  - Jul- Aug 1999 – Public Workshops (7 locations)
  - Nov 2000 – Public Open Forum Hearings (7 locations)
- Developed and maintained a toll free information phone and message service.
- Developed and maintained a study website.

### 1.5.2 Restructured Study Background

The Navigation Study was temporarily halted in February 2001 in order to assess the results of the special investigations and National Research Council review. The latter was instrumental in assisting the Corps in the restructure and refocus of the study. A summary of key drivers follows.

#### *1.5.2.1 National Research Council Review.*

In February 2000, the Department of Defense requested that the National Research Council (NRC) review the original Navigation Study activities in its role to advise the Federal Government on science issues for the National Academy of Science. The National Research Council launched this review in April 2000 and appointed an expert committee under the joint auspices of the National Academy of Science’s Water Science and Technology Board (WSTB) and Transportation Research Board (TRB). This review was conducted in accordance with the following statement of task and was to be completed in one year:

“This study will focus on the U. S. Army Corps of Engineers’ economic analysis regarding proposed improvements, including economic assumptions, methods and forecasts regarding barge transportation demand on the Upper Mississippi River-Illinois Waterway. The Corps must also consider larger water resources project planning issues such as formal U.S. federal water resource planning guidelines, possible environmental impacts, and the costs of navigation improvements. Thus while the committee will focus on the Corps’ economic analysis, they will also comment upon the extent to which these larger issues are being appropriately considered in the navigation system feasibility study.”

The NRC was hampered in its initial review of the study by the fact that a draft report had not been completed for the original study. However, the Corps study team provided a preliminary draft and partially completed reports in July 2000 to aid the NRC in their review. The NRC review report was provided to the Corps in February 2001 (National Research Council 2001). This report included many recommendations, however, there were four conclusions that provided the main impetus for the restructured study. They are:

1. The study should include equal consideration of fish and wildlife resources,
2. The study should assess ongoing effects of the existing Nine-Foot Channel Project,
3. Defensible 50-year forecasts are unlikely to be achieved,
4. The Spatial Equilibrium Model used was incomplete and should be further developed. It also lacked sufficient data to support assumptions. The NRC recommended that the model in its current form “should not be used in the feasibility study.”

The complete report can be viewed at:

<http://books.nap.edu/books/0309074053/html/index.html>

#### *1.5.2.2 Federal Principals Task Force.*

After release of the NRC review, the Chief of Engineers announced a pause in the study to allow time to evaluate the comments and determine a new course of action. The Corps solicited help in this endeavor by forming a Federal Principals Task Force made up of senior members of the Department of Interior, Department of Agriculture, Department of Transportation, and Environmental Protection Agency. This task force provided a national level balance and guidance on important economic and environmental issues related to the NRC recommendations. The Federal Principals Task Force is a collaborative and collegial forum for advising the Corps on how to address the NRC recommendations and other key issues in an appropriate and effective manner. A counterpart-working group defined as the Regional Interagency Work Group was also established to help guide the future of this study at the local level. This group worked with members of the Project Delivery Team (PDT) on the details of the various broad actions needed to address the NRC recommendations and advise the Task Force on the preferred actions. The Federal Principals Task Force and Regional Interagency Work Group met several times during the spring and summer of 2001, in order to develop a plan of action on how to address the NRC recommendations. They considered several topics that needed to be addressed in the plan and presented them in the form of Issue Papers (Appendix 3). The topics covered the following environmental and economic issues:

## **ENVIRONMENTAL THEMES & ISSUES:**

- Theme 1a:** Equal consideration for fish and wildlife resources.
- Theme 1b:** Environmental effects of the existing Nine-Foot Channel Project.
- Issue 2:** Incorporate a cause and effects cumulative effects analysis in the System Study.
- Issue 3:** Should the scope of the tow traffic effects analysis be expanded to include quantification of the impacts of existing traffic (including Second Lock traffic) and traffic increases expected to occur without navigation expansion, or should existing traffic impacts remain identified as the baseline condition?
- Issue 4:** Include an assessment of ongoing project operation and maintenance (O&M) impacts as an element of the System Navigation Study.
- Issue 5:** Include a comprehensive mitigation plan that addresses the total array of navigation effects (O&M impacts, baseline traffic, Second Lock traffic, avoid and minimize, and incremental traffic) as part of the Navigation Study.
- Issue 6:** Assessment of traffic effects due to the Second Lock, Melvin Price Lock and Dam.
- Issue 7:** Upper Mississippi River cooperating Federal and state agencies should develop and implement a comprehensive ecosystem management plan for the Upper Mississippi River System.
- Issue 8:** How will site-specific impacts be addressed and incorporated into the overall environmental impact assessment?
- Issue 9:** Inadequacy of incremental effects studies due to insufficient data.

## **ECONOMIC ISSUES:**

- Issue 1a:** Calculation of Traffic Forecast: Relates to Issue 1, “Spatial Equilibrium Model and Data” of the National Research Council (NRC) review report.
- Issue 1b:** Demand Elasticities. Relates to Issue 1, “Spatial Equilibrium Model and Data” of the National Research Council (NRC) review report.
- Issue 1c:** Use of ESSENCE Model (Benefit Model). Relates to Issue 1, “Spatial Equilibrium Model and Data” of the National Research Council (NRC) review report.

**Issue 2:** Consider nonstructural options for improving traffic management as a baseline condition for the study. This relates to issue 2 of the National Academy of Sciences Review Report.

### *1.5.2.3 Concept Paper.*

The Issue Papers were presented to the Federal Principals Task Force in May 2001. The task force summarized the Issue Papers and provided recommendations for restructuring the Upper Mississippi River and Illinois Waterway Navigation Feasibility Study to address the NRC review in the form of a concept paper. The recommendations are presented in total in Appendix 3.

## **1.6 Restructured Feasibility Study.**

### 1.6.1 Guidance for Restructured Feasibility Study

The Concept Paper produced by the Federal Principals Task Force was used as the basis for new guidance developed by the Corps (Appendix 4). The new guidance was released on August 2, 2001, and signaled the restart of the Navigation Study in a restructured format. The restructured feasibility study will focus on the authorized Federal navigation projects on the Upper Mississippi River System (including the Illinois Waterway) and the ecological and floodplain resources that are affected by these navigation projects. The objectives of this restructured feasibility study are to relieve lock congestion, achieve an environmentally sustainable navigation system, and address ecosystem and floodplain management needs related to navigation in a holistic manner. The restructured navigation study will seek to ensure that the rivers and waterway system will continue to be an effective transportation system and a nationally treasured ecological resource. The restructured study will: (1) further identify the long-term economic and ecological needs, and potential measures to meet those needs, through collaboration with interested agencies, stakeholders, and the public; (2) evaluate various alternative plans to address those needs; (3) present a plan consisting of a set of measures for implementation that will achieve the study objectives; and (4) identify and address issues related to the implementation of the recommended plan.

### 1.6.2 Collaboration.

A key foundation of the restructured study will be the new emphasis on collaboration among Federal and state agencies, non-governmental organizations, and the general public. Collaboration is an important mechanism for increasing cooperation and communication, fostering trust and understanding among participants, and allowing a greater set of interests to be met. Since the restart of the restructured navigation study, all interaction with the stakeholders has been accomplished in a collaborative atmosphere. Information has been expeditiously shared through meetings, phone calls, and email distribution. The coordinating committees that were used previously have been redesigned to allow more participation from the stakeholders of the system. Collaboration has occurred between the economic and environmental interests by having combined sessions of the Economic Coordinating Committee and the Navigation Environmental Coordinating Committee. Collaboration was also evident in the March 2002 series of public meetings where

stakeholders participated in the meetings. Collaboration will be an evolving process as implementation issues are defined.

### 1.6.3 Sustainability

The original feasibility study was narrowly focused on the problem of reducing commercial traffic congestion on the system. Coordination was occurring between economic and environmental interests, however, each group was being consulted independent of the other. With the new focus of the restructured study on sustainability, it became important for the stakeholders of the system to prepare a common vision for the future of the UMR-IWW. In November 2001, the Economic Coordinating Committee (ECC) and the Navigation Environmental Coordinating Committee (NECC) met jointly to prepare this vision. Although not all representatives were present, they all had an opportunity to review and comment on the vision statement and sustainability definition below. The stakeholders at this meeting included the following:

#### **Federal Agencies**

U.S. Fish and Wildlife Service  
U.S. Environmental Protection Agency  
U.S. Maritime Administration  
U.S. Department of Agriculture  
U.S. Army Corps of Engineers

#### **State Agencies**

Wisconsin Department of Natural Resources  
Iowa Department of Transportation  
Iowa Department of Natural Resources  
Illinois Department of Natural Resources  
Missouri Department of Conservation  
Upper Mississippi River Basin Association

#### **Environmental Non-Governmental Organizations**

Mississippi River Basin Alliance  
Izaak Walton League  
The Nature Conservancy  
Audubon Society  
American Rivers  
Upper Mississippi River Conservation Committee

#### **Economic Non-Governmental Organizations**

Midwest Area River Coalition 2000  
National Corn Growers  
Upper Mississippi Illinois and Missouri Rivers Association  
American Waterways Operators  
Holcim (US) Inc.

The following vision statement was developed:

*“To seek long-term sustainability of the economic uses and ecological integrity of the Upper Mississippi River System.”*

The following definition of sustainability was collaboratively developed and agreed to by the group as well:

*“The balance of economic, ecological, and social conditions so as to meet the current, projected, and future needs of the Upper Mississippi River System without compromising the ability of future generations to meet their needs.”*

The vision statement and definition of sustainability form the basis for the restructured feasibility study. The sustainability concept will reflect that economic activity will be evaluated for environmental impact, and that environmental actions will be evaluated for economic impact.

#### 1.6.4 Integrated Management

The restructured feasibility study will strive to integrate Federal river management activities to achieve sustainability of the system. The Federal activities to be coordinated under the sustainability umbrella include operation and maintenance of the 9-Foot Channel Navigation Project, the Environmental Management Program, Environmental Continuing Authorities Programs (CAP; i.e., Sections 204, 206, and 1135), the WRDA 1999 (Public Law 106-53 §459) Comprehensive Plan for the floodplain, U.S. Fish and Wildlife Service Refuge management, and the Illinois River Basin Restoration initiatives (Illinois River Ecosystem Restoration Feasibility Study and WRDA 2000, Public Law 106-541 Section 519, Illinois River Basin Restoration) which are briefly described below. A conceptual model of the floodplain and the areas of responsibility for these various ongoing Federal actions is presented in Figure 3.

The restructured feasibility study provides the mechanism to define the baseline ecosystem sustainability goals and objectives to be used across Federal management activities within the spatial limits described in Figure 3. Each individual program will then determine implementation requirements within its area of responsibility. The Navigation Feasibility Study will define management for sustainability within the limits of the navigation project. Likewise, the Comprehensive Study will define management for sustainability within the floodplain for the Mississippi River. The Illinois River Basin Restoration initiatives will define management for sustainability outside the navigation project limits on the Illinois Waterway and throughout the Illinois River Basin. The Environmental Management Program and Environmental CAP (Sections 204, 206, and 1135) will integrate the baseline sustainability goals and continue to operate throughout the river floodplain system. The U.S. Fish and Wildlife Service Refuge Comprehensive Conservation Plans will incorporate the baseline sustainability goals and objectives. A schematic of these planning relationships is shown in Figure 4. There are obvious overlaps and gray areas that will need to be further defined during the remainder of the restructured feasibility study. The

feasibility study will evaluate opportunities for better integration of the various Federal programs including new or modified authorities.

Achieving sustainability of the river system will require close collaboration with Federal, state, and non-governmental organizations. The feasibility study will continue to work closely with stakeholders to develop the baseline sustainability goals and objectives. The feasibility study will also attempt to identify non-Federal land management initiatives that could be integrated into this effort.

#### *1.6.4.1 Operation and Maintenance of the 9-Foot Channel Navigation Project*

The Congress authorized the Upper Mississippi River and Illinois Waterway for the single purpose of providing a navigation channel on the Upper Mississippi and Illinois Rivers. This includes operation and maintenance of the lock and dam structures, channel training structures, periodic dredging of the channel, and periodic structural rehabilitation. This operation and maintenance responsibility extends to the stewardship of the land and water resources of the Federal projects making up the system. Ongoing environmental activities include avoid and minimize measures accomplished in conjunction with the construction of the Mel Price Lock and Dam and under the operation and maintenance authority of the existing projects. Ongoing natural resource management includes the operations and maintenance of 31 recreation areas along the Mississippi River and the management of lands purchased for the 9-Foot Channel Navigation Project. Seventy-three additional recreation areas are located on Corps lands but are leased to other organizations that are responsible for operation and maintenance. The natural resource management program also supports forest management programs that provide the proper forest inventory, reforestation, harvest, and monitoring activities to sustain valued forest resources.

#### *1.6.4.2 Environmental Management Program (EMP)*

The UMRS-EMP, authorized by the Water Resources Development Act (WRDA) of 1986 (Public Law 99-662), extended through the year 2002 by the WRDA 1990 (Public Law 101-640 §304), and given continuing authority in WRDA 1999 (Public Law 106-53 §509), has come to be recognized as the single most important effort committed to ensuring the viability and vitality of the Upper Mississippi River System's diverse and significant fish and wildlife resources since establishment of the National Wildlife Refuges on that system. This systemic program provides a well-balanced combination of monitoring, research, and habitat restoration activities. Program accomplishments to date include: (1) the completion of 39 habitat restoration projects resulting in the direct physical restoration of approximately 60,000 acres of riverine and floodplain habitats; 21 more projects in various stages of design will add another 29,000 acres of restored habitat when implemented; (2) the collection of millions of data samples (primarily fish, water quality, vegetation, and invertebrates) critical to carrying out the trend analysis and applied research that is leading to enhanced understanding of the dynamics of large floodplain rivers and successful multi-purpose resource management; (3) the development of extensive digital data bases, mapping products, and establishment of an information clearinghouse through which UMRS data and information can be universally accessed; and (4) a partnership between a multitude of Federal and state agencies, non-governmental organizations, and the general public.

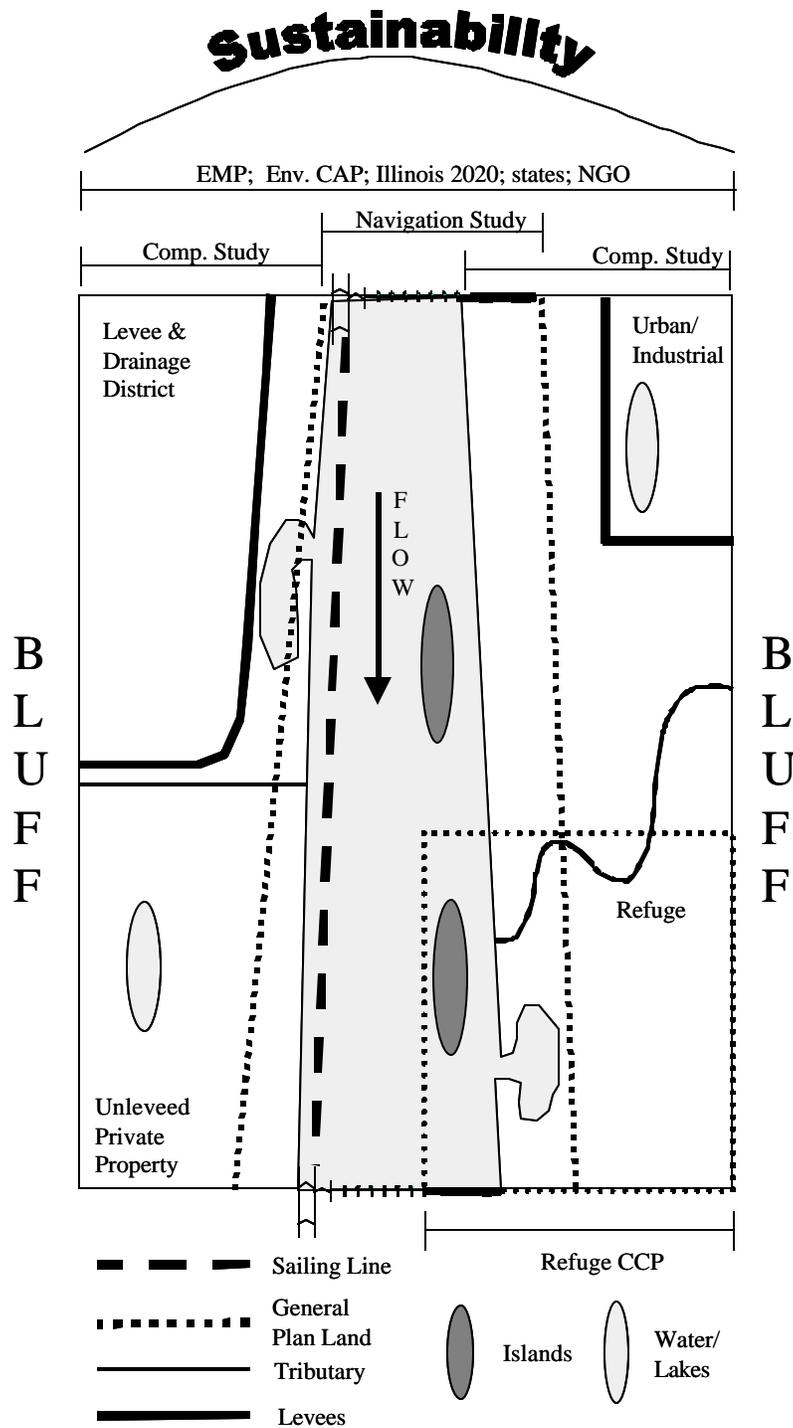


Figure 3. Schematic representation of a river reach illustrating the general types of land uses and ownership and the approximate extent of river management authorities including: the Environmental Management Program, Environmental CAP, states and NGOs, U.S. Fish and Wildlife Service Refuges, the floodplain Comprehensive Study, Illinois River Restoration (Illinois 2020), and the Navigation Study.



Figure 4. Goals and Objectives for the UMR-IWW will be established in a comprehensive fashion under the authority of the restructured navigation feasibility study. Detailed planning and implementation will be distributed among many applicable authorities.

*1.6.4.3 Environmental Continuing Authorities Programs (CAP)*

The Environmental CAP is composed of three separate ecosystem restoration authorities—Sections 1135, 206, and 204. These authorities apply nationwide and are limited to smaller individual projects. Section 204, authorized in WRDA 1992 (Public Law 102-580), provides authority for projects for the protection, restoration, and creation of aquatic and ecologically related habitats, including wetlands, in connection with dredging for construction, operation, or maintenance of an authorized navigation project.

Section 1135, authorized in WRDA 1986 (Public Law 99-662), provides authority to review and modify structures and operations of water resource projects completed by the Corps prior to 1986 for the purpose of improving the quality of the environment when it is determined that such modifications are feasible, consistent with the authorized project purposes, and will improve the quality of the environment in the public interest.

Section 206, authorized in WRDA 1996 (Public Law 104-303), provides authority for the development of aquatic ecosystem restoration and protection projects that improve the quality of the environment, are in the public interest, and are cost effective.

*1.6.4.4 Upper Mississippi River Comprehensive Plan (UMRCP)*

The UMRCP study was authorized by Section 459 of WRDA 1999 to “develop a plan to address water resource and related land resource problems and opportunities in the upper Mississippi and Illinois River basins from Cairo, Illinois, to the headwaters of the Mississippi River, in the interest of the systemic flood damage reduction by means of—

- (1) Structural and nonstructural flood control and floodplain management strategies;
- (2) Continued maintenance of the navigation project;
- (3) Management of bank caving and erosion;
- (4) Watershed nutrient and sediment management;
- (5) Habitat management;
- (6) Recreation needs; and
- (7) Other related purposes.”

With initial funding in FY 02, three Corps of Engineers Districts—Rock Island, St. Louis and St. Paul—are working in collaboration with Federal and non-Federal agencies and other stakeholders to conduct the 3-year study. This study will focus primarily on planning for the 500-year floodplains of the reach of the UMR between Anoka, MN, and Thebes, IL, and the reach of the Illinois River between its confluence with the Mississippi and the confluence of the Kankakee and Des Plaines Rivers. Although the development of the Comprehensive Plan will be at Federal expense, any feasibility studies resulting from development of the plan will be subject to cost sharing under Section 105 of WRDA 1986 (33 U.S.C. 2215).

The UMRCPP will embrace the dual overarching national goals of flood damage reduction, and associated environmental sustainability. The study will focus on development and evaluation of multiple systemic alternative plans composed of various combinations of structural and nonstructural measures that, if implemented, would result in reduced flood damage potential and net improvements to floodplain habitat conditions. An integrated study approach with the Navigation Study will allow both studies to benefit from the ongoing effort of identifying ecosystem goals and objectives for the UMRS. The study will build extensively upon previously completed work, including the 1993 flood reports, the Floodplain Management Assessment, the Galloway Report, Delft Plan, Working River, and numerous other recent efforts to document the system’s problems, needs, and opportunities.

The report will be completed in the summer of 2004, with submission to the Committee on Transportation and Infrastructure of the House of Representatives and the Committee on Environment and Public Works of the Senate scheduled for December 2004. This schedule assumes adequate funding amounts will be made available for the expeditious conduct of the study.

#### *1.6.4.5 National Fish and Wildlife Refuge Comprehensive Conservation Plans*

The U.S. Fish and Wildlife Service is preparing Comprehensive Conservation Plans and associated environmental impact statements for the National Wildlife Refuges nationwide and on the UMR-IWW. The Comprehensive Conservation Plans will guide management decisions on the refuges for 15 years. The U.S. Fish and Wildlife Service is the principal Federal agency responsible for conserving, protecting and enhancing fish, wildlife and

plants and their habitats for the continuing benefit of the Nation. The agency enforces Federal wildlife laws, administers the Endangered Species Act, manages migratory bird populations, restores nationally significant fisheries, conserves and restores wildlife habitat such as wetlands, and helps foreign governments with their conservation efforts. It also oversees the Federal Aid program that distributes hundreds of millions of dollars in excise taxes on fishing and hunting equipment to state fish and wildlife agencies.

#### *1.6.4.6 Illinois River Ecosystem Restoration Feasibility Study*

The Illinois River Ecosystem Restoration Feasibility Study is being conducted under the authority of Section 216 of the Flood Control Act of 1970 in partnership with the State of Illinois Department of Natural Resources (IDNR). The study will identify the Federal and State interest in addressing problems in the entire Illinois River Watershed. System-wide problems and a draft set of goals have been developed with agency representatives, local sponsors, and other stakeholders. The principal habitat problems in the Illinois River Basin are sedimentation in backwater lakes and side channels, degradation of tributary streams, water level fluctuations, and other adverse impacts caused by human activities. The goals established for the study are:

1. Reduce sediment delivery from upland areas and tributary channels to the Illinois River,
2. Selectively remove sediment, reduce sediment deposition, and improve sediment characteristics in Illinois River backwaters and side channels,
3. Restore floodplain and riparian habitat and function,
4. Increase connectivity of aquatic and terrestrial habitats,
5. Naturalize hydrologic regimes in tributaries and the mainstem Illinois River,
6. Restore natural disturbance regimes,
7. Protect high quality and restore degraded native ecosystems and habitats, and
8. Maintain viable populations of native species.

These goals drive two efforts currently underway in the study: (1) system evaluations focused on assessing overall watershed needs and general locations for restoration, and (2) site-specific evaluations focused on developing detailed restoration project plans.

#### *1.6.4.7 Illinois River Basin Restoration*

Opportunities for Illinois River Basin restoration have strong support from state, Federal, and local agencies and organizations. Accordingly, development of a comprehensive plan and critical restoration projects were called for in Section 519 of WRDA 2000 (Public Law 106-541). These efforts will be developed using information from the complementary Illinois River Ecosystem Restoration Feasibility Study and additional Illinois River Basin Restoration Section 519 efforts. Initial efforts will be undertaken in three areas specified in WRDA 2000 Section 519 (Public Law 106-541): (1) Comprehensive Plan, (2) Critical Restoration Projects, and (3) Long Term Resource Monitoring. Comprehensive Plan tasks not covered in the Illinois River Ecosystem Restoration Feasibility Study include the development and implementation of a long-term resource monitoring plan and computerized inventory and analysis system; development and implementation of innovative sediment removal, characterization, and beneficial use options; summarization

of Illinois River transportation and economic investment; and other related evaluations summarizing system needs and restoration options. The critical restoration projects will initially include six ongoing investigations identified through the Illinois River Ecosystem Restoration Feasibility Study, with additional projects identified through the planning process presented in that document. Similarly, the Corps will initiate long-term system monitoring tasks, which are clearly needed to improve the understanding of the system's problems and needs and understand the ecological response to restoration projects to enhance the success of future projects.

## 2 PLAN FORMULATION

### 2.1 Description of the Restructured Feasibility Study Process.

The Restructured Upper Mississippi River and Illinois Waterway System Navigation Feasibility Study will be conducted following the Corps of Engineers' six-step planning process specified in Engineering Regulation (ER) 1105-2-100 (USACE 2000a; <http://www.usace.army.mil/inet/usace-docs/eng-regs/er1105-2-100/toc.htm>). The process identifies and responds to problems and opportunities associated with the Federal objective and specified state and local concerns. The process provides a flexible, systematic, and rational framework to make determinations and decisions at each step so that the interested public and decision makers can be fully aware of: the basic assumptions employed, the data and information analyzed, the areas of risk and uncertainty, and the significant implications of each alternative plan. The steps used in the plan formulation process include:

1. Identify Problems and Opportunities: The specific problems and opportunities are identified, and the causes of the problems discussed and documented. Planning goals are set, objectives established, and constraints identified.
2. Inventory and Forecast Resource Conditions: This step characterizes and assesses conditions of the navigation and ecosystem as it currently exists and forecasts the without-project condition (or "no action" alternative) over the 50-year period of analysis. This assessment gives the basis by which to compare various alternative plans and their impacts. In an effort to address the uncertainty of 50-year traffic forecasts, a scenario-based approach to traffic forecasting has been employed. As a consequence, multiple representations of the without-project condition with respect to traffic and the associated impacts will be developed.
3. Formulate Alternative Plans: Alternative plans are developed in a systematic manner to ensure that reasonable alternatives are evaluated. In addition to the "no action" alternative, small- and large-scale measures, ecosystem restoration measures, and modifications to the operations and maintenance of the existing 9-foot channel project will be combined in various ways to form an array of alternatives for evaluation.

4. Evaluate Alternative Plans: The evaluation of each individual alternative consists of measuring or estimating the economic, engineering, environmental, and social effects of each plan, and determining the difference between the without- and with-project conditions. Feasible plans are carried forward for comparison against one another.
5. Compare Alternative Plans: Alternative plans are compared, focusing on the differences among the plans identified in the evaluation phase and public comment. As part of the comparison of plans, the combined National Economic Development (NED) and National Ecosystem Restoration (NER) outputs will be identified.
6. Select Recommended Plan: A Recommended Plan is selected and justification for the selection is prepared.

The traditional formulation process includes the evaluation of alternative plans against a single without-project condition to assess the impacts. In the restructured study, multiple without-project conditions exist, one for each scenario. For each scenario, an integrated alternative plan will be evaluated in terms of its contribution to National Economic Development (monetary impacts to the national economy, both positive and negative), and contributions to National Ecosystem Restoration (non-monetary effects both positive and negative on ecological, cultural and aesthetic resources). Integrated alternatives that include combinations of ecosystem improvement and navigation improvement alternatives are not necessarily interdependent. The environmental and navigation improvements that are combined must be compatible and internally consistent such that no component of the alternatives constrains the ability to implement the other.

An important study assumption is that there would be unconstrained funding for both future without- and with-project investment needs. The assumption is that if any future work is recommended, the funds will be available and provided in a timely fashion. The schedules and investments identified in this study do not account for future budgetary uncertainties regarding the provision of funding.

This Interim Report is a status report to the feasibility study and as such will not contain completion of all the planning steps cited above. This report will define the problems and opportunities including planning objectives (step 1), and existing and future without-project conditions (step 2). The process of formulating alternative plans (step 3) will be initiated in this Interim Report, although it will not be completed until the feasibility study. Evaluating and comparing alternatives (steps 4 & 5) will be qualitatively discussed in this report; however, the technical aspects of the analysis will not be completed until the feasibility study. This Interim Report will not select a recommended plan (step 6).

## **2.2 Assessment of Problems and Opportunities.**

The principal **navigation** problem addressed by this study is the potential for significant traffic delays on the UMR-IWW Navigation System within the 50-year planning horizon. The principal **environmental** problems addressed by this study are changes to ecosystem structure and function imposed by the operation and maintenance of the existing 9-Foot

Channel Navigation Project, and potential navigation system improvements. **Floodplain** issues as they relate to the navigation system will be considered, but the ongoing WRDA 1999 (Public Law 106-53 Section 459) Comprehensive Floodplain Study will be relied on for detailed analysis of problems and opportunities in the floodplain. The primary opportunities are to reduce or eliminate commercial traffic delays and improve the economic and social climate while restoring, protecting, and enhancing the environment. The goal of the feasibility study is to outline an integrated plan to ensure the economic and environmental sustainability of the UMR-IWW Navigation System.

### 2.2.1 Establishing Collaborative Goals and Objectives for the UMR-IWW

Successful adaptive management of complex systems such as the UMR-IWW requires agreement among stakeholders on basic system goals and objectives. The stakeholders of the UMR-IWW have agreed that the overriding goal for the Restructured UMR-IWW Navigation Feasibility Study is to develop a plan for sustainable communities, economies, and ecosystems. Collaborative agreement on broad goals is an essential first step toward comprehensive and integrated river management. There also needs to be agreement on reference conditions, perhaps based on historic conditions, for the river system. Unifying principles for river management can be identified and agreed upon as the basis for collaborative planning.

Goals and objectives must be set at different levels (Table 1). At the highest level, the broad goal of sustainability of the UMR-IWW was defined as described above. A second level of goals can more specifically address the condition and management of the river ecosystem and specific economic and social goals related to floodplain land use and the navigation system. Such broad goals for integrated and adaptive river management have been applied in many other river management situations world-wide.

Table 1. Tiered goals for integrated river planning.

<b>Level of Goal</b>	<b>Scale</b>	<b>Example</b>
First Tier Goals	System-Wide Consensus Based	Sustainability of system components
Second Tier Goals	Broad Qualitative Integrated and Adaptable	Restore and maintain evolutionary and ecological processes; maintain reliable, efficient inland waterway
Third Tier Goals and Objectives	Quantitative Local to Regional Component Specific	1,000,000 duck use days in Pool X; lock improvements at Locks 20 - 25

At a third level, measurable objectives for the condition of the river, floodplain, and navigation systems should be identified. The Environmental Management Program (EMP) Habitat Needs Assessment (USACE 2000b) was a large first step toward a set of measurable objectives for river system habitats. Some parties in floodplain areas have expressed desires for uniform flood protection and other economic development.

Examples of some important societal needs include clean and abundant water, efficient waste assimilation, and safe recreational opportunities. Objectives for reduced delays at locks form the basis of the original UMR-IWW Navigation Feasibility Study. The objectives will be set collaboratively in the feasibility study, with the assistance of technical experts and conceptual and predictive models. These objectives need to be considered and established for each distinct river reach, given the great differences in physical, biological, and economic conditions along the river system.

### 2.2.2 Federal Government Goals

The Federal Government's goal is to develop alternative plans that allow for the ultimate identification of sustainable National Economic Development (NED) and National Ecosystem Restoration (NER) outputs. National economic development, in this case, is measured in terms of the navigation system efficiency, with the goal of safely maximizing improvements in commodity shipping at the least cost to the Nation. National ecosystem restoration, in this case, is measured in terms of the sustainability of the UMR-IWW river floodplain ecosystem with the goal of restoring it to a less degraded, more fully functioning ecosystem.

## 2.3 Inventory and Forecast of Resource Conditions.

Resource inventories assess existing resource components, their function, and their benefit to the region and the Nation. The **existing condition** considers the current state of system components and the factors responsible for their maintenance and condition. The forecast of resource condition, or **without-project condition**, is normally the most likely condition to exist in the future in the absence of any change in law or policy. It does not project the *status quo* or existing condition through the analysis period. Rather, the existing condition is the base for measuring the without-project condition.

Determining the without-project condition is critical to the study for many reasons:

- The analysis helps determine the economic viability of maintaining the existing lock and dam system,
- It helps determine the level of restoration required to achieve environmental sustainability given current and projected land and water uses.
- It is used as a baseline for measuring the incremental benefits, costs, and other effects of the alternative plans for navigation and ecosystem improvements—the **with-project** alternatives.

### 2.3.1 Physical and Landscape Setting

The influences of large-scale geologic and climatic factors are quite variable among UMR-IWW river reaches. The predevelopment Mississippi River flowed through relatively steep bluffed, narrow (<3 miles wide), and island braided reaches north of Clinton, Iowa. Reaches with larger frequent, irregular islands and notable rapids through valley constrictions traversed a widening valley from Clinton to the confluence of the Missouri River. The Open River, or Middle Mississippi River (MMR), reach south of St. Louis, Missouri, was an alluvial channel in a broad floodplain (7 - 10 miles wide) to Thebes gap and into the Lower Mississippi Valley which is as much as 95 miles wide (USGS 1999).

The pre-settlement landscape in the northern reaches (Pools 1 to 13) was characterized by riparian forests interspersed with marshes and prairies. The pre-settlement landscape in intermediate latitude river reaches (Pool 14 to the Kaskaskia River and the Lower Illinois River) was characterized by riparian forests that graded through savannas, that then gave way to prairies. The southern-most river reach, below the Kaskaskia River supported mature southern bottomland hardwood communities that covered the entire floodplain (USACE 2000b).

Natural disturbances, such as glaciers and flooding, shaped the river valley and the physical landscape of the UMR-IWW (USACE 2000c). The pre-settlement channel and landscapes developed over thousands of years of seasonal and cyclical disturbances (USACE 2000c). Although rivers are usually considered physically shaped and biologically colonized, there are many biologic feedback loops that affect the condition of the river. River biota are generally adapted to the dynamic river floodplain environment. The most obvious natural disturbance in the river floodplain system was the annual spring flood that allowed animal migrations and energy and nutrient transfers between the river and the floodplain. A less obvious disturbance in the modern era was the pre-dam occurrence of extreme low flows during late summer (USACE 2000d). Anecdotal references of people crossing the channel by foot are common throughout the river system. While detrimental to efficient water transport, low flow periods were very important for a host of ecological functions. Plant communities were distributed in relation to fluctuations in the annual hydrograph, animals generally moved with or away from the flood to benefit from or escape from flood waters (Junk et al. 1989).

Beginning in the late 19th century, intensive land use for agricultural and urban development altered native plant communities and watershed function (USGS 1999). Native plant communities in the uplands and floodplains were replaced by crops, lawns, parking lots, and buildings, which altered basin hydrology, allowing water to run off the land quicker than it did with native plant cover (DeMisse and Khan 1993). The rapid runoff also carried more sediment and nutrients to the waterways than the predevelopment landscape did (DeMisse et al. 1992). Floodplain development also converted native plant communities and, in many locations, the floodplains were also isolated from the rivers by flood protection measures, such as levees, initiated by private, local, and state entities (USGS 1999). Bankside logging destabilized river banks that were easily eroded creating a wide, sediment choked, and shallow channel in the late 1800's (Simmons et al. 1974).

River channel improvements for commercial navigation began in earnest in the late 1800's. Many structural measures were put in place to narrow and deepen the channels, various lock and dam and canal configurations were implemented on the Illinois River by non-Federal entities, and eventually the existing lock and dam system was constructed. The completion of the lock and dam system created a new physical template for the river in the impounded reaches.

Considering the physical setting and landscape changes that have occurred over the last 150 years, there is a need to define reference conditions for the desired state of the river.

Channel training structures in the Middle Mississippi River reach restored the pre-settlement channel width and position south of St. Louis. The current channel position, with a desire for increased off-channel area and main channel border diversity through innovative structure placement and design might provide a reference for the Middle Mississippi River desired condition. The physical and hydrologic template of the Illinois River was greatly altered by the diversion of Lake Michigan water in 1900 and by dams in the 1930's. These changes constitute the current physical template that supported a very productive system until a multitude of cumulative impacts greatly degraded the system over time. The high productivity of the early post-diversion and pre-pollution (1900 - 1910) period is a likely reference condition for the condition of the Lower Illinois River. On the pooled reaches of the Mississippi River, the early post-dam period was considered a boon to wildlife by many. In 1941, the superintendent of the Upper Mississippi River Wildlife and Fish Refuge was quoted "We are impressed with the fact that in this instance a navigation construction project has, in fact, been of tremendous benefit to wildlife." His successors, however, have overseen the degradation of the resource by the cumulative effects generically referred to as pool aging.

### 2.3.2 Existing Conditions

#### 2.3.2.1 Existing Navigation System Conditions

##### 2.3.2.1.1 LOCK STRUCTURES.

The study area includes 29 lock locations (35 locks) on the Upper Mississippi River (UMR) and 8 locks on the Illinois Waterway (IWW). Much of the UMR-IWW lock and dam system was in place by the 1940's. Except as noted below, the locks are 600 feet long, although, modern tow configurations include 15 barges and approach 1,200 feet long. As a result, most tows must lock through using a time-consuming two-step process in which the first three rows of barges (9 barges) are locked through first and the last two rows of barges (6 barges) and the towboat are locked through second. The entire process may take 1.5 hours or longer depending on many variables. In contrast, Lock 19 has a 1,200-foot lock and Melvin Price Locks and Dam (Lock 26 replacement) and Locks 27 have both a 1,200-foot and a 600-foot chamber at each site. The lockage process takes an average of 1.0 hour at Lock 19 and 0.6 hour at Locks 26 and 27. The location, age, and physical characteristics of each of the UMR and IWW locks are listed in Table 2. Table 2 also lists lock utilization for 1999. Utilization reflects the total time a lock chamber is in use divided by the total time the chamber is available for use during the navigation season.

##### 2.3.2.1.2 LOCK CAPACITY.

In 1999, lock tonnage ranged from 30 to 40 million tons at UMR Locks 14 - 25, with tonnage declining from 40 million, moving upstream. Upstream from Lock 14, tonnage continues to taper off to a volume of 11 million tons at Lock 2. Above Lock 2, traffic is 1 million tons or less. On the IWW, La Grange and Peoria locks totaled 36 million and 31 million, respectively, during 1999. Upstream of Peoria, tonnage on the IWW tapered off to 7 million tons at Thomas J. O'Brien. Estimates of lock capacity are roughly 45 - 55 million tons at facilities with a single 110-foot by 600-foot chamber. The capacity at Peoria and La Grange is estimated to be larger due to year round navigation at these sites and open pass conditions during roughly 40% of the navigation season.

2.3.2.1.3 FLEET CHARACTERISTICS, PORT FACILITIES, AND FLEETING.

Roughly 50 towing or barge companies operate on the UMR-IWW System. These operators have approximately 12,500 hopper barges, 1,300 tank barges, and 550 towboats. There are 778 commercial docks in the UMR-IWW study area, with 453 (58%) providing services for shipping or receiving commodities. Facilities tend to be concentrated in medium and large urban centers such as Minneapolis/St. Paul, Chicago, St. Louis, Peoria, or the Illinois/Iowa Quad Cities area. About 160 fleet areas are along the Upper Mississippi River and 42 along the Illinois Waterway (USACE 2000e).

2.3.2.1.4 COMMODITIES SHIPPED.

Farm products, including corn, soybeans, and animal feeds, are the largest single commodity transported on the system (Figure 5). Other major commodities shipped on the system include coal, chemicals, petroleum, crude materials (sand, gravel, iron ore, steel, and scrap), and manufactured goods.

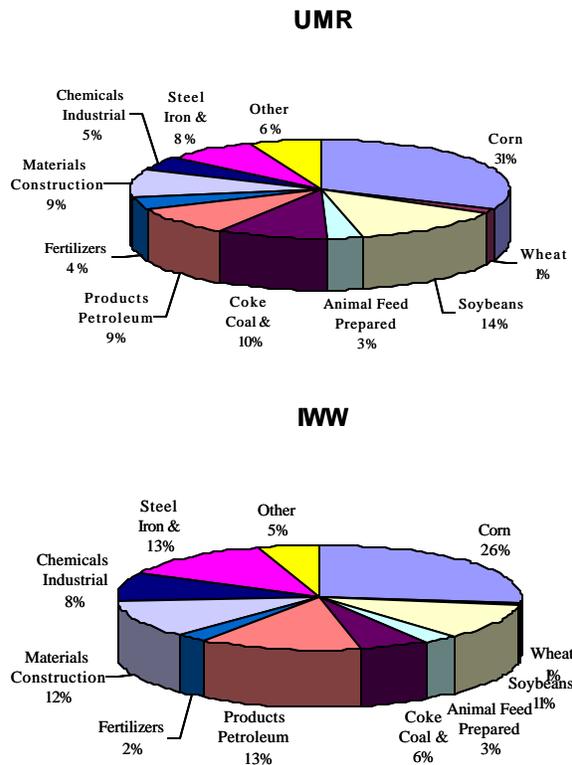


Figure 5. 2000 Commodity percentages by river (Source: Waterborne Commerce Statistics Center 2000g).

Table 2. Physical characteristics of locks.

Lock	River Mile	Year Opened	Length (Feet)	Width (Feet)	Lift (Feet)	1999 Utilization %
Upper Mississippi River System						
Upper St. Anthony Falls	853.9	1963	400	56	49	18
Lower St. Anthony Falls	853.3	1959	400	56	25	19
No. 1 Main Chamber	847.6	1930	400	56	38	20
No. 1 Auxiliary Chamber	847.6	1932	400	56	38	n.a.
No. 2 Main Chamber	815.0	1930	500	110	12	39
No. 2 Auxiliary Chamber	815.0	1948	600	110	12	n.a.
No. 3	796.9	1938	600	110	8	41
No. 4	752.8	1935	600	110	7	40
No. 5	738.1	1935	600	110	9	35
No. 5a	728.5	1936	600	110	5	34
No. 6	714.0	1936	600	110	6	42
No. 7	702.0	1937	600	110	8	43
No. 8	679.0	1937	600	110	11	44
No. 9	647.0	1938	600	110	9	44
No. 10	615.0	1936	600	110	8	47
No. 11	583.0	1937	600	110	11	52
No. 12	556.0	1938	600	110	9	53
No. 13	523.0	1938	600	110	11	51
No. 14 Main Chamber	493.0	1939	600	110	11	76
No. 14 Auxiliary Chamber	493.0	1922	320	80	11	6
No. 15 Main Chamber	482.9	1934	600	110	16	73
No. 15 Auxiliary Chamber	482.9	1934	360	110	16	18
No. 16	457.2	1937	600	110	9	70
No. 17	437.1	1939	600	110	8	75
No. 18	410.5	1937	600	110	10	72
No. 19	364.2	1957	1200	110	38	47
No. 20	343.2	1936	600	110	10	70
No. 21	324.9	1938	600	110	10	73
No. 22	301.2	1938	600	110	10	80
No. 24	273.4	1940	600	110	15	76
No. 25	241.4	1939	600	110	15	76
Melvin Price Main Chamber	200.8	1990	1200	110	24	50
Melvin Price Aux. Chamber	200.8	1994	600	110	24	20
No. 27 Main Chamber	185.5	1953	1200	110	21	56
No. 27 Auxiliary Chamber	185.5	1953	600	110	21	12
Illinois River System						
La Grange	80.2	1939	600	110	10	42
Peoria	157.7	1938	600	110	11	58
Starved Rock	231.0	1933	600	110	19	n.a.
Marseilles	244.6	1933	600	110	24	n.a.
Dresden Road	271.5	1933	600	110	22	n.a.
Brandon Road	286.0	1933	600	110	34	n.a.
Lockport	291.1	1933	600	110	40	55
Thomas J. O'Brien	326.5	1960	1000	110	4	36

2.3.2.1.5 HISTORIC/EXISTING TRAFFIC LEVELS.

Traffic usage and tonnage increased rapidly through the 1970's, but growth rates have flattened considerably since the 1980's (Figure 6). Between 1965 and 1998, commercial traffic increased by an annual average growth rate of 2.3% for the UMR system, 1.3% for the IWW system, and 3.2% for the Middle Mississippi River system. Traffic is greatest at the downstream end of the navigation system as different regions add or consume commodities in the downstream or upstream direction, respectively (Figure 7).

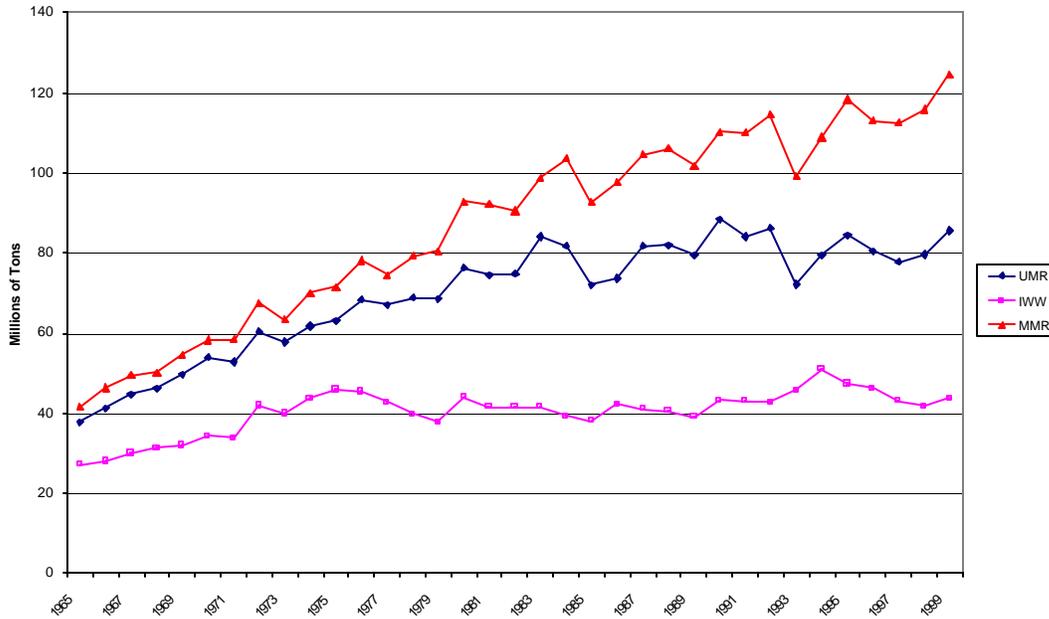


Figure 6. Historic traffic levels (millions of tons).

2.3.2.1.6 EXISTING LOCKAGE DELAYS.

Eight locks on the UMR and 3 IWW locks were among 20 locks with the highest average delays in 1987 at the beginning of this study (USACE 1989). This remains the case as illustrated in Figure 8, which shows the distribution of peak monthly delays at locks around the country in 1998. The UMR-IWW System had over half (19 of 36) of the most delayed lock sites in the country.

Under current conditions, delays to tows are common at a number of locks on the UMR System. Existing delays vary based on the location on the system. In general, delays are greatest at the most downstream 600-foot locks. For the 10-year period 1990-1999, delays per tow averaged 3.4 hours at Locks 20-25; 2.2 hours at Locks 14-18; 0.9 hour at Locks 8-13; and 0.4 hour for Upper St. Anthony Lock to Lock 7. On the IWW over the same period, delays per tow averaged 1.8 hours at Peoria and La Grange and 1.1 hours for the other locks. Percent of tows delayed, average delay for tows, and the total ton-hours of delay by chamber during 1999 are presented in Table 3. Total ton-hours is the product of tons and average delay.

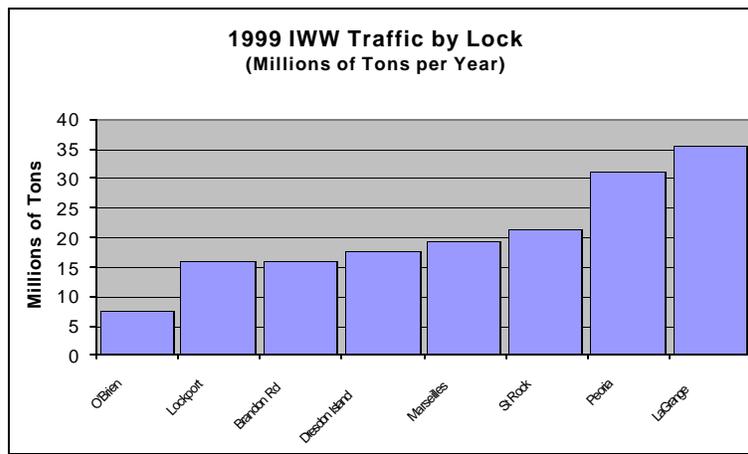
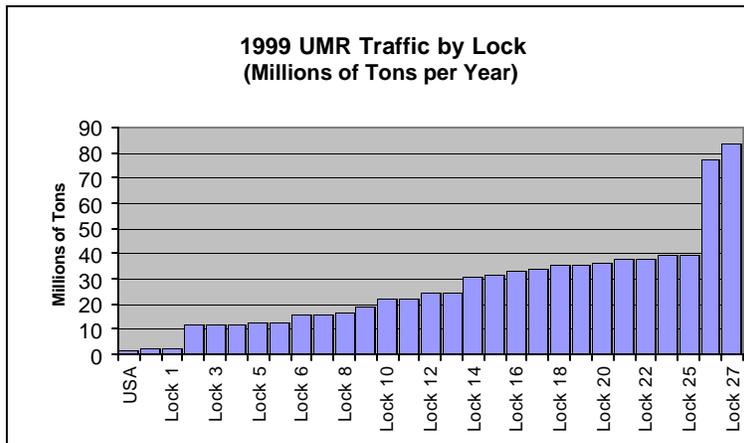


Figure 7. Commodities passing through locks on the UMR and IWW (Source: Lock Performance Monitoring System).

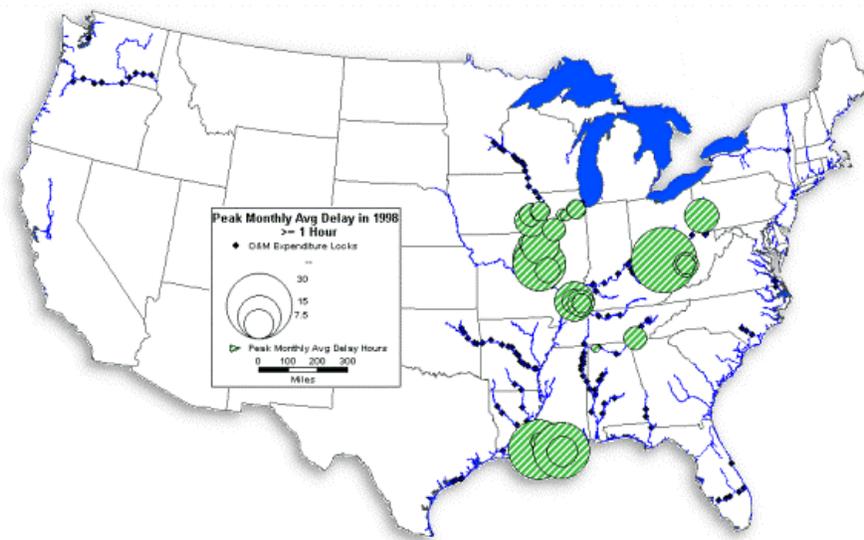


Figure 8. Peak monthly average lock delay in 1998 (Source: Navigation Data Center, 1999).

Table 3. 1999 average delay, percent tows delayed, and ton-hours of delay.

Lock	Average Delay of Tows (Hours)	Percent of Tows Delay	Total Tonnage (Millions)	Ton-Hours of Delay (Millions)
<b>Mississippi River</b>				
Upper Saint Anthony Falls	0.3	8	2.1	0.7
Lower Saint Anthony Falls	0.3	11	2.1	0.6
No. 1	0.5	7	2.1	1.1
No. 2	1.2	47	11.6	13.7
No. 3	1.1	44	11.6	12.4
No. 4	1.2	45	12.3	14.1
No. 5	1.2	38	12.8	15.1
No. 5a	1.1	48	12.8	13.4
No. 6	1.4	48	15.8	21.6
No. 7	1.3	50	15.9	20.5
No. 8	1.7	50	16.8	27.7
No. 9	1.4	49	18.8	26.7
No. 10	1.6	49	22.0	34.1
No. 11	1.6	59	22.5	36.2
No. 12	1.8	59	24.4	43.9
No. 13	1.8	57	24.8	43.4
No. 14 Main Chamber	4.8	81	30.8	148.8
No. 14 Auxiliary Chamber	0.0	0	0.0	0.0
No. 15 Main Chamber	3.7	74	30.6	112.6
No. 15 Auxiliary Chamber	0.2	13	0.6	0.1
No. 16	2.4	74	33.1	79.8
No. 17	2.8	76	34.2	96.8
No. 18	2.4	74	35.7	86.8
No. 19	1.3	57	35.8	46.2
No. 20	2.9	76	36.6	104.7
No. 21	2.6	76	37.9	96.6
No. 22	4.5	85	38.1	171.8
No. 24	3.6	82	39.3	139.9
No. 25	4.5	84	39.5	178.9
Melvin Price Main Chamber	1.2	56	69.6	84.9
Melvin Price Aux. Chamber	16.7	46	8.0	133.7
No. 27 Main Chamber	1.7	66	79.9	133.4
No. 27 Auxiliary Chamber	18.8	29	3.5	65.6
<b>Illinois River</b>				
La Grange	5.1	55	35.6	180.5
Peoria	3.4	38	31.1	106.1
Starved Rock	2.4	54	21.4	50.9
Marseilles	2.8	61	19.2	52.8

Table 3 (continued). 1999 average delay, percent tows delayed, and ton-hours of delay.

Lock	Average Delay of Tows (Hours)	Percent of Tows Delayed	Total Tonnage (Millions)	Ton-Hours of Delay (Millions)
Dresden Island	1.9	54	17.7	33.1
Brandon Road	2.2	58	16.1	35.6
Lockport	2.5	56	16.0	39.4
Thomas J. O'Brien	0.3	18	7.4	1.9

2.3.2.1.7 TRANSPORTATION COSTS.

An evaluation of transportation costs for the UMR System indicated that rate savings to waterway users averaged about \$8.60 per ton (1994 prices) over the best possible all-land routing alternative (TVA, Transportation Rate Analysis: Upper Mississippi River Navigation Feasibility Study, 1996). Savings for each of the 11 commodity groupings identified for this analysis are summarized in Table 4.

Table 4. All land vs. water differential by commodity group (total system; 1994 prices).

<b>Commodity Group</b>	<b>Weighted Differential (\$)</b>
Corn	7.05
Soybeans	11.51
Wheat	7.69
Farm NEC	2.64
Coal	6.77
Petroleum	12.26
Ind. Chemicals	13.59
Ag. Chemicals	6.43
Iron & Steel	12.12
Aggregates	7.53
Miscellaneous	8.13
<b>Total</b>	<b>8.60</b>

2.3.2.1.8 WATER COMPELLED RATE SAVINGS/  
REGIONAL ECONOMIC DEVELOPMENT BENEFITS.

The presence of the rivers provides many benefits to the regions, states, and counties along the river corridor and the Nation as a whole. Benefits are derived from the employment and income generated from transportation of goods, recreation, hydropower production, and water supply for municipalities, commercial, industrial, and domestic use. The

waterways also contribute to regional and national economic development by offering a means of shipping bulk commodities at low cost.

#### 2.3.2.1.9 BENEFITS OF EXISTING SYSTEM.

The existing UMR-IWW System provides considerable transportation cost savings to the Nation. Measured as the transportation rate differential between an all-land routing versus water, the existing system generates an estimated \$725 million (2000 prices) of transportation cost savings associated with the level of traffic in 2000. These benefits compare with the operation and maintenance costs of approximately \$115 million.

#### 2.3.2.1.10 EXISTING OPERATIONS AND MAINTENANCE FOR NAVIGATION SYSTEM.

Operations and Maintenance (O&M) costs include funding for lock and dam personnel, maintenance crews, dredging, utilities, minor repairs, and the maintenance of training structures south of St. Louis. These routine costs are incurred annually, but they have not historically been sufficient to maintain an acceptable level of performance, leaving a need for additional monies to maintain a system that otherwise will deteriorate over time. Appropriations for O&M have been “flat-lined” in recent years, losing pace with inflation and deferring much needed maintenance. There is a current backlog of unfunded critical maintenance items that exceed \$75 million.

O&M costs based on historical cost data from 1981 to 1999 are estimated at \$115 million per year. Lock and dam operations account for \$45 million, dredging \$32 million, maintenance \$23.5 million, contract expenses \$13 million, and engineering costs \$1.5 million. Cost data were converted to year 2000 dollars using the Civil Works Construction Cost Index System (USACE 2000f; <http://www.usace.army.mil/inet/usace-docs/eng-manuals/em1110-2-1304/toc.htm>). The percentage breakdown of baseline O&M costs is depicted in Figure 9.

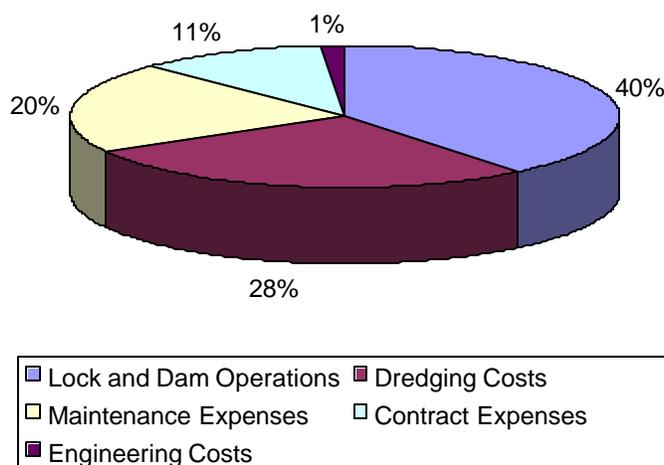


Figure 9. Annual baseline operations and maintenance (percent of cost).

#### 2.3.2.1.11 EXISTING REHABILITATION PROGRAM.

Rehabilitation of the lock and dam system has been ongoing since 1975. The program involves project feature restoration work intended to improve the reliability of the existing structures for an additional 25 years. Rehabilitation has been accomplished at the majority of lock sites on the Upper Mississippi and Illinois Waterways. Over \$900 million has been expended on this program since 1975.

#### 2.3.2.2 *Existing Environmental Conditions*

##### 2.3.2.2.1 LAND COVER.

The UMR-IWW floodplain ecosystem encompasses 2,768,638 acres (Figure 10). Based on the most recent system-wide aerial photograph and satellite imagery (1989), agriculture was the dominant land cover class, occupying 44% of the floodplain. Open water was the second dominant land cover class, covering 17% of the floodplain. Floodplain forests followed closely, occupying 14% of the floodplain. None of 15 other classes exceeded 10% of the floodplain area, and only developed land areas exceeded 5% (USACE 2000b).

Land cover classes are disproportionately distributed throughout the river system (Figure 11), and their absolute abundance is dependent on the total area of the reach under consideration. The largest differences occur in the amount and distribution of agriculture and the proportion of open water in the floodplain. Agriculture dominates the wide floodplain south of Rock Island, Illinois, and open water occupies a greater proportion of the floodplain north of Clinton, Iowa. Wetland classes are generally more abundant in northern river reaches, wet meadows are fairly evenly distributed, and grasslands (prairie remnants and wet meadow) are rare throughout the river system. Forest classes generally occupy between 10% to 20% of the floodplain throughout the system (USACE 2000b).

##### 2.3.2.2.2 DAMS.

Existing Federal projects affecting environmental resources on the UMR-IWW System include, but are not limited to, the navigation system, local flood protection projects (federally constructed, improved, or inspected but privately owned and maintained), and National Wildlife Refuges. The navigation system consists of 28 dams with locks on the Mississippi River and 8 on the Illinois Waterway (see Figure 1) and numerous channel training structures. Most of the dams were constructed during the 1930's for the specific purpose of increasing low and moderate flow water surface elevations to maintain a continuous 9-foot navigation channel from St. Louis, Missouri, to Minneapolis, Minnesota, and Lake Michigan. The dams impede fish movement for much of the year. The frequency of "open river" conditions when all dam gates are out of the water and fish may move unimpeded is presented in Figure 12 (USGS 1999), but there is also evidence that they can move through locks and under partially closed gates. There are 266 tributary dams with a minimum capacity of at least 5,000 acre-feet in the watershed (USGS 1990), and many more small dams or weirs that impede fish movement to tributaries.

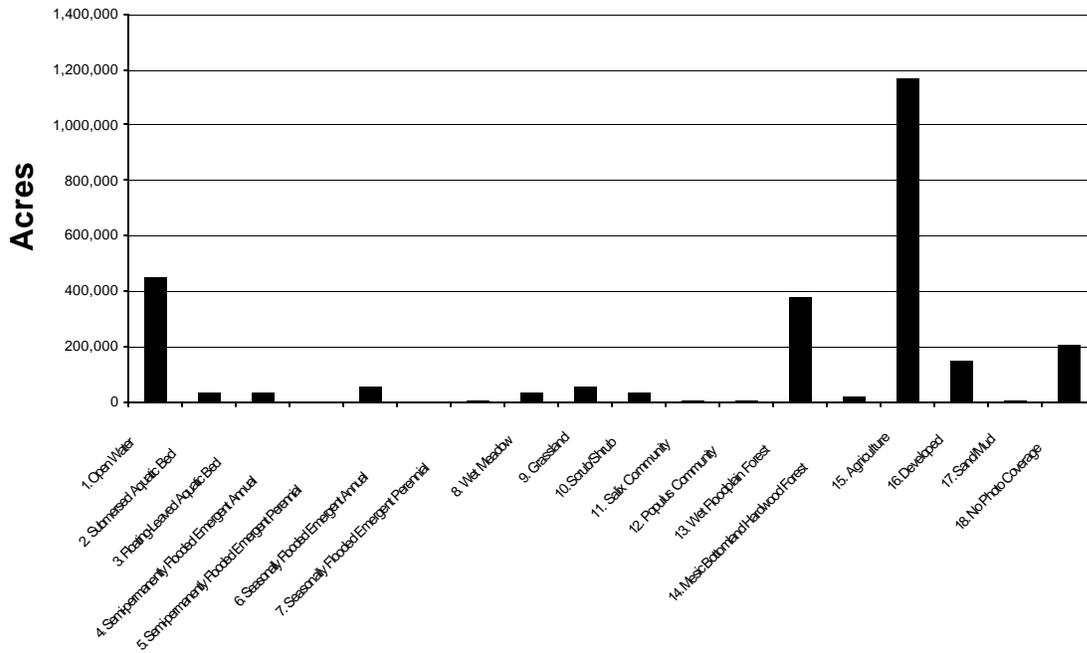


Figure 10. Upper Mississippi River System land cover distribution by Habitat Needs Assessment 18 category classification (USACE 2000b).

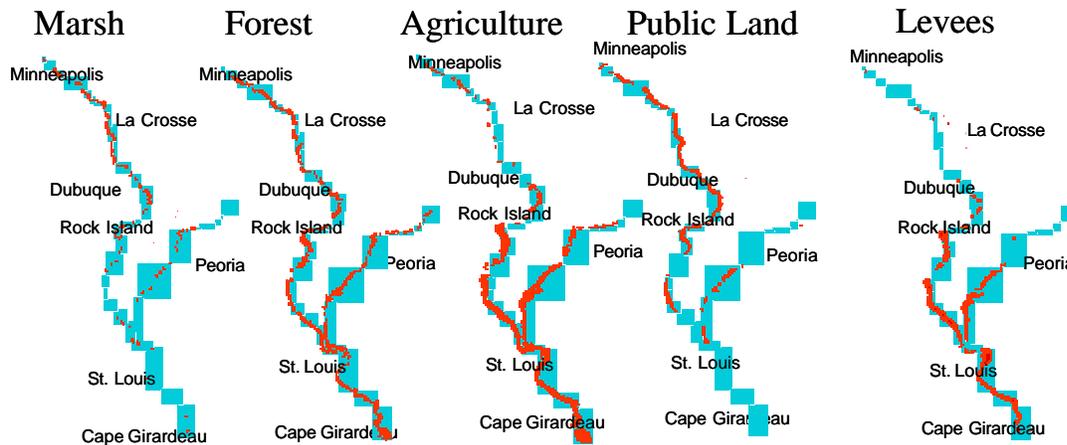


Figure 11. Marsh, forest, agriculture, public land, and levee distribution in the Upper Mississippi River System. Shaded areas exaggerate the abundance of land cover or land use categories to emphasize their distribution (USACE 2000b).

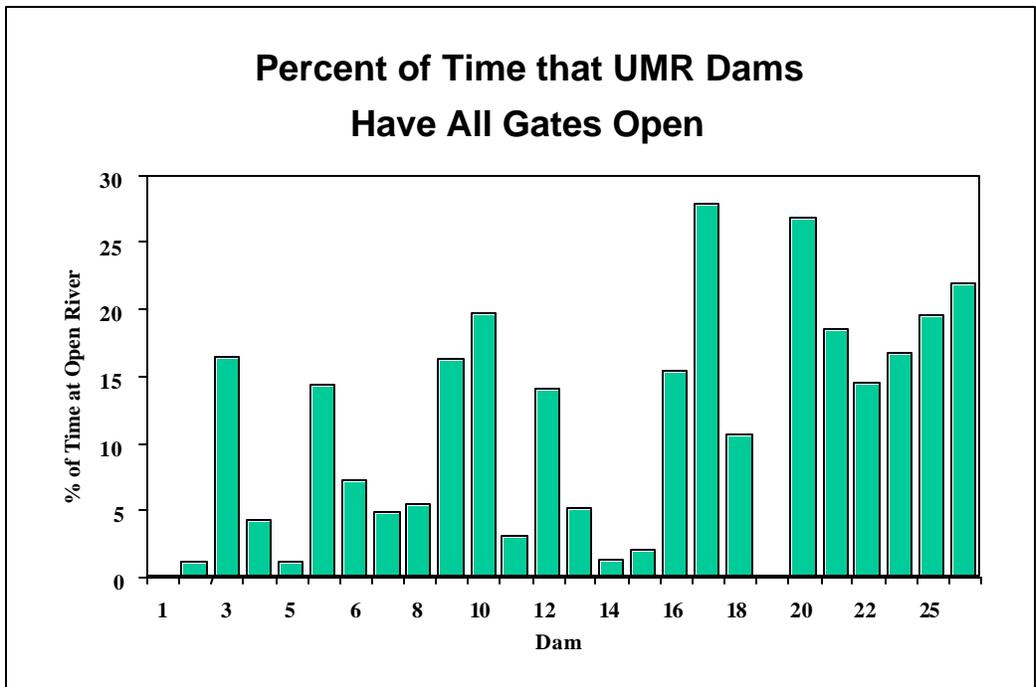


Figure 12. Frequency that Upper Mississippi River-Illinois Waterway System dam gates are opened with maximal potential fish passage (USGS 1999).

#### 2.3.2.2.3 CHANNEL TRAINING.

Channel training structures include wing dikes that manage sediment and locally influence the distribution of velocity and direction of flow along the main channel. The elevation of most of these structures restricts their effect to below bankfull conditions with negligible impact on larger floods. The majority of the training structures in the pooled river reaches were constructed prior to the completion of the 9-foot channel project and were submerged when the locks and dams were constructed. This and structure deterioration over the last 100 years have reduced their effectiveness to various degrees depending on their location in the navigation pools. Wing dams and other channel training structures are prominent features south of St. Louis, Missouri, where they and dredging alone are used to maintain the navigation system. Channel clearing activity removed much of the natural structure found in numerous woody snags and mussel beds. Wing dikes and other submerged structures currently provide similar aquatic habitat, substrate, and structure important to many aquatic invertebrates and fishes. Wing dam construction and alteration of sedimentation patterns adversely affected freshwater mussels in some channel border locations.

#### 2.3.2.2.4 LEVEES.

Levees constructed by private entities, cooperative quasi-governmental levee districts, and the Federal Government protect urban centers, rural communities, and croplands. In some areas, pumps are used to control water levels within leveed backwaters to enhance wildlife habitat. Levees are not evenly distributed, and the proportion of leveed floodplain area to total floodplain area increases as the floodplain widens in a southerly direction (Table 5; see Figure 11). Levees protect about 3% of the floodplain north of Clinton, Iowa, 50% of the floodplain between Clinton and Alton, Illinois, 83% of the floodplain south of St. Louis to the Ohio River, and 60% of the Illinois River south of Peoria, Illinois (Upper Mississippi River Basin Commission 1982, Scientific Assessment and Strategy Team 1994 (see Galloway 1994), USACE 2000b). Levees isolate the floodplain from the main channel of the river, increasing velocity, bank erosion, and bed scour along the main channel during floods.

#### 2.3.2.2.5 REFUGES.

Federal interest in habitat protection increased in the early 1900's when commercial mussel, fish, and wildlife harvests were taking large quantities of the river system's resources, and sewage and industrial pollution from urban centers were degrading water quality and killing aquatic organisms. The Upper Mississippi River Wildlife and Fish Refuge was authorized in 1924 and eventually acquired almost 270,000 acres. There are five National Wildlife Refuges on the Illinois River with a total of 16,000 acres (Table 6; USFWS 2002). Flood-prone lands sometimes become available after extreme floods, and Federal agencies including the Federal Emergency Management Agency, the Corps, and the Fish and Wildlife Service work together to acquire and manage these lands.

#### 2.3.2.2.6 IMPOUNDMENT AND CHANNEL TRAINING EFFECTS.

The infrastructure supporting commercial navigation and the ecological response to it differ along the length of the river. Aquatic habitat in Mississippi River reaches north of the Quad Cities increased significantly following impoundment (Figure 13). Impoundment effects south of the Quad Cities to Alton, Illinois, were not pronounced in plan view (map view), but river levels were stabilized within channels (Figure 14; USACE 2000b, c, d). South of the Missouri River, channel plan form configurations have been restored from previously degraded conditions, but off channel habitats are degraded and the floodplain is isolated from the mainstem in all but the worst floods. Illinois River aquatic habitats were expanded in size as a result of diversion but they still fluctuated with high and low flow periods. Navigation dams stabilized the low flow river stage making the expanded aquatic habitats permanent features of the floodplain (USGS 1999).

River impoundment changed vegetation communities throughout the river. Forests and marshes were inundated and killed by increased water levels in some areas. Marshes developed in many areas where shallow water habitats were created by the dams, but emergent marshes in many pools have degraded and disappeared. Forest community structure and species diversity has been simplified by a high, stable water table maintained by the dams. Many native floodplain plant communities were also replaced by agriculture (USGS 1999).

Table 5. Leveed area and public lands distribution and abundance in the UMR-IWW (USACE 2000b).

Reach	Total Floodplain Acres	Leveed Area		Public Ownership	
		Total Acres	% of Floodplain	Total Acres	% of Floodplain
Pool 2	21,620	1,013	4.70%	4,723	21.80%
Pool 3	23,584	0	0.00%	10,468	44.40%
Pool 4	70,062	188	0.30%	19,893	28.40%
Pool 5	29,931	82	0.30%	18,616	62.20%
Pool 5a	16,887	5	0.00%	12,399	73.40%
Pool 6	25,011	5,968	23.90%	11,609	46.40%
Pool 7	41,543	0	0.00%	19,834	47.70%
Pool 8	47,110	1,400	3.00%	29,272	62.10%
Pool 9	52,166	2	0.00%	45,944	88.10%
Pool 10	39,863	274	0.70%	23,754	59.60%
Pool 11	31,959	222	0.70%	25,387	79.40%
Pool 12	21,981	1,084	4.90%	14,677	66.80%
Pool 13	85,287	8,408	9.90%	52,228	61.20%
Pool 14	65,840	22,042	33.50%	12,150	18.50%
Pool 15	10,307	2,067	20.10%	1,040	10.10%
Pool 16	33,906	4,090	12.10%	10,517	31.00%
Pool 17	80,554	59,925	74.40%	7,820	9.70%
Pool 18	126,123	46,436	36.80%	20,432	16.20%
Pool 19	123,312	37,156	30.10%	842	0.70%
Pool 20	70,402	47,513	67.50%	3,922	5.60%
Pool 21	61,081	39,918	65.40%	12,024	19.70%
Pool 22	88,643	68,340	77.10%	8,129	9.20%
Pool 24	88,774	65,245	73.50%	14,062	15.80%
Pool 25	89,071	50,677	56.90%	16,292	18.30%
Pool 26*	138,382	32,290	23.30%	3,633	2.60%
L+D 26 to Kaskaskia R.	278,559	209,221	75.10%	1,709	0.60%
Kaskaskia R. to Grand Tower	130,399	87,492	67.10%	27,471	21.10%
Grand Tower to Ohio R.*	264,095	65,917	25.00%	25,518	9.70%
<b>Total Reach</b>	<b>2,156,461</b>	<b>856,981</b>	<b>39.70%</b>	<b>454,361</b>	<b>21.10%</b>
Lockport	15,433	0	0.00%	412	2.70%
Brandon	1,855	0	0.00%	0	0.00%
Dresden	6,076	0	0.00%	647	10.70%
Marseilles	25,503	0	0.00%	37	0.10%
Starved Rock	13,956	0	0.00%	0	0.00%
Peoria	131,476	4,952	3.80%	13,590	10.30%
Lagrange	221,226	119,590	54.10%	39,599	17.90%
Alton	196,652	133,563	67.90%	21,104	10.70%
<b>Total Reach</b>	<b>612,177</b>	<b>258,105</b>	<b>42.20%</b>	<b>75,389</b>	<b>12.30%</b>

\* GIS levee coverage incomplete (see Scientific Assessment and Strategy Team in Galloway 1994)

Table 6. Summary of UMR-IWW National Wildlife Refuge lands (USFWS 2002).

<b>Management Unit</b>	<b>Acres</b>	<b>Location</b>
<b>Upper Mississippi River National Wildlife and Fish Refuge</b>		
Winona District	43,389	Pools 4-6
La Crosse District	46,469	Pools 7-8
McGregor District	90,678	Pools 9-11
Savanna District	52,973	Pools 12-14
<b>Trempealeau NWR</b>	5,733	Pool 6
<b>Mark Twain National Wildlife Refuge Complex</b>		
Port Louisa NWR	8,375	Pools 17-18
Great River NWR	10,037	Pools 20-24
Clarence Cannon NWR	3,751	Pool 25
Two Rivers NWR	2,660	Pools 25-26
Middle Mississippi NWR	4,400	Open River
<b>Total Mississippi Acres</b>	<b>268,465</b>	
<b>Illinois River National Wildlife and Fish Refuges</b>		
Cameron-Billsbach Unit	1,709	Peoria Pool
Chautauqua NWR	4,488	La Grange Pool
Emiquon NWR	1,303	La Grange Pool
Meredosia NWR	2,883	Alton Pool
<b>Mark Twain National Wildlife Refuge Complex</b>		
Two Rivers NWR	5,840	Alton Pool
<b>Total Illinois Acres</b>	<b>16,223</b>	

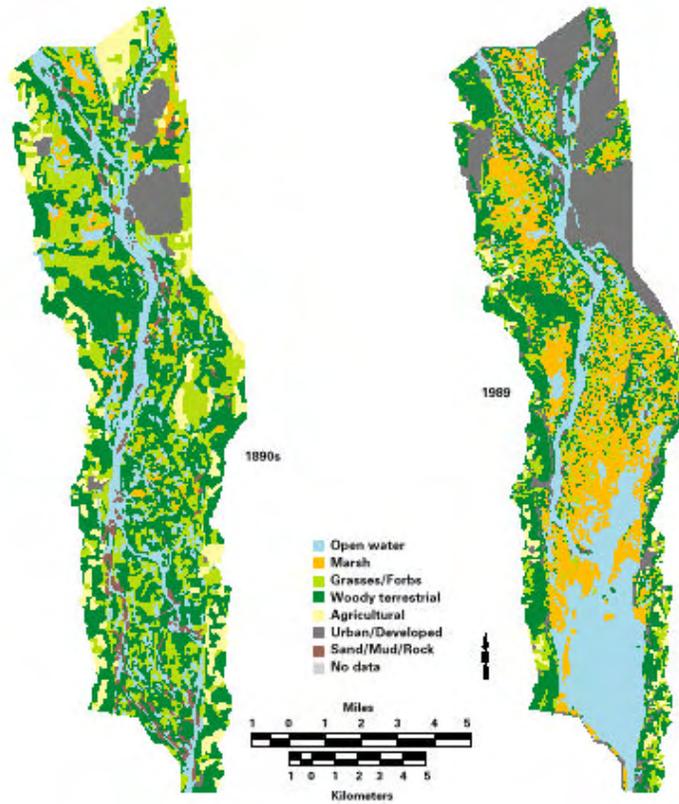


Figure 13. Dam impacts on the distribution of water in Pool 8 near La Crosse, Wisconsin.

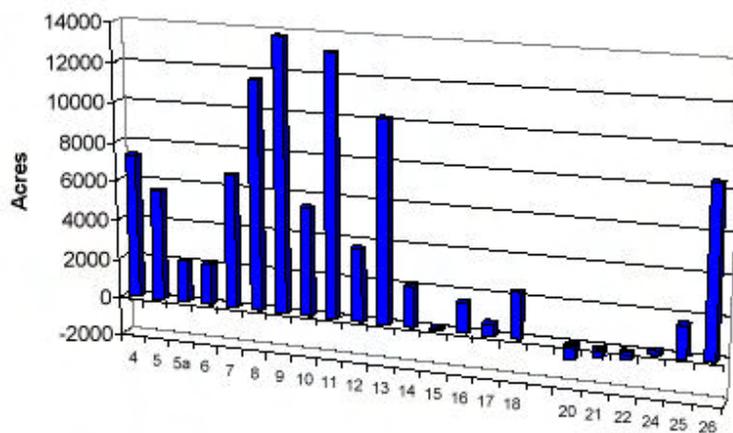


Figure 14. The change in acres of open water in Upper Mississippi River pooled reaches attributable to impoundment.

Riverbed morphology and microhabitat availability have been altered throughout the UMR-IWW. The occurrence of snags (woody structure), sand bars, and riffles has been reduced or eliminated because of hydraulic modifications imposed by locks and dams, dredging, and channel training structures, although training structures do re-create bathymetric and hydrodynamic diversity beneficial to many organisms. Islands in the lower portions of the northern pools eroded after lock and dam construction because of wave action and the altered sediment regime. Excessive sediment from upland loess soil erosion has been trapped in backwater lakes and impounded areas, especially on the Illinois River, causing loss of depth, loss of aquatic area, and loss of bathymetric diversity. In most areas, the sediments remain unconsolidated and subject to resuspension by wind- and boat-generated waves and benthic feeding fishes. Sediment resuspension increases water column turbidity, which can limit submersed aquatic plant growth (USGS 1999).

The result of the development of the Mississippi and Illinois Rivers is an altered ecosystem that, depending on the river reach, is in various stages of evolution towards a new quasi-stable environmental condition. Some river reaches may be close to this environmental stability, while it may take centuries for other reaches to achieve stability. The cumulative impacts of land use changes increased the sediment and water delivery to the river. Human disturbance from basin to habitat scales has altered habitat diversity and quality throughout the UMR-IWW (USGS 1999).

#### 2.3.2.2.7 HABITAT CONDITION.

The river system has been altered by human activities for thousands of years, but human impacts have increased substantially over the last two centuries. Some of the environmental impacts associated with the navigation system and other stressors are presented in Table 7. An assessment of existing conditions on the UMR-IWW was conducted at system, river, river reach, and pool scales for the Upper Mississippi River System Habitat Needs Assessment (USACE 2000b). The analysis included 12 river reaches, 37 pools/reaches, and 33 land cover and geomorphic area classes. To summarize, the greatest habitat diversity and quality occurs north of Pool 14 due primarily to the existence of a connected floodplain and ample public land. Wildlife and fish habitat abundance and quality generally degrade in a downstream direction because of increasing proportions of private croplands in the floodplain and adverse effects of sedimentation in aquatic habitats. One common impact throughout the river system is that water level regulation has altered natural hydrology, which contributes to aquatic habitat degradation. Another widespread impact is that longitudinal connectivity allowing long distance migrations by fish species such as paddlefish, sturgeon, and skipjack herring is reduced by mainstem and tributary dams. Lateral connectivity allowing movements into inundated floodplains is reduced where levees are prevalent.

The results of the qualitative analysis of habitat conducted for the Habitat Needs Assessment clearly indicate that resource managers are concerned about backwater sedimentation and secondary channel loss. When surveyed, river managers identified 16 geomorphic processes affecting river habitats (Table 8). These areas were also mapped as illustrated in the example from Pool 13 (Figure 15). Over 65% of state DNR managers comments referenced geomorphic processes that contributed to backwater or secondary channel loss. Some geomorphic changes are a systemic concern, whereas others are

restricted to specific regions of the river based on unique geomorphic characteristics. In general, resource managers were concerned with loss of aquatic area, habitat quality, and species diversity.

Table 7. Ecological stressors and resource impacts affecting the Upper Mississippi River ecosystem.

<b>Ecological Stressor</b>	<b>Resource Impact</b>
Land Use Change	Loss of native plant community diversity and abundance; decreased infiltration creating increased volume and force of upland runoff
Reduced Aquatic Connectivity	Impeded fish migration and material/ nutrient transport
Channel Training Structures	Flow concentration, increased current velocity, increased structure and flow diversity
Impoundment	Inundation of lands in pooled areas, increased aquatic habitat, hydraulic modifications in pools, pool aging
Altered Hydrology	Loss of low river stage, altered water table
Contaminants	Nutrient enrichment, toxic responses
Sedimentation	Backwater and secondary channel filling, reduced sediment quality, increased turbidity due to resuspension
Resource Consumption	Reduce standing stocks of mussels, fish, and wildlife
Exotic Species	Competition with native species
Floodplain Development	Loss of native communities and seasonal habitats
Commercial Traffic	Direct effects (entrainment, wake waves), indirect effects (sediment resuspension and transport)
Bank Erosion (from any cause)	Tree fall, loss of cultural resources, island erosion
Dredging and Material Placement	Animal displacement, instream habitat disruption, terrestrial habitat damage
Recreational Boating	Propeller strikes, bank erosion, noise

Table 8. Occurrences of geomorphic processes affecting UMR-IWW habitats as reported by natural resource managers.

<b>Geomorphic Process</b>	<b>Number of Occurrences</b>
Loss of Contiguous Backwaters	153
Loss of Secondary Channels	116
Loss of Isolated Backwaters	49
Tributary Delta Formation	43
Filling between Wing Dams	34
Loss of Contiguous or Isolated Backwaters	32
Wind-Wave Erosion of Islands	25
Island Formation	20
Island Dissection	15
Loss of Bathymetric Diversity	12
Loss of Contiguous Impounded	9
Shoreline Erosion	8
Loss of Tertiary Channels	5
Island Migration	4
Channel Formation	3
Delta Formation	3

2.3.2.2.8 EXISTING ENVIRONMENTAL MANAGEMENT EFFORTS.

Just as Federal, state, and private entities have combined to affect the resources of the UMR-IWW System environmental resources, so do they all contribute to the management of the system. Typical environmental management actions include designating areas as refuge and park areas that are off limits to development, and land management activities such as prescribed burns, timber stand management, and moist soil management. The opportunities and funding for these actions, however, have not historically been sufficient to counteract the adverse effects of other human activity in the river, floodplain, and basin. Adverse environmental impacts have been mounting since modern culture began to develop the region (Figure 16). The Habitat Needs Assessment (USACE 2000b) is the most comprehensive accounting of the quantitative extent and locations and qualitative nature of these impacts. Land acquisition and facilities improvements are occasionally made in response to flood disasters, but resource managers are generally very constrained by a lack of funding.

Current spending on UMR-IWW environmental management is somewhat difficult to track because of the many entities involved. The U.S. Army Corps of Engineers owns fee title to about 270,000 acres of General Plan lands purchased during the 1930's to implement the 9-Foot Channel Navigation Project. The St. Paul District and Rock Island



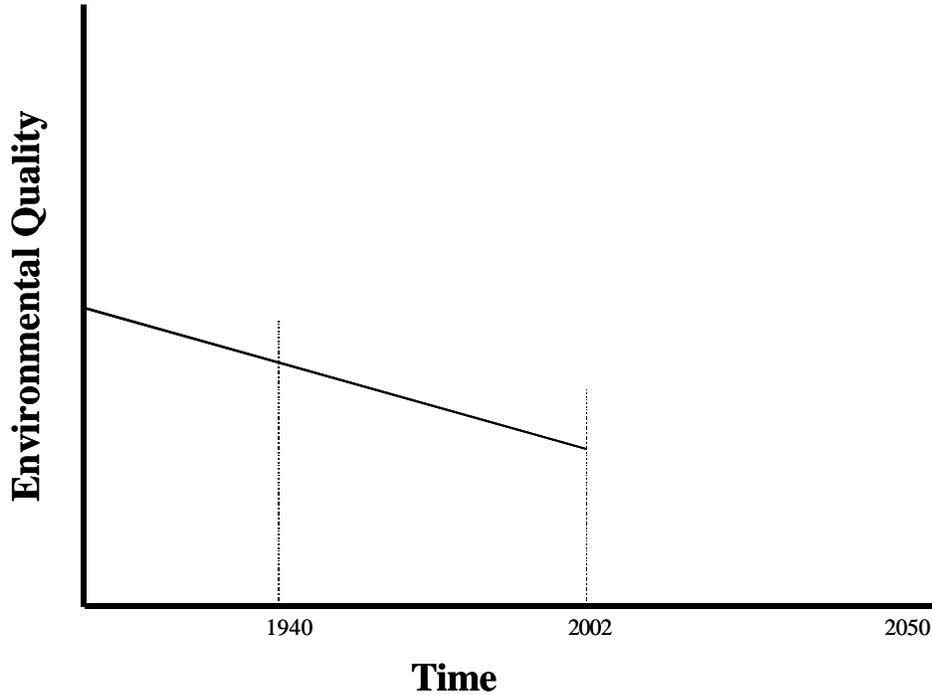


Figure 16. Schematic representation of the environmental impacts of human activities on Upper Mississippi River System natural resources (no scale implied).

District have active forest management programs, and all UMR-IWW Corps districts maintain lands and recreational facilities described below. U.S. Fish and Wildlife Service entities manage about 280,000 acres of refuges, primarily for migratory birds, threatened and endangered species, and other Trust species. States actively manage about 140,000 acres (state owned or General Plan lands). Private duck hunting clubs have been active on the Lower Illinois River for much of the 20th century; they currently manage about 60,000 acres (Havera 1995). Other private clubs manage land on the Mississippi River in northeast Missouri and near Burlington, Iowa. Remnant oxbow lakes and floodplain crop fields support migrating geese in the highly developed areas south of St. Louis. Non-governmental conservation organizations are increasing their participation in habitat protection efforts with significant land acquisitions on the Lower Illinois River and southern Illinois floodplain.

Total annual spending on environmental management is about \$9 million for Fish and Wildlife Service refuges, less than \$3 million for state departments of natural resources, and less than \$2 million for Corps natural resource management (Upper Mississippi River Conservation Committee 2000). The Upper Mississippi River System - Environmental Management Program (EMP) was authorized to rehabilitate and enhance river-floodplain habitats and to monitor environmental trends in conjunction with authorization of the

Second Lock at the Melvin Price Lock and Dam. The EMP has been funded approximately \$15 million annually over the last 13 years. Its authorization allows funding up to \$33 million annually.

Several more Corps programs and authorities improve river habitats, but the funding allocation has not been separated from traditional river management activities for this Interim Report. Programs, projects, or activities that also enhance environmental resources in the mainstem rivers include:

- Dredged Material Management Program, Rock Island District
- Avoid and Minimize Program, St. Louis District
- Channel Maintenance Management Plan, St. Paul District
- Committee to Assess Regulating Structures, Rock Island District
- St. Louis District Master Plan 2002
- Threatened and Endangered Species Conservation Plan
- Section 204 Beneficial Uses for Dredged Material
- Section 1135 Aquatic Ecosystem Restoration
- Section 206 Aquatic Ecosystem Restoration

#### 2.3.2.2.9 MEASURES TO RESTORE RIVER HABITATS.

Impacts are readily apparent when examining change in the UMR-IWW environment that can be attributed to navigation system infrastructure and maintenance. The 9-Foot Channel Navigation Project is not the only impact on the river system. The cumulative effects of human activities in the uplands and floodplains, constrained within the hydrologic regime imposed by the navigation system, have also contributed to wetland, aquatic, island, and terrestrial habitat degradation (see Table 7). River managers have been evaluating and addressing these impacts for many years, and they have developed many tools or methodologies to restore degraded habitats (Table 9; see also Appendix 5). The ability to implement measures or actions to restore degraded habitats, however, is dependent on the availability of and competition for limited funds. Funding and authority limitations prevent the implementation of restoration actions at an appropriate scale to restore the UMR-IWW.

There are many aspects of river channel operation and maintenance that have been redesigned to make them less environmentally damaging or to promote environmental restoration. The moorings described in small-scale measures to improve lockage efficiency serve a dual purpose in that they do indeed aid commercial navigation, but they also keep barges away from sensitive shoreline habitats (see Section 2.4.1.1.1.2).

The St. Louis District has been altering dike field and shoreline revetment configurations to enhance aquatic habitat diversity since the 1970's. Off-bank revetments (Figure 17) are one example, but there are many dike notching, chevron dikes, multiple round points, and other innovative channel structure modifications being designed and constructed within existing authority and funding limits.

Table 9. Habitat management tools and actions (also see Appendix 5).

<b>Water Level Management</b>	<b>Structures</b>	<b>Sediment management</b>	<b>Fish Passage (FP &amp; Trib)</b>	<b>Other</b>
Moist soil unit	Off-bank revetment	Main channel dredging	Trib. dam removal	Stocking
Env. pool management	Notched wing dams	Backwater dredging	Rock ramps	Bag limits
Pool/system drawdowns	L-dikes	Secondary/tertiary channel dredging	Modified gate opening	Closed areas
Temp drawdowns	Chevron dikes	Beneficial use of dredged material	Bypass channel	Refuges
Centralized dam operations	Multiple roundpoints	Confined dredged material placement	Lateral passage to backwaters	Watershed
	Bullnose dikes	Thalweg placement of dredge material	Stoplogs	Exotic species control
	Vanes	Dredged material placement behind ag. levee	Gated structures	Forestry management
	Hardpoints	Dredged material placement for beach nourishment		Water quality
	Groins	Dredged material removal from floodplain		Thermal pollution reduction
	Revetments	Silt fencing		Water quality regulations
	Secondary channel closures	Cropland erosion control		Spill response plans
	Bendway weirs	Conservation farming		Industrial wastewater treatment
	Grade control	Tributary stream bank stabilization		Waste water treatment
	Large woody debris	Shoreline stabilization		Floodproof toxic hazards
	Gravel bars	Sediment consolidation		Mooring cells
	Islands	Sediment traps		
	Levees	Barrier dike/levee construction		
	Overbank tree screens	Barrier islands		
		Closure structures		
		Substrate modification such as adding gravel beds		

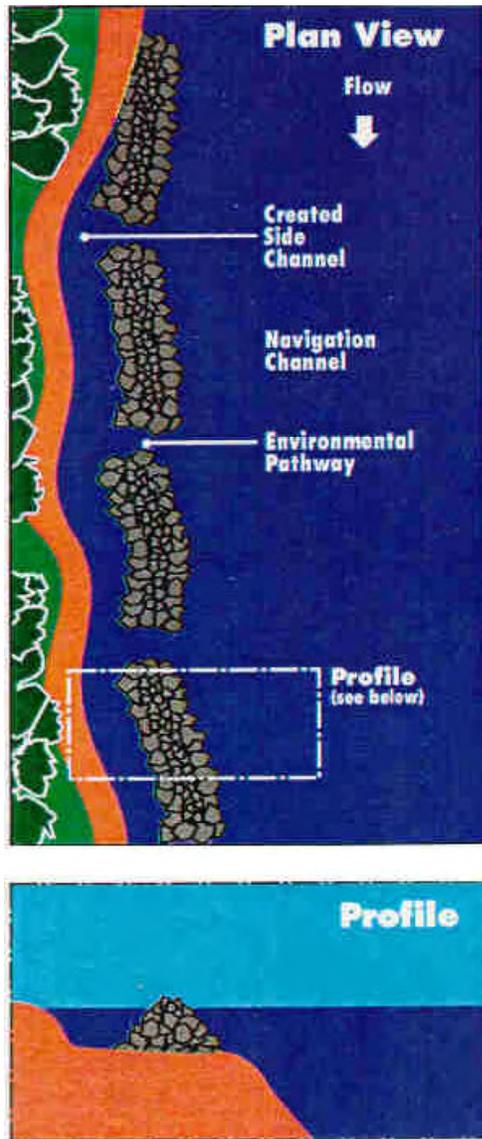


Figure 17. Off-bank revetments that reduce shoreline erosion and create slackwater habitat in channel border areas.

Water level management strategies have also been reviewed to determine where environmental benefits can be achieved without adversely impacting navigation. The first success was demonstrated in St. Louis District pooled reaches that have a wide operating band during moderate flow condition. Normal pool drawdown operating procedures were modified to provide optimum conditions for emergent plant germination (Figure 18). The practice, now known as Environmental Pool Management (EPM), can be implemented with minimal impacts to commercial or recreational boaters. Similar drawdown opportunities have been investigated in the Rock Island and St. Paul Districts. A

drawdown in Pool 8 during 2001 required considerable planning because the range of drawdown desired exceeded normal operating limits. Advanced dredging was required to ensure there would be navigable depths through the summer.



Figure 18. Emergent plant growth in response to a drawdown.

Fish passage at navigation dams is another area of investigation in the UMR-IWW. St. Louis District staff have been using hydroacoustic fish locating equipment in conjunction with experimental dam gate openings to determine whether fish passage at existing structures can be enhanced. There have been a few attempts to detect fish in lock chambers, but they have met with marginal success. The most far-reaching approaches include constructing traditional steel and concrete passage structures, or more recently, naturalistic by-pass channels (Figure 19). The larger scale efforts require funding above-and-beyond what is available from current funding levels and potentially would require additional authorization.

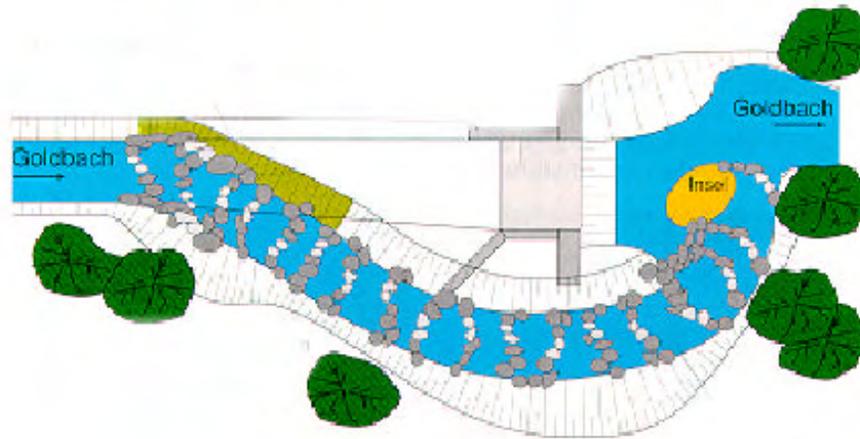


Figure 19. Rock riffle by-pass channels could be designed and implemented to improve fish passage opportunities at Upper Mississippi River System dams.

2.3.2.2.10 IMPLEMENTATION OF THE U.S. FISH AND WILDLIFE SERVICE'S BIOLOGICAL OPINION.

In April 1998, the U.S. Fish and Wildlife Service (USFWS) Region 3 and U.S. Army Corps of Engineers Mississippi Valley Division (MVD) voluntarily entered into formal Section 7 consultation under the Endangered Species Act of 1973, as amended (Public Law 93-205). The consultation covered the continued operation and maintenance of the UMR-IWW 9-Foot Channel Navigation Project. Specifically addressed within the consultation were operation and maintenance direct effects, navigation traffic indirect effects, recreation indirect effects, and cumulative effects. The direct effects of operation and maintenance included navigation channel dredging, dike and revetment maintenance, water level management, and management of Corps lands. A 1998 baseline was established for the effects and a 50-year evaluation period (to 2048) was used.

Formal consultation was concluded in August 2000, when the MVD Commander sent a letter to the Director of USFWS Region 3 setting forth an implementation plan for the 9-Foot Channel Navigation Project that would accommodate the findings of the USFWS's Biological Opinion (BO). The species of concern covered in the BO include:

- Decurrent False Aster – Incidental take with no significant Reasonable and Prudent Measures (RPM)
- Bald Eagle – Incidental take with no significant RPM
- Indiana Bat – Incidental take with no significant RPM
- Interior Least Tern – Incidental take with RPM
- Pallid Sturgeon – Jeopardy and incidental take with Reasonable and Prudent Alternative (RPA) and RPM
- Higgins' Eye Pearly Mussel – Jeopardy and incidental take with RPA and RPM
- Winged Mapleleaf – Incidental take with RPM

The River Resources Action Team (RRAT) is an interagency committee that responds to multiple natural resource issues in the St. Louis District. They were the coordinating entity charged with resolving issues related to the BO. The RRAT provides an effective forum for implementation of the reasonable and prudent alternatives and prudent measures contained in the BO for pallid sturgeon and least tern.

A subcommittee of the RRAT, the Pallid Restoration and Conservation Planning Team/Workgroup (Pallid Team), was formed to address studies and restoration directed toward pallid sturgeon aspects of the BO. The Pallid Team has reviewed and supplied input to the scope of work for the Pallid Habitat and Population Demographics Study and is working on an overall plan for the conservation and restoration of pallid sturgeon in the Middle Mississippi River. The plan will be reviewed by the full RRAT and forwarded to the USFWS Pallid Recovery Team for comment and inclusion.

The RRAT also provides a forum for coordination of the regulation works and channel maintenance programs that affect habitat in the lower pools and Middle Mississippi River. The team has supplied input and review for several ongoing planning efforts such as the side channel vision document, the alteration of existing stone dike structures planning effort, and pilot type projects for the Middle Mississippi River as well as the pooled portions within the St. Louis District. These efforts include incorporation of wood within existing dikes, constructing and placing wood structures within the Middle Mississippi River, designing and locating innovative structures such as off-bank line revetment, chevron dike structures, multiple round point structures, and notching of existing dikes.

A Decurrent False Aster (*Boltonia decurrens*) Inventory and Assessment was conducted on the Illinois River during 2000. *B. decurrens* occurs primarily in the Illinois River. Disturbed sites likely to support the plant are inspected, and where necessary dredging or other activities are modified to avoid sites supporting the plant.

The interagency Mussel Coordination Team was formed to respond to the endangered mussel species issues raised by the BO. Their work efforts are concentrated in the pooled reaches of the UMR and tributaries. A long-term mussel monitoring program was initiated in 2000 to evaluate the health and status of Higgins' eye and other native mussels. Pilot Higgins' eye propagation and relocation projects were completed in 2000, 2001, and 2002. A Relocation Plan and Environmental Assessment was prepared in April 2002; the plan would be enacted over 10 years. Effort has also been devoted to monitoring zebra mussel infestations, monitoring larval zebra mussel distribution and concentrations, and a reconnaissance study for zebra mussel management on UMRS. Host identification research for winged mapleleafs will be completed in fall 2002. Pilot winged mapleleaf propagation and relocation efforts will be initiated in 2003 and the development of a long-term Relocation Plan and Environmental Assessment will be completed in 2004. Pilot projects to test the efficacy of manually removing zebra mussels from native mussels on an annual basis were initiated in Pools 10, 11, and 14 during 2001 and 2002.

The districts are also implementing nesting and wintering management guidelines in all operations to minimize disturbance of bald eagles (*Haliaeetus leucocephalus*). Staff at locks and dams report eagle counts during winter. Efforts to protect and enhance bald eagle habitat on Corps land are being incorporated into district forest management plans.

Forest management efforts on Corps land are also being conducted to maintain tree species and sizes that ensure a long-term supply of potential roost sites for Indiana bats (*Myotis sodalis*). Many river management actions are restricted to non-critical life history periods (i.e., nesting and overwintering) to minimize disturbance to Indiana bat populations.

### 2.3.2.3 Existing Floodplain Conditions

The existing configuration of cities, towns, farms, and flood protection measures was determined long ago when the region was developed. Cities, towns, and farms were established in the 1800's, and over time the residents in many areas determined there were safety and economic benefits to building flood control measures, including levees. These structures were constructed by non-Federal entities to serve local interests and therefore in the absence of system-wide planning for effective flood control. Development of flood control measures by private drainage districts was encouraged by enactment of the Swamp Lands Act of 1850 (9 Stat. 519). Flood control was one of the missions assigned to the Mississippi River Commission, which was established in 1879 (21 Stat. 37). The Flood Control Act of 1917 (Public Law 367) extended the Corps' authority for levee work to Rock Island, Illinois. The Flood Control Act of 1928 (Public Law 391) expanded the Corps' flood control mission to establish a national policy on flood control. The majority of agricultural levees had been built by 1958 when the Congress then focused its attention on urban and tributary flood protection (USACE Floodplain Management Assessment 1995). Nonstructural measures to reduce flood damage had been proposed throughout the period of development of the UMR-IWW floodplain, but the security provided by levees led to the current landscape (FPMA 1995). Nonstructural approaches to flood risk reduction were revived in the 1960's. The National Flood Insurance Program was authorized in 1968 and the Flood Disaster Protection Act was authorized in 1973 to encourage flood damage reduction through zoning (FPMA 1995).

The earlier description of land cover revealed that of the 2.6 million floodplain acres, urban developed areas cover about 6% of the floodplain or about 160,000 acres. A little more than one-half of that urban area (88,000 acres) has some level of structural flood protection. Agricultural areas occupy 4% or about 1.2 million acres and their distribution is highly skewed in a southern direction. Given the Illinois Department of Agriculture 1999 average farmland value of \$2,250/acre (Illinois Agricultural Statistics 2000), the floodplain agricultural land value would be about \$2.7 billion. Levees protect about 67% of the floodplain agricultural lands.

There were several efforts assessing flood damage resulting from the flood of 1993. The Galloway Report and the Floodplain Management Assessment estimated the \$1.4 billion flood damage to urban areas, \$500 million flood damage to agriculture, and almost \$1 billion in disaster assistance required to recover from the flood in the UMR-IWW (FPMA 1995). Current estimates for the three UMR-IWW Corps districts indicate that

almost \$37 billion (2001 dollars) in damages had been prevented by Federal projects between 1993 and 2001 (USACE 2001).

The economic benefits of floodplain agriculture and industry to the region and the Nation are indeed significant, as are the related social benefits to public health and safety. However, a lack of detail and understanding of floodplain resources and risks is also present. Two significant on-going assessments will enhance the knowledge base. The Flow Frequency Study is being conducted to better model flood flows to estimate flood risk. The Comprehensive Plan (WRDA 1999, Public Law 106-53 Section 459) is delineating affected areas, developing socio-economic profiles, determining floodplain characteristics (e.g., mapping, acres of cropland, values of structures, etc.), conducting evaluations of National Economic Development (NED), Regional Economic Development (RED), and social impacts of proposed plans with improved levees, with erosion protection, identifying other project purposes, and trade-off analyses between various project purposes.

#### *2.3.2.4 Existing Social and Recreational Conditions*

The UMRS provides important ecosystem services to communities along the waterways. The rivers are a water supply for 22 municipalities. Riverside communities also rely on the river to treat and assimilate wastes. Many cities are capitalizing on their rivers by incorporating riverfront beautification, green space, and commercial development as integral components of community development projects. Many school programs incorporate river activities in a diverse array of subjects. Recreation, of course, is a very important service provided by the river.

Recreational visits to the Upper Mississippi River region exceeded 11 million trips in 2000, a number that exceeds Yellowstone and most other National Parks (National Park Service 2001; <http://www.aqd.nps.gov/stats/>). The three Corps districts operate and maintain 31 recreation areas along the river and manage thousands of acres of land purchased for the 9-Foot Channel Navigation Project. Seventy-three additional recreation areas are located on Corps lands but are leased to other organizations that are responsible for operation and maintenance. Twenty-two major public parks are located along the river. Boating access to the river is provided by approximately 360 boat access points or marinas and 11,500 marina slips along the UMR, excluding the St. Croix and Minnesota Rivers. Though boating is a popular activity throughout the system, vessel density and activity are greatest in the northern pools (1-10) and decrease as one moves down the system. Sport fishing, both from boat and shore, nearly equals boating in popularity as a recreational pursuit. Several recreational use surveys conducted between 1972 and 1981 indicated that more than 10 million sport fishing days occur annually on the UMR alone. Recreation activity in 1993 was estimated to generate \$400 to \$500 million to the regional economy and 7,000 to 10,000 jobs regionally; similarly, it generates \$1.2 billion and more than 18,000 jobs nationally (USACE 1993). An economic profile completed in 1999 for the USFWS documented \$6.6 billion in tourism spending along the river corridor (Black et al. 1999).

Similar to recreation vessel density noted above, other recreational spending is also most concentrated in the northern reaches where 60% of the total UMR-IWW recreation dollars

are expended. Recreation spending amounts to 31% on the Mississippi River in the lower pooled reaches between Guttenburg, Iowa, and Saverton, Missouri, 6% on the Illinois River, and 6% from Saverton south to the Ohio River (USACE 1993).

Access to riparian lands is difficult in many areas due to the lack of a road system, patterns of public/private land ownership, remote locations, extensive railroad and levee systems, and road jurisdiction and maintenance problems. Over the years, numerous unauthorized roads and illegal vehicle accesses have been developed on public lands throughout the UMR area mostly for recreational purposes. Destruction of real property, trash dumping, and reduced public safety are some of the negative impacts of unauthorized and unregulated vehicle access on public lands.

The majority of camping along the river occurs on Federal lands managed by the Corps or leased to other entities. Designation of camping sites can make camping safe and sanitary for visitors and impacts to the natural resources can be minimized. Controlled and maintained camping areas also encourage safe and manageable use of project lands. Traditionally, visitors have used lands, public and private, along the UMR system for primitive camping sites. The majority of camping takes place on secluded areas such as islands and sandbars and dredged material placement sites.

### 2.3.3 Without-Project Conditions

Identification of the without-project conditions expected to exist in the future is a fundamental first step in the evaluation of potential improvements. The without-project condition serves as a baseline against which alternative plans of improvement are evaluated. The increment of change between an alternative plan and the without-project condition provides the basis for evaluating the beneficial or adverse economic, environmental, and social effects of the considered plan. A description of the without-project condition for both the navigation and ecosystem are presented below.

#### 2.3.3.1 *Without-Project Condition for Navigation System*

##### 2.3.3.1.1 SCENARIOS FOR TRAFFIC FORECASTING.

In an effort to address the difficulty and inherent uncertainty of forecasting for a 50-year planning horizon, a scenario-based approach to traffic forecasting has been employed. Such an approach follows the guidance provided by the Federal Principals Task Force. The scenarios developed represent a range of alternative views of the future demand for navigation on the UMR-IWW System. A consequence of applying a scenario-based approach to traffic forecasting is multiple representations of the without-project condition. As currently constructed, individual scenarios will not be evaluated with respect to numerical probability or likelihood of occurrence. A single most probable without-project condition therefore will not be identified. The scenario-based approach is consistent with the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (P&G), the procedural and analytical framework for Corps feasibility studies. (See Section 3.5 for additional discussion.) Specifically, this approach is intended to define a range of reasonable alternative future scenarios that ultimately describe the demand for inland waterway transportation of farm products for the waterway system.

A range of possible futures with respect to trends, policies, conditions, and events that could impact the U.S. agricultural sector and export markets are considered in the scenarios. It is not presumed that the scenarios encompass the absolute extremes, but rather are limited to the more plausible.

The impacts of each scenario are translated into demand for barge transportation for farm products for the waterway system broken down by the UMR and the IWW. The demand forecast horizon was to 2050, and the resulting demand forecasts were unconstrained with respect to increases in future lock delays or waterway capacity. The farm products barge demand forecasts included breakdowns for corn, soybeans, wheat, and prepared animal feeds (or meal).

In producing unconstrained estimates of waterway demand, the scenarios contribute to the definition of the without-project condition by establishing the basis for specifying the without-project condition levels of waterway traffic. However, the unconstrained traffic estimates generated by the scenarios do not define the without-project condition levels of waterway traffic directly. The unconstrained demand must be processed through the waterway system economic model in order to identify the level of traffic “constrained” by the processing capability of the waterway system. This estimate of “constrained” traffic over the 50-year planning horizon defines the without-project condition with respect to waterway volume. As indicated above, with a scenario-based approach to traffic forecasting, multiple without-project conditions will be generated with respect to traffic.

In order to reflect a complete forecast of waterway demand, all commodity groups must be addressed. To such an end, single 50-year forecasts of waterway demand forecasts for each non-farm commodity group have been evaluated. These non-farm commodity groups are coal, agricultural chemicals, industrial chemicals, petroleum products, construction materials, iron and steel, and other products. These non-farm forecasts were based on a review and update of previously developed forecasts prepared in the mid-1990’s, and by assessing those forecasts with relevant changes in market conditions and with respect to the scenarios developed for farm products. The single forecast for each non-farm group was combined with each of the scenarios for farm commodities to produce a set of scenarios that incorporated forecast waterway demand for all traffic.

The approach followed in scenario construction was built on five basic fundamentals:

1. Over the long run (5-year or longer periods) world production and world usage are by definition nearly identical.
2. Factors that impact world production indirectly impact world consumption, and factors that impact world consumption indirectly impact world production.
3. Trade between countries resolves imbalances between production and usage within countries.
4. As a surplus producer, world trade directly impacts U.S. agriculture. World needs represent export opportunities for the U.S. and conversely their absence represents a lack of opportunities.

5. Barge movement volume was assumed to be unconstrained with respect to increases in the cost of water transportation.

The process of building the family of scenarios started with the construction of a central reference, the Central Scenario. The Central Scenario is intended to represent a “middle-of-the-road” U.S. export prospect. The Central Scenario essentially is a reference point with respect to the other scenarios. Around the Central Scenario, scenarios were developed that were more favorable and less favorable to U.S. agricultural trade. Each scenario has several key factors, or “drivers,” that make it different and influence its relative output.

To define the scenarios, four key drivers were identified that impact exports favorably or unfavorably. The key drivers were world trade, crop area, crop yield, and consumption drivers. Each key driver contains several variables that best reflect the prospects for change and scenario variation. The key drivers and the corresponding variables are displayed in Figure 20.

The key world trade drivers include:

- General world attitude toward utilizing trade barriers to encourage or discourage trade (expansion or contraction of World Trade Organization (WTO) influence)
- Acceptance of Genetically Modified Organism technology (GMO) throughout the world and related trade limitations, if any
- China’s posture toward self-sufficiency as compared to being import dependent for food supplies
- India’s posture toward self-sufficiency as compared to being import dependent for food supplies
- Possible shifts in relative competitiveness among major surplus producing countries

The key crop area drivers include:

- Supply control policies in the U.S., expressed in terms of land removed from cultivation (i.e., set-a-side type policies)
- Conservation-oriented public policies removing land from cultivation
- Cropping practices adopted to manage the problem of Hypoxia in the Gulf of Mexico

The key crop yield drivers include:

- Rate and uniformity of increase
- Climate change, including a consideration of the disparate views of the scientific community regarding global warming

The key consumption drivers include:

- Bulk agriculture commodity use as an alternative to petroleum-based energy (ethanol and bio-diesel)
- Alternative population growth assumptions
- Alternative per capita consumption rates

Scenario Drivers	Key Variables	Trade Scenarios				
		Least Favorable	Less Favorable	Central Scenario	Favorable	Most Favorable
World Trade	International trade policy (WTO)					
	China's willingness to become trade dependant					
	India's willingness to become trade dependant					
	General competitiveness of U.S. agriculture					
Crop Area	U.S. supply control policy (set-a-side)					
	Conservation Issues					
	Hypoxia					
Crop Yield	Rate and uniformity of increase					
	Climatic variability					
Consumption	Ethanol and Bio-diesel					
	Population					
	Per capita consumption					

Figure 20. Scenario development matrix.

In order to quantify the prospects for U.S. grain and oilseed exports over an extended timeframe under several defined scenarios, an analytical framework was created in which production and use were independently estimated for five geographical regions of the world (Table 10). The surplus or deficits implied by production/use imbalances quantify that geographic area's need for trade with a surplus implying export activity and a deficit implying an import activity.

Table 10. Global geographic regions.

Countries/Regions				
USA Canada Mexico Brazil Argentina Other Latin America	West Europe	Central Europe FSU-15	Japan Taiwan South Korea China India Indonesia Malaysia Other Asia	Australia South Africa North Africa & Middle East Other Africa

The U.S. Department of Agriculture's World Production, Supply, and Demand database (USDA 2001) was the source of all historical area, yield, production, trade, and use data. That database begins in 1970 for most series, but is not complete across all countries of the world in the early years. The data set used in this study's analysis started with 1974 data.

Commodities included were wheat, rice, and coarse grains (corn, sorghum, barley, oats, and millet). The oilseeds included were soybeans, rapeseed, sunseed, peanuts, and cottonseed. Wheat, rice, and corn were individually considered and the remaining grains were lumped together as other coarse grains. For oilseeds, soybeans were considered individually and the others were lumped together as other oilseeds.

The analytical horizon spanned from 2001 through 2050. Within the analysis, annual estimates were made through 2010 and at 5-year increments through the remainder of the horizon.

In establishing production estimates, area and yield components were independently addressed (Figure 21). Area estimates were made with consideration given to trends which had occurred over the past 20-25 years, respect for cultivated area constraints suggested by historical cropping activity, and awareness of that region's agricultural characteristics. Individual and commodity group yield change rates were established with implied future yields then multiplied times area estimates to arrive at the production component.

Usage levels for each commodity group were established as the product of population estimates and per capita usage estimates. Population levels used in all scenarios quantified were directly derived from estimates made by the U.S. Department of Commerce, Bureau of the Census, and the United Nations. Per capita usage rates for grain fed to livestock, grains used in food and other uses, and for protein meal were derived for the 1975-2000 timeframe and rates of change were estimated for the analytical horizon. Historical rates of change, along with consideration with respect to reasonableness across the usage category, were the major factors impacting change rates established for the forecast horizon. In a manner identical to production, usage estimates were then derived as the product of two components.

Within the Central Scenario, world supply and usage estimates were balanced over the forecast horizon. The balancing activity was an iterative process over the time span of the 50-year forecast horizon. The objective was to successively equate world production and world usage estimates through time in order to depict real world developments that could plausibly be expected to occur. Adjustments to area under cultivation in Argentina and Brazil were the focal point of the iterative balancing activity. Implied exports and imports are equal with the sum of either reflective of world trade volume. U.S. exports represent the portion of world trade that is estimated to be produced in the U.S. but not used within the U.S., and for which there is an estimated deficit elsewhere.

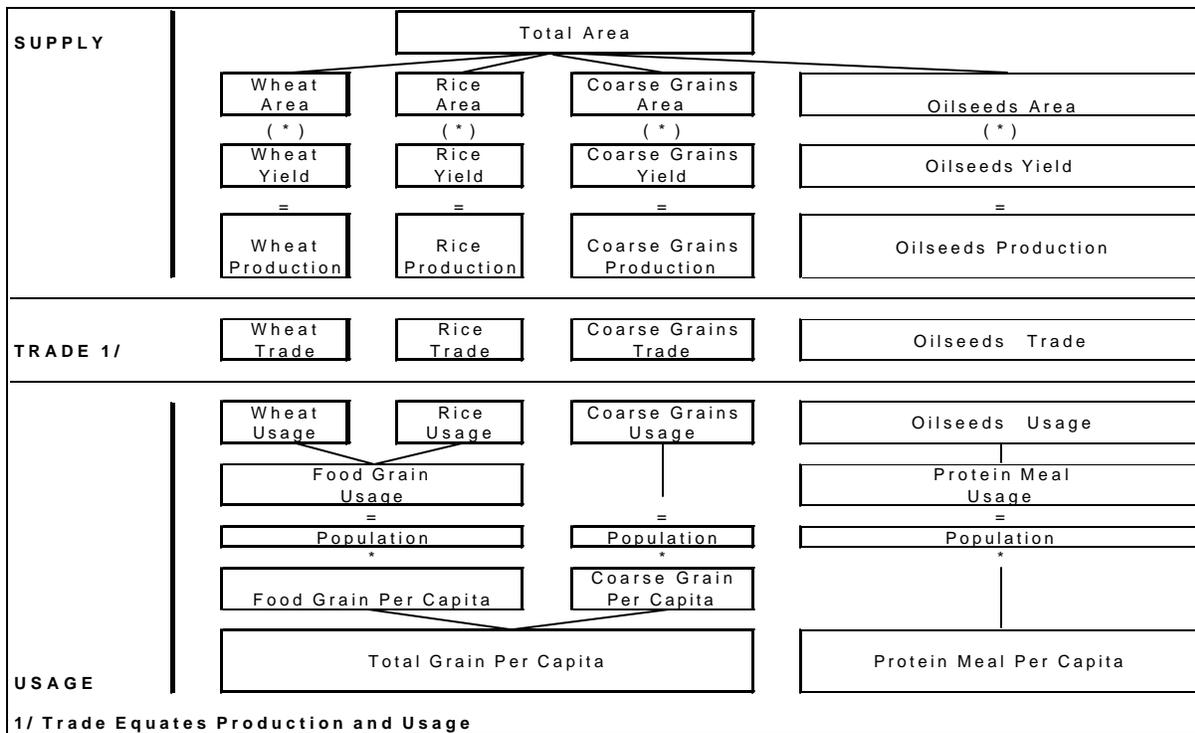


Figure 21. Country/region analytic framework.

For scenarios other than the Central Scenario, no attempt was made to balance world supply and use sums over the forecast horizon. Supply and use estimates implied by specified adjustments characterizing that alternative scenario were independently calculated. Implied country/regional imbalances quantify a need for trade under that scenario with the difference between total world supply and estimated world usage left unresolved. This inequality between estimated world supply and estimated world usage is, however, taken into consideration within the U.S. export estimates associated with each scenario. U.S. net exports implied by the scenario's U.S. production minus use calculation are adjusted up or down in proportion to the U.S. share of each commodity's Central Scenario world trade. The U.S. share of world trade within the Central Scenario is applied to the world's scenario imbalance. If the world imbalance is characterized by supply being greater than usage, the U.S. export estimate is adjusted proportionally downward; and if the world imbalance is characterized by usage greater than supply, the U.S. export estimate is adjusted proportionally upward. This approach allows the evaluation of adjustment combinations that could not practically be considered otherwise. At the same time, however, it also yields U.S. export levels that are biased upward in strong export scenarios and biased downward in weak export scenarios.

The volume of grain moved on the UMR and IWW was determined by first allocating total U.S. exports of grain (corn, wheat, soybeans, and animal feed) by port range (Lakes, Atlantic, Center Gulf, Texas Gulf, Pacific, and Interior). The allocation of exports by port range was determined by applying the base year data (1995-2000), obtained from the USDA's Federal Grain Inspection Service, port share of grain to the export forecast for

each grain. Barge movements of grain from the UMR and IWW are transported to ports located in the Center Gulf port range. The Center Gulf port range is located at the mouth of the Mississippi River where its confluence drains into the Gulf of Mexico. The Center Gulf port range includes ports where export grain elevators are located. Barges of grain that originated on the UMR-IWW are moved to these export elevators where they are unloaded either into temporary storage for loading onto a bulk ocean vessel or the grain is unloaded directly from the barge into the ocean vessel. The volume of grain moved on each river segment was determined by applying the river segment share of the base year data (1995-2000) to that of Center Gulf exports.

The results for barge demand in this study are reported as barge movements for each river segment, the UMR or the IWW, and were unconstrained by infrastructure. The forecasted volume of traffic on the UMR accounts for movements that either originated or terminated on the UMR, but does not include traffic that originated or terminated on the IWW.

A summary of the values and assumptions for key drivers for all scenarios, expressed relative to the Central Scenario, is shown in Table 11. Total farm product movement projections for the various scenarios are presented in Tables 12 through 16. Projections for individual crops are presented in the paragraphs below.

Exports of corn, wheat, soybeans, and protein meal were historically high in 1981 at 130.4 million metric tons. Over a 3-year period, 1979-1981, exports averaged 129.2 million metric tons. In 2000, exports of those same grains totaled 108.2 million metric tons, 17% below the historical high, but 50% greater than the level of exports in 1974. Between 1995 and 2000, total exports averaged 104.8 million metric tons per year. Based on the Central Scenario, exports are forecast to total 130.2 million metric tons in 2025 and 145.9 million metric tons in 2050. Somewhere between 2020 and 2025, total grain exports are forecast to equal the historical high, nearly 4 decades later. The range of exports across all scenarios by 2050 is projected to be as high as 161.4 million metric tons under the Most Favorable Trade Scenario, to as low as 36.8 million metric tons under the Least Favorable Trade Scenario. The range of exports could be as much as 15.5 million metric tons higher than the Central Scenario's projected export level or 109.1 million metric tons below the Central Scenario.

Exports of corn are expected to increase initially before retracting in about 2040 under all scenarios except the Least Favorable Trade Scenario. Under the Least Favorable Trade Scenario, corn exports are expected to be lower than exports in 2000 and fall below 5 million metric tons by 2050. Corn exports are expected to be at their highest level at 123.0 million metric tons in 2040 under the Most Favorable Trade Scenario. The next highest level for corn exports is under the Favorable Trade Scenario, but its high in 2040 would be about 5 million metric tons more than the Central Scenario high. The historical high for corn exports was 61 million metric tons in 1979, and depending on the scenario, corn exports could reach that level as early as 2007 under the Most Favorable Trade Scenario, to as late as sometime between 2015 and 2020.

Regardless of the scenario, exports of wheat are expected to decrease throughout the forecast period. Under the Least Favorable Trade and Less Favorable Trade scenarios, wheat exports are expected to fall below 5 million metric tons by 2050, and are expected to be close to 10 million metric tons in all the other scenarios.

Soybean exports are expected to be higher under all scenarios. The Central, Favorable Trade, and Less Favorable Trade Scenarios all increase in a similar fashion. Under the Most Favorable Trade Scenario, soybean exports initially rise to 37 million metric tons in 2035 before declining to 32.5 million in 2050. The reduction in soybean exports under the Most Favorable Trade Scenario after 2035 occurs as U.S. consumption increases and draws down soybean exports.

As with the case of wheat exports, protein or prepared animal feed exports are expected to be lower in all scenarios through 2050. Although, while exports under the Most Favorable Trade Scenario are mostly less than the Central and Favorable Trade Scenarios, exports of protein meal are expected to rebound after 2020 under the Most Favorable Trade Scenario.

The other commodity forecasts in this evaluation are adjustments made to a report prepared for the Corps during the mid-1990's by Jack Faucett and Associates (USACE 1997; [http://www.mvr.usace.army.mil/pdw/nav\\_study/econ\\_reports/watfor/finrep.htm](http://www.mvr.usace.army.mil/pdw/nav_study/econ_reports/watfor/finrep.htm)). Industry experts for each of the other commodities prepared detailed forecasts for the JFA report. Since the original forecast had a greater level of detail, the original forecasts were only replaced, modified, or re-specified if a major assumption had changed. The forecasts from the JFA report were updated using barge movement data through the year 2000. The JFA report developed forecasts of the demand for barge transportation of coal and coke, fertilizer, industrial chemicals, petroleum products, construction materials, iron and steel, and other miscellaneous products for the UMR-IWW System.

For this effort, independent forecasts were specified as necessary, or modifications made to the original forecasts were adopted if a major assumption from the previous report required changing, or if the Central Scenario in the farm products section of this analysis warranted substantial changes to the forecast for other commodities from the mid-1990's report. In addition, all other commodities were examined by making forecasts using macro economic variables, and then comparing the results to the original forecast.

In general, the assumptions and forecasts for coal and coke, petroleum products, fertilizer, construction materials, and other products from the JFA report are still valid. For all other commodities, the absolute levels of barge movements for 2000 are adjusted to reflect the most recent data. The forecasted change in barge movement volumes over the next 50 years is consistent with the original forecasts for coal and coke, petroleum products, fertilizer, construction material, and other products. Major modifications were made to the original forecasts for iron and steel and industrial chemicals due to assumptions that have since changed. The non-farm commodity barge movements are summarized in Table 17.

Table 11. Scenario component matrix.

Scenario Drivers	Key Variables	Trade Scenarios			
		Least Favorable	Central Scenario	Favorable	Most Favorable
World Trade	International trade policy (WTO)	The general movement toward less encumbered world trade relations is assumed to persist throughout the time period considered, though there will unquestionably be periods of more rapid advancement and periods of retrenchment along with ever-present bilateral disputes.			
	GMO developments and acceptance	Identical to Central Scenario	Common acceptance is assumed. The use of GMO technology in grain and oilseed production is widely accepted through the major producing regions of the world. Most importing countries accept GMO grains and oilseeds with no reservations and others require labeling of selected products derived from their being processed. GMO technology is assumed to continue to expand into the foreseeable future.	Identical to Most Favorable Scenario	Wheat imports more than three times as coarse grain imports nearly twice as large as those contained in the Central Scenario are permitted with unconstrained oilseed/meat trade.
	China's willingness to participate in trade	Negligible grain trade is permitted with oilseed/meat trade unconstrained.	Global non-acceptance is assumed.	Identical to Central Scenario	Grain trade volume similar to that pledged by China as part of their WTO accession is assumed along with unconstrained oilseed/meat trade.
	India's willingness to participate in trade	Negligible grain trade is permitted with oilseed/meat trade unconstrained.	Identical to Central Scenario	Identical to Central Scenario	Consistent with ongoing policies, grain trade is assumed to be negligible and oilseed complex trade is unconstrained.
	General competitiveness of U.S. agriculture	A decline in U.S. relative competitiveness is reflected by a moderation in supply availability (yield growth moderated).	Identical to Central Scenario	Identical to Central Scenario	Assumed to be consistent with currently prevailing relationships.
	U.S. supply control policy (set-aside)	A U.S. acreage reduction policy of 5 percent is assumed to begin in 2005 and continue thereafter.	Identical to Central Scenario	Identical to Central Scenario	Total absence of acreage limiting policies is assumed over the time period considered.
Crop Area	Conservation issues	Identical to Central Scenario	CRP to grow by 3.2 million acres and WRP to grow by 1.25 million acres (by year 2007)	Identical to Central Scenario	No allowance is made for policies that measurably impact cultivated area beyond that of existing programs. The development of desirable conservation practices that reduce soil, water, and air pollution will continue to evolve as they have in the past.
	Hypoxia	Identical to Central Scenario	Specific crop area and yield impacts estimated in the Topic 6 Report on the Integrated Assessment on Hypoxia in the Gulf of Mexico were incorporated.	Identical to Central Scenario	No specific policy addressing this issue is taken into consideration.
Crop Yield	Rate and uniformity of increase	A catch-up in technology used within producing areas outside the U.S. is incorporated through boosting non-U.S. yield growth rates relative to those assumed in the Central Scenario.	Global yield growth for corn and soybeans reduced by 10% due to non-acceptance of GMO.	Identical to Central Scenario	Yield changes consistent with that of the past 20-25 years are assumed to continue.
	Climatic variability	No specific adjustments are made to any scenario as sufficiently quantified impacts do not exist that deal with worldwide production.			
Consumption	Ethanol and Biodiesel	Grain used for ethanol in the U.S. is assumed to grow nearly 30 percent faster than the more historic rate included in the Central Scenario.	Identical to Central Scenario	Identical to Central Scenario	Growth consistent with that of the past 20-25 years is assumed to continue.
	Population	Central Scenario population estimates for the countries/regions considered are increased in line with the population implied by the U.N.'s low variant estimates.	Identical to Central Scenario	Identical to Central Scenario	U.S. Bureau of Census population estimates used.
	Per capita consumption	Identical to Central Scenario	Identical to Central Scenario	Identical to Central Scenario	Growth consistent with that of the past 20-25 years is assumed to continue.
					Central Scenario population estimates for the countries/regions considered are increased in line with the population implied by the U.N.'s high variant estimates. Grain and protein meal consumption growth outside the U.S. was boosted some 5 percent as compared to that of the Central Scenario.

Table 12. Upper Mississippi River System total farm product movements – Central Scenario (million metric tons).

	<b>2000</b>	<b>2025</b>	<b>2050</b>	<b>Change 00-25</b>	<b>Change 25-50</b>
Corn	24.0	38.1	46.9	14.1	8.8
Soybeans	10.2	13.5	16.5	3.3	2.9
Wheat	0.9	0.6	0.4	-0.3	-0.3
Meal	1.7	0.7	0.6	-1.0	-0.1
Total	36.8	52.9	64.3	16.1	11.4

Table 13. Upper Mississippi River System total farm product movements – Most Favorable Trade Scenario (million metric tons).

	<b>2000</b>	<b>2025</b>	<b>2050</b>	<b>Change 00-25</b>	<b>Change 25-50</b>
Corn	24.0	45.1	58.4	21.1	13.4
Soybeans	10.2	14.0	12.3	3.8	-1.7
Wheat	0.9	0.7	0.3	-0.2	-0.4
Meal	1.7	0.6	0.6	-1.1	0.0
Total	36.8	60.4	71.7	23.6	11.3

Table 14. Upper Mississippi River System total farm product movements – Favorable Trade Scenario (million metric tons).

	<b>2000</b>	<b>2025</b>	<b>2050</b>	<b>Change 00-25</b>	<b>Change 25-50</b>
Corn	24.0	40.0	50.0	16.1	10.0
Soybeans	10.2	13.5	17.0	3.3	3.4
Wheat	0.9	0.6	0.4	-0.3	-0.3
Meal	1.7	0.7	0.5	-1.0	-0.2
Total	36.8	54.9	67.9	18.1	13.0

Table 15. Upper Mississippi River System total farm product movements – Less Favorable Trade Scenario (million metric tons).

	<b>2000</b>	<b>2025</b>	<b>2050</b>	<b>Change 00-25</b>	<b>Change 25-50</b>
Corn	24.0	32.7	35.1	8.7	2.4
Soybeans	10.2	12.9	14.4	2.7	1.5
Wheat	0.9	0.3	0.0	-0.6	-0.3
Meal	1.7	0.1	0.0	-1.6	-0.1
Total	36.8	46.0	49.4	9.2	3.4

Table 16. Upper Mississippi River System total farm product movements – Least Favorable Trade Scenario (million metric tons).

	<b>2000</b>	<b>2025</b>	<b>2050</b>	<b>Change 00-25</b>	<b>Change 25-50</b>
Corn	24.0	15.3	0.7	-8.7	-14.6
Soybeans	10.2	10.2	11.3	0.0	1.1
Wheat	0.9	0.3	0.1	-0.6	-0.2
Meal	1.7	0.5	0.4	-1.3	0.0
Total	36.8	26.3	12.5	-10.5	-13.7

Table 17. Summary of non-farm commodity barge movements, Upper Mississippi River System (million metric tons).

	<b>2000</b>	<b>2025</b>	<b>2050</b>	<b>Change 00-25</b>	<b>Change 25-50</b>
Coal & Coke	8.2	9.0	10.9	0.8	1.9
Pet. Prods.	8.5	9.4	9.1	0.9	-0.4
Agri. Chem.	3.1	2.9	2.6	-0.2	-0.2
Const. Mat.	10.0	11.4	13.6	1.4	2.3
Indus. Chem	4.1	6.8	12.0	2.6	5.3
Iron & Steel	6.4	7.4	9.0	1.0	1.6
Miscellaneous	4.7	6.8	9.1	2.1	2.3
Total Non-Farm	45.0	53.7	66.3	8.6	12.6

UMR-IWW tonnage forecasts for total farm products are summarized in Figure 22 below. Similarly, forecasts for all commodities are summarized in Figure 23.

#### 2.3.3.1.2 OPERATION AND MAINTENANCE FOR THE NAVIGATION SYSTEM.

Operation and maintenance of the existing navigation infrastructure is expected to continue into the future. It is projected that O&M funding will continue to be flat at \$115 million/year for the foreseeable future. Operating and maintaining the system to an acceptable level of performance will continue in the future. The backlog of critical maintenance will continue to grow. Several factors were identified that are likely to influence future operations and maintenance costs, even though they have not been significant in the past. Those factors could add as much as 10% to the baseline estimate, or about \$11 million a year, but they were not included in the baseline estimate because of the uncertainty that they will actually occur. They include:

- New environmental constraints on channel maintenance dredging and material placement,
- Zebra mussels accelerating corrosion of unprotected steel and clogging pipes,
- Stricter painting regulations that increase costs, and
- Increased lockages that increase wear and tear on lock components.

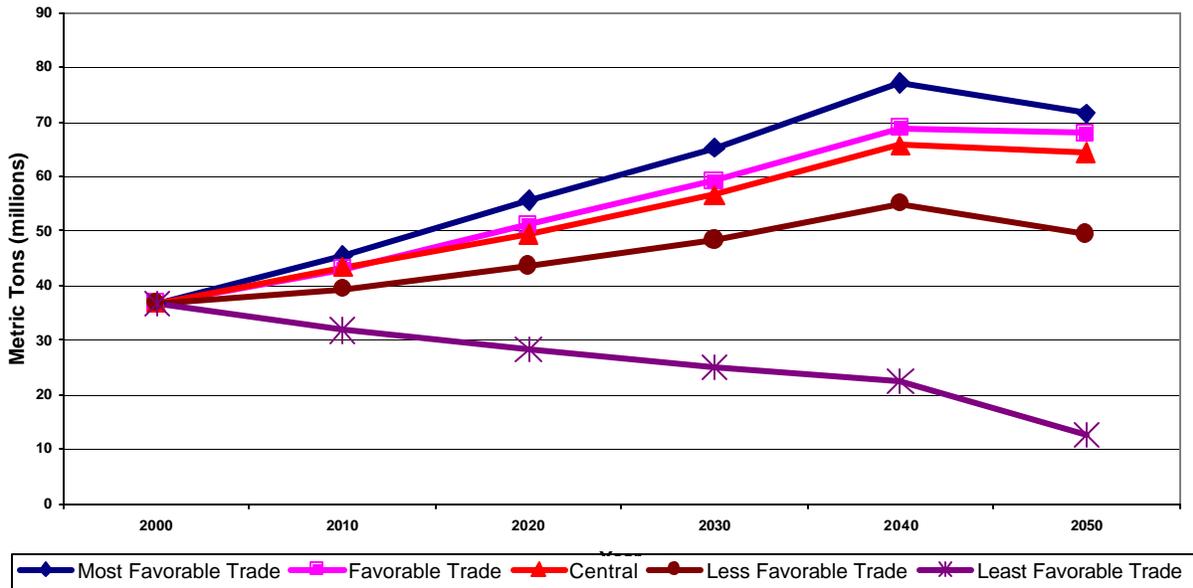


Figure 22. Upper Mississippi River System forecasts of total farm product movements by scenario.

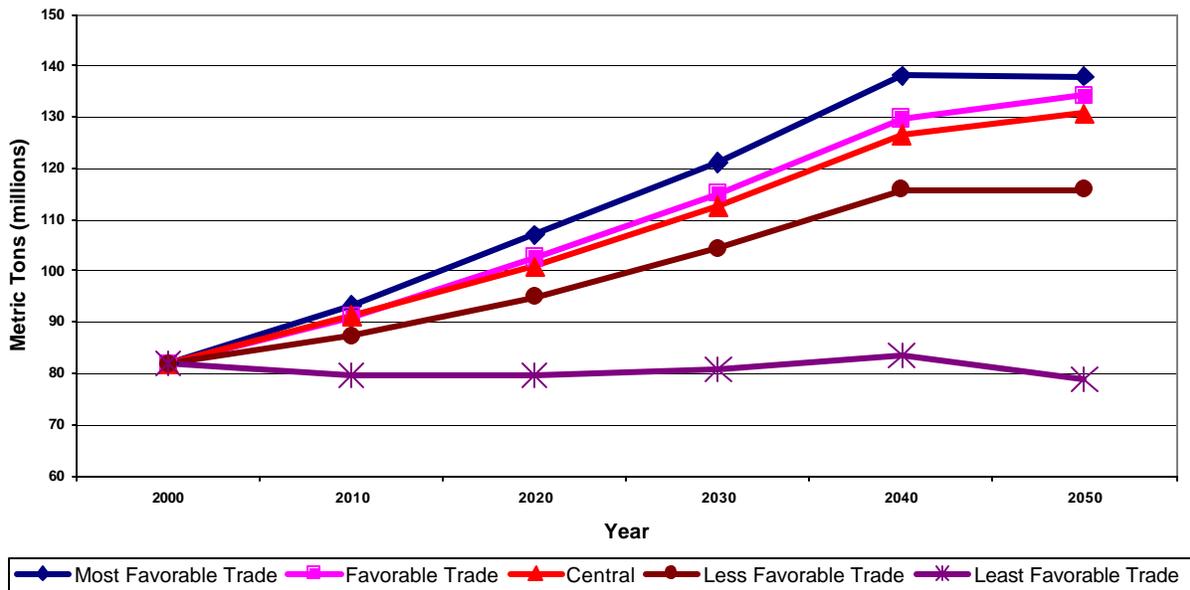


Figure 23. Upper Mississippi River System forecasts of all commodities by scenario.

2.3.3.1.3 REHABILITATION PROGRAM.

The need for future rehabilitation is a qualitative assessment based primarily on historical data, engineering judgment, and expert elicitation to estimate which components were likely to require restoration over the 50-year planning horizon. It was determined that periodic rehabilitation would be needed at most lock and dam sites approximately every 25 years, with variations based on equipment needs, degree of barge impact to gates and concrete, weather-related deterioration, and modernization. Anticipated future rehabilitation needs were determined to be \$25 to \$30 million per lock site, and \$15 million per dam for each 25-year cycle of rehabilitation. Therefore, two rehabilitation undertakings were planned over the 50-year period for each of the 37 lock and dam sites. That amounted to:

Lock Rehabilitation Projects	\$2.0 billion
<u>Dam Rehabilitation Projects</u>	<u>\$1.0 billion</u>
Total Rehabilitation, 2000-2050: (approximately \$60 million per year over the planning horizon)	\$3.0 billion

The study concluded that the life of existing locks and dams and their components can be extended with normal periodic rehabilitation for another 50 years and match the design life of any new construction being considered as part of the “with-project” condition.

When projected over the 50-year planning horizon, the total cost of the navigation system is projected to be an average annual amount of \$175 million a year for the entire system (annual operation and maintenance costs of \$115 million and annual rehabilitation of approximately \$60 million).

2.3.3.2 *Without-Project Efficiency Improvements*

The with-project condition for this system study was defined to include all measures potentially implemented on a system basis by a Federal action for system efficiency reasons. This definition resulted in identification of measures that do not provide significant system efficiencies or require Federal actions and thus fall into the without-project condition.

For efficiency reasons, all small-scale measures, both with- and without-project items, were evaluated at the same time. The details of the evaluation can be found in *Detailed Assessment of Small-Scale Measures* (USACE 1998a) and the *Summary of Small-Scale Measures Screening* (USACE 1999a; [http://www2.mvr.usace.army.mil/umr-  
iwwsns/documents/screenrpt.pdf](http://www2.mvr.usace.army.mil/umr-<br/>iwwsns/documents/screenrpt.pdf)). Small-scale measures likely to occur to some level in the without-project condition that could contribute to system efficiencies are summarized in Table 18. The use of helper boats to assist lockages is assumed to continue at existing rates into the future. Due to the high degree of uncertainty regarding the potential for increased use and implementation of deck winches and powered ratchets, these items are not recommended for inclusion into the final analysis. If new information becomes available in the years subsequent to this study, the Corps may choose to reevaluate this

decision. The future use of industry self-help and lock operating procedures in the without-project was included and considered. The efficiencies of these measures will be analyzed in the feasibility study.

Table 18. Without-project small-scale measures.

Helper Boats
Industry Self-Help without Additional Facilities
Deck Winches
Powered Ratchets
Lock Operating Procedures (N-up/N-down)

2.3.3.3 *Without-Project Ecosystem Conditions*

It is assumed that current levels of funding for environmental management and restoration would remain constant. The habitat management and restoration activities described in Sections 2.3.2.2.8 and 2.4.1.2 would likely continue at present levels, but these actions have not prevented system-wide habitat degradation in the past and will likely not meet existing habitat needs in the future. Increased efforts to reverse impoundment effects on aquatic habitats, vegetation succession, and forest health will be required to sustain ecosystem values. The uncertainty regarding the future direction of changes in environmental quality is depicted in Figure 24.

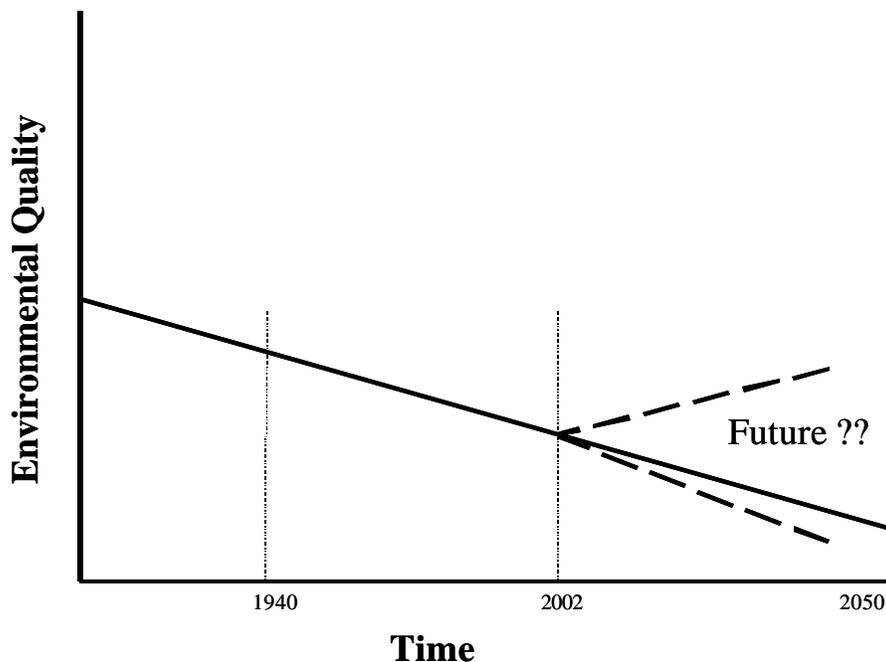


Figure 24. Schematic representation of existing environmental impacts of navigation system operation and maintenance and other cumulative stressors on the UMR-IWW ecosystem and the uncertainty regarding the direction of future change (no scale implied).

Natural resource managers were asked to express their expected and desired future conditions for river resources during the first habitat needs assessment (HNA). As part of this exercise, it was necessary to assess the likely future without condition, based on their individual experience and sphere of knowledge. While their response indicated that there was inadequate systemic data to compare or contrast rates of change river-wide, they did indicate a continued downward trend in resource condition in areas in which they were familiar. These changes were largely due to impoundment effects from water level regulation, sedimentation, and loss of floodplain cover types (USACE 2000b).

Habitat quality and diversity are not likely to increase unless natural disturbances are restored, sediments are managed, exotic species are controlled, and management measures are enacted. The present array of species and communities (many degraded) will likely be present within the project timeframe. Depending on changes in agricultural product demand, agricultural conservation programs, and urban expansion, the presently degraded basin hydrology will likely persist. Current water quality standards would remain and water quality will likely be improved further with the enactment of regulations for Total Maximum Daily Loads (TMDLs) for non-point sources.

The Cumulative Effects Study (USACE 2000c) quantitative assessment of geomorphic change revealed that backwaters and secondary channel loss were the most prominent changes of concern in most river reaches. While absolute acreages of backwater classes differ among reaches and absolute acreage loss may be small in some reaches, the proportional loss of backwaters exceeded 10% in more than half of the reaches examined. Several reaches are projected to lose from 20% to 30% of their backwaters over the next 50 years. Island loss and a resultant increase in open water was the largest change identified in between Pools 5 and 9. This implies a loss of habitat diversity and degradation of aquatic areas as they fill with island soils. System-wide summaries that predict small amounts of system-wide change mask the importance of change at the local scale. It is also important to reiterate that the geomorphic assessment analysis examined only plan form change; loss of depth, loss of plants, and other factors affecting habitat quality were not quantitatively assessed.

#### *2.3.3.4 Without-Project Social Conditions*

The without-project future for societal needs will be the same types of uses considered today, but the demand on resources will likely be higher. Water supply and waste treatment services will have to be provided regardless of the changes. Cities will likely continue to capitalize on their river resources. Recreational activities should continue to be popular, and continued investments in land management will be required. Waterway transportation will continue to provide benefits to the region and the Nation.

#### *2.3.3.5 Integrated Without-Project Condition*

The without-project future for the UMR-IWW would include fewer backwaters, less water depth in non-channel habitats, degraded forest structure and land cover diversity, longer waits at locks, lost trade revenue, lower standard of living, lost job base, and uncoordinated floodplain management. The restructured navigation study will provide the plan to integrate system management regardless of measures for any of the individual system components.

#### 2.3.4 With Project Goals and Objectives

Management agencies and private sector interests have goals for various system components and properties, but there is no unified set of objectives for the condition of the UMR-IWW among all private, state, and Federal entities. The identification of consensus-based goals and objectives for the condition of the UMR-IWW, however, is critical for effective river management. There have been many prior planning efforts to support the comprehensive nature of this study. The Reconnaissance Report for the initial Navigation Study (USACE 1988) established objectives for navigation system maintenance and improvement. The recently conducted EMP Habitat Needs Assessment (USACE 2000b) was a first, agency sanctioned, step toward a set of consensus-based objectives for the condition of the UMR-IWW ecosystem. The Interagency Floodplain Management Review Committee Report (Galloway 1994), Floodplain Management Assessment (USACE 1995c), and the “Delft Report” (Delft Hydraulics 1997) established objectives for floodplain resources. Notably lacking in most of the historic and existing management plans and proposals are comprehensive, quantifiable objectives for the desired condition, or even common understanding of the baseline or reference condition.

Planning for future navigation system infrastructure needs, navigation system operation and maintenance, habitat protection, enhancement, and restoration, river recreation, floodplain management, and water quality management should be conducted in the context of a set of clear goals and objectives for condition of the UMR-IWW. Setting these goals and objectives and defining reference conditions should be done collaboratively, with participation of the full community of river stakeholders. Development of a set of measurable objectives for integrated and adaptive management of the UMR-IWW will be complex. It will require considerable collaborative effort, making use of conceptual models, predictive models, and visualization tools to comprehend the interconnections between system components and to enable the community of stakeholders to actively participate in planning for a sustainable multiple use river-floodplain system. Integrated planning will be an on-going effort to optimize the national benefits achieved from efficient and effective adaptive river management.

##### *2.3.4.1 Federal Goals for Sustaining a Navigable Waterway*

The existing navigation infrastructure has been an integral part of the UMR-IWW since the 1930’s. It is assumed that this system may be modified in the future. However, the basic system will remain in place.

The Federal goals for sustaining the system are as follows:

- Ensure that the existing infrastructure is maintained to provide safe, reliable, and efficient service to commercial and recreational users of the UMR-IWW.
- Ensure that the future needs of the UMR-IWW, including potential modernization or expansion, are identified to prevent economic or social losses to the region and Nation.

- Develop a plan for operating and maintaining the system in a way that sustains both navigation and ecosystem benefits.

#### 2.3.4.2 *Federal Ecosystem Goals*

Ecosystem level resource management and planning was recognized as necessary in the 1990's (Congressional Research Service 1994) and the goals for natural resource management were revised to fit the broad nature of UMR-IWW environment. Considering that changes in the timing, extent, or duration of ecological driving forces and disturbances degraded ecological integrity and quality over time, naturalization of the hydrologic regime and connectivity along the river continuum and floodplain became highly desired in several planning efforts. Introductions of economically and environmentally damaging exotic species (e.g., zebra mussels and Asian carp) meant that goals for the exclusion and management of exotic species also needed to be established for the UMR-IWW ecosystem.

An adaptive management strategy was proposed for Upper Mississippi River Conservation Committee (UMRCC) sponsored Ecosystem Management planning efforts in 1994 following the International Large River Conference in La Crosse, Wisconsin. The goals, which may be incorporated at Tier 2 ecosystem goals, were:

1. Maintain viable populations of native species in situ
2. Represent all native ecosystem types across their natural range of variation
3. Restore and maintain evolutionary and ecological processes (i.e., disturbance regimes, hydrological processes, nutrient cycles, etc.)
4. Integrate human use and occupancy within these constraints

Interagency work groups in the three USACE UMR-IWW districts developed ecosystem management strategies for several pools and implemented some changes in river system management (notably water level management in selected navigation pools to promote growth of aquatic vegetation while maintaining navigation), but the strategies were never combined into a plan for the system.

The UMRCC report, *A River That Works and a Working River* (Upper Mississippi River Conservation Committee 2000) identified several additional goals that may also be incorporated as Tier 2 ecosystem goals for the river system. They were:

1. Improve water quality for all uses
2. Reduce erosion and sediment impacts
3. Restore natural floodplain
4. Restore natural hydrology
5. Increase backwater connectivity with main channel
6. Increase side channel, island, shoal, and sand bar habitat
7. Minimize or eliminate dredging impacts
8. Sever pathways for exotic species introductions/dispersal
9. Improve native fish passage at dams

The Upper Mississippi River System Environmental Management Program Habitat Needs Assessment (HNA; USACE 2000b) was the first agency sanctioned effort to present quantitative objectives for the system. These quantitative objectives begin to address the third tier objective described above. The system-wide objectives outlined for the HNA were:

Create or restore:

- 1,700 acres of main channel habitat
- 27,000 acres of secondary channel habitat
- 55,500 acres of contiguous backwater
- 24,000 acres of isolated backwater habitat
- 24,000 acres of island habitat

Many resource managers felt that while the HNA effort was a good first step, it was not detailed enough to provide spatially explicit, comprehensive quantitative goals for the ecosystem. An ad hoc planning process, called Pool Plans, was initiated in the Minnesota-Wisconsin boundary waters under the auspices of the St. Paul District Fish and Wildlife Work Group. The process gained acceptance by similar coordination committees—the Upper Mississippi River Conservation Committee, the Fish and Wildlife Interagency Committee in the Rock Island District, and the River Resources Action Team in the St. Louis District. Ecosystem pool plans, channel maintenance pool plans, and perhaps floodplain land use pool plans need to be unified in a framework to achieve third tier goals mentioned above.

Figure 25 depicts a desired condition that might be established through a process to set goals and objectives for the system. The difference between the current and without-project ecosystem condition and the desired condition represents a base level of restoration needed to achieve a desired and sustainable ecosystem condition within the current UMR-IWW System. It is important to emphasize that this is an existing need. Impacts from increased traffic resulting from improvements to the navigation system would be in excess of this level of restoration.

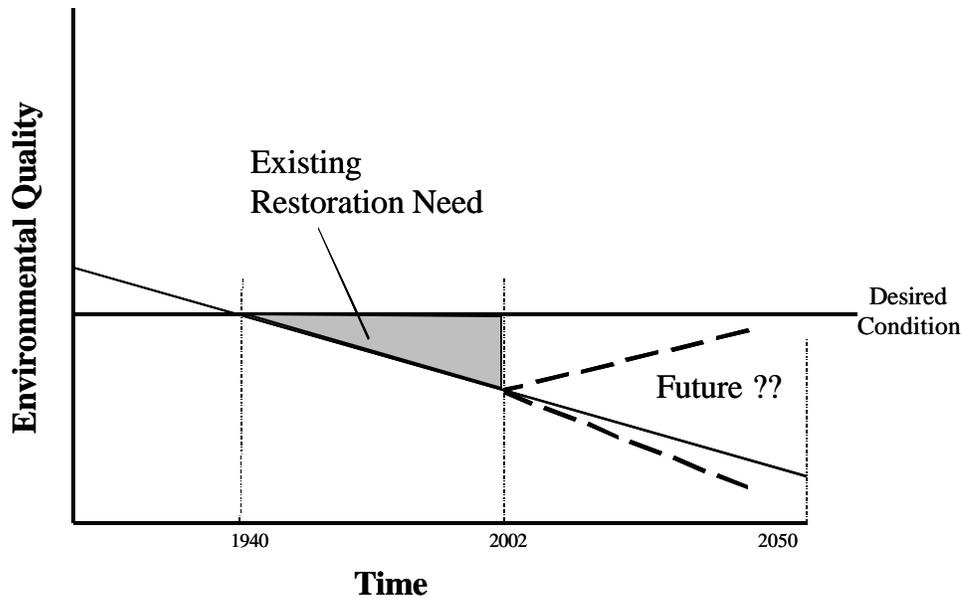


Figure 25. Schematic representation of existing environmental impacts of navigation system operation and maintenance and other cumulative stressors on the UMR-IWW ecosystem and the restoration need to achieve desired future conditions (no scale implied).

#### 2.3.4.3 Goals for the Floodplain

The UMR-IWW has a large and diverse floodplain that provides many economic and environmental services. The Flood of 1993 and subsequent floods caused extensive damage throughout the UMR-IWW and Missouri River. Several studies have been completed regarding floodplain issues and goals for the UMR-IWW (e.g., Galloway Report, Floodplain Management Assessment, Delft Report, etc.). These studies commented on the need for better, more integrated planning and institutional organization that would reduce flood damage and vulnerability. Generally, most agricultural interests favored structural measures (levees) to reduce flood damage (USACE 1995c). Conversely, environmental, other agriculture, and recreational interests favored nonstructural approaches to flood protection, especially where environmental benefits could be enhanced (USACE 1995c). There were optimistic statements that win-win situations could be achieved such that economic expansion in highly developed areas would be less risky and that environmental enhancement in other areas would increase recreation and tourism spending (Delft 1997). The WRDA 1999 (Public Law 106-53 Section 459) Comprehensive Study for the floodplain will look to develop a plan to evaluate the problems and opportunities in the interest of systemic flood control and floodplain management strategies.

#### 2.3.4.4 Social Goals

The UMR and IWW are essential to the economies of the counties and states that they border. Many people living and working in those places rely on the river system for their livelihood. The presence of the rivers also provides many other benefits to the states and counties along the river corridor. Benefits are derived from the employment and income generated from transportation of goods, recreation, hydropower production, and water

supply for municipalities, commercial, industrial and domestic use. The floodplain also harbors a rich cultural resource in the form of relics from past cultures and more recent history of settlement and development of the region which provide evidence of our Nation's past.

The public has been provided formal opportunities to express their desires for the river system on several occasions. Results from the Long Term Resource Monitoring Program public expectations survey in 1996 revealed that:

- 99% of respondents value the rivers for future generations
- 70% of respondents want to control industrial pollution
- 55% of respondents want improved water quality
- 45% of respondents want improved fish and wildlife habitat
- 25% of respondents want improved sport fishing
- 15% of respondents want less barge traffic

Public involvement in the HNA revealed five themes or areas of interest for the future of the UMR System:

- More fish and wildlife in general (habitat diversity, species diversity, and abundance)
- Clean and abundant water
- Reduction of sediment and siltation
- Balance between the competing uses and users of the river
- Restoration of backwaters, side channels, and associated wetlands

Restructured UMR-IWW Navigation Feasibility Informational Public meetings were held at five locations in the region during March 2002. They were designed to provide an update on the restructuring of the study and to get public feedback on the new direction of the study. The meetings were held in Peoria, Illinois; St. Louis, Missouri; Bloomington, Minnesota; La Crosse, Wisconsin; and Davenport, Iowa. Attendees were eager to learn about the restructured study, and actively participated in the meetings and the feedback process. During these five meetings, attendees submitted a total of 258 questions, issued 120 statements, and returned 305 comment sheets (an additional 28 comments were received via the study newsletter comment sheet).

The majority of those who responded agreed with the balanced focus of the restructured study and encouraged the Corps of Engineers to continue collaborating with the stakeholder groups.

When asked to provide input on what the goals of the restructured study should be, nearly 79% of the responders agreed with having a balanced, sustainable approach to navigation and the environment, and only 4% disagreed; 77% agreed and 11% disagreed with improving the efficiency of the navigation system; 75% agreed and 11% disagreed with

sustaining a healthier ecosystem; and 66% agreed, while 5% disagreed, with restoring river habitat.

### 2.3.5 Non-Governmental Organization Goals

#### 2.3.5.1 *Economic*

The goal of many economic interests using the UMR-IWW Navigation System is to maintain a globally competitive inland waterway system to ensure the Midwest region continues to participate effectively in the international grain trade. Existing and anticipated future constraints on commodity movements through the Inland Waterway System are a large concern because even small delays can affect the export price of grain. In a global market, pennies on the bushel can make a large difference, and other countries are considering significant waterway improvements that may give their farmers the competitive edge.

The economic interests commissioned a report titled, *Determination of the Economic Impact of Increased Congestion on the Upper Mississippi River – Illinois River Waterway*, by Dr. Michael Evans, Evans, Carroll & Associates, March 2002. The report recognizes the importance of inland waterway transportation and its relationship to exports, rail rates, farm income, and food prices.

#### 2.3.5.2 *Environmental*

Environmental NGO interests active on the UMR stress their desire to protect, preserve, and restore the lands and waters necessary to support plants, animals, and natural communities that provide the public with recreational, environmental, and economic benefits. Sustainability of this globally unique and significant resource is a focus of most organizations.

The Upper Mississippi River Conservation Committee (UMRCC) is an organization of state and Federal agency biologists working collaboratively to promote the preservation and wise utilization of the natural and recreational resources of the Upper Mississippi River; formulate policies, plans, and programs for carrying on cooperative surveys and studies; keep necessary records; publish and distribute reports; and make recommendations to the governing state bodies in the furtherance of the objectives of the UMRCC. They have recently prepared a preliminary estimate of measures and costs to achieve a desired level of ecosystem integrity for the UMR-IWW (UMRCC 2000). They caution, however, that the “report presents estimated annual costs or management actions that must be implemented in order to maintain and restore UMRS natural resources. It would be tempting to sum the total annual costs of the management actions presented here and arrive at a lump sum annual cost to restore the UMRS ecosystem. Such a calculation would be short-sighted since management actions will change according to the river’s future condition. Any summation of actions presented here should not be construed to represent an ecosystem restoration plan for the UMRS.” They further recommend an adaptive management framework to ensure the long-term restoration and maintenance of the UMR-IWW. Their full report can be viewed at the following web site: <http://www.mississippi-river.com/umrcc/pdf/JUNEfinal.pdf>.

## 2.4 Preliminary Formulation and Evaluation of Alternative Plans.

The complete process for formulation and evaluation of alternatives will be contained in the feasibility study. This Interim Report outlines potential measures identified to date for navigation improvements and ecosystem restoration opportunities. It also outlines the initial set of alternatives and the process to be used in their evaluation. Finally, a set of preliminary observations is provided based on work completed to date. The complete formulation, evaluation, and comparison of alternative plans will be contained in the feasibility study.

### 2.4.1 Identification of Measures

#### 2.4.1.1 Navigation Improvement Measures

Navigation improvement measures are those modifications or additions that can be made to the existing infrastructure to increase the efficiency or capacity of the system. These measures fall into a small-scale or large-scale category. Small-scale measures involve relatively low-cost structural or nonstructural features to be added to the system. Small-scale measures evaluate individual increments of the lockage process. Large-scale measures have a relatively high cost and include new locks or lock extensions. Large-scale measures essentially reduce the lockage time by 50% by not requiring a double lockage. Technical evaluations were made to determine the feasibility of various small-scale and large-scale measures for the purpose of reducing congestion at the existing locks on the system. For both cases, a deliberate process was used to first define the universe of potential measures and then screen those to identify which showed the most promise in meeting the planning criteria of effectiveness, completeness, acceptability, and efficiency. The complete documentation of this process will be included in the feasibility study. Listed below is a summary of the process and the measures identified for inclusion into the final analysis.

##### 2.4.1.1.1 SMALL-SCALE MEASURES.

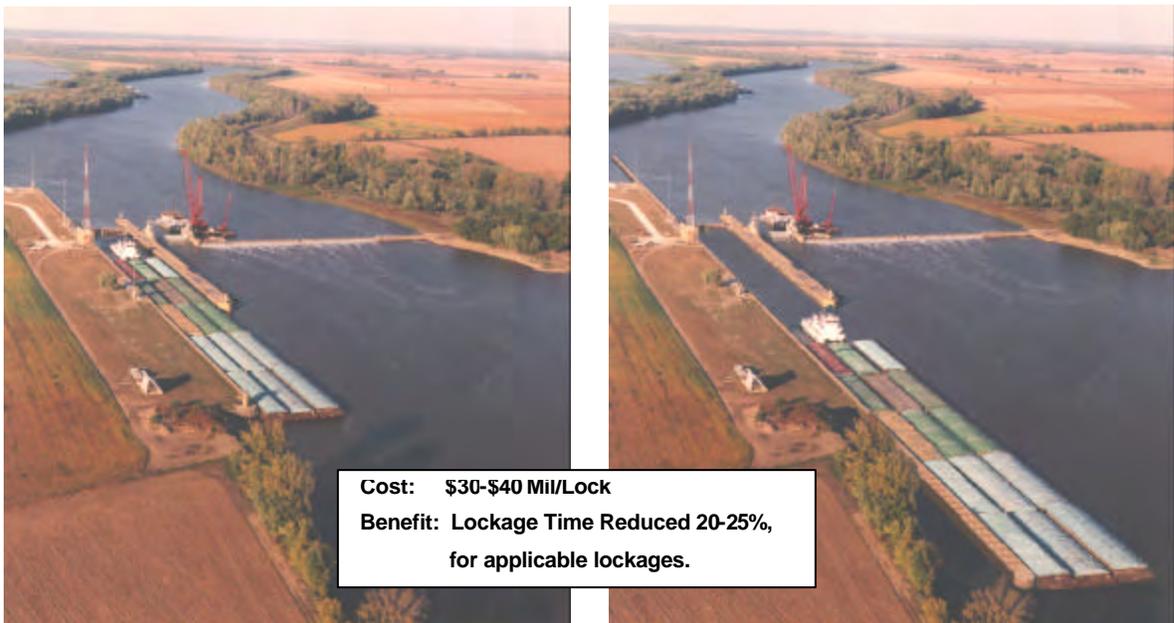
The process first identified 92 potential small-scale measures that might improve system efficiency. This information is documented in a report entitled, *Detailed Assessment of Small-Scale Measures* (USACE 1998a) with some information also being summarized in the *Improved Tow Haulage* (USACE 1995a) and *Universal Couplers and Crew Training* (USACE 1995b) reports. After further development and analysis, the measures were distinguished based on whether they fell in the with- or without-project condition. This additional information provided the necessary details for a final secondary/quantitative screening. The value of this analytical process, which continually screens out the least promising measures, is that study resources are continually concentrated on those items showing the greatest promise based on the Corps planning criteria. The *Summary of Small-Scale Measures Screening* (USACE 1999a) fully documents the reasoning underlying the screening process.

The result of this entire process was the identification of five small-scale measures for use in the development of alternative plans and systemic analysis of costs, benefits, and impacts. The measures include: (1) guidewall extensions with powered keels; (2) switchboats with guidewall extensions; (3) congestion tolls/lockage time charges; (4) mooring facilities; and (5) approach channel improvements. These five measures were

the most promising in terms of addressing the study objective of assessing system efficiency improvements to reduce delays at the lock sites. A sixth measure to include scheduling and tradable permits was suggested by the National Research Council (NRC) for evaluation. Scheduling was previously screened out in the referenced documents; however, it was added back in after the NRC review. A description of each measure is listed below.

2.4.1.1.1.1 Extended Guidewalls.

Extending the existing 600-foot guidewalls to 1,200 feet (Figure 26) would allow the powered cut to remake with the unpowered cut completely outside of a 600-foot lock chamber. The lock is therefore free to turn back for the next vessel and is not impeded while double lockage tows reconfigure on the guidewall. There is also a potential for faster extraction of the unpowered cut than the current system provides. For the measure to work, it must be combined with either powered traveling kevels or switchboats, which are used to extract the unpowered cut.



**Without Guidewall Extension**

**With Guidewall Extension**

Figure 26. Guidewall Extension from 600 to 1,200 feet.

A kevel is a heavy metal deck fitting having two horn-shaped arms projecting outward around which lines may be made fast for towing or mooring a vessel. A powered traveling (rail-mounted) kevel provides the force to extract the unpowered first cut from the lock out along the extended guidewall. An unpowered kevel, riding the same rail ahead or behind the powered kevel, can be used to hold the cut along the guidewall as the cut moves down the guidewall. The other option for extraction of cuts is to use switchboats in the 1,800 to

2,000 hp range. Boats this size were determined to be able to safely extract the unpowered first cut of double lockages out along an extended guidewall.

Guidewall options primarily provide time savings based on their ability to improve two steps in the lockage process: pulling the first cut and remaking the tow outside of the chamber. Switchboats and powered levels allow for faster extractions of the unpowered first cut than the existing cable winch system. If cuts are extracted along an extended guidewall, the recoupling (remake) can occur outside of the chamber, allowing the next tow traveling in the same direction to use the lock (Figure 27). For tows traveling downstream, moving the unpowered cut farther down the guidewall allows faster chamber emptying since the danger of breaking lines would be reduced. However, due to the limited water elevation differences at most locks on the UMR, the savings is less than 1 minute.

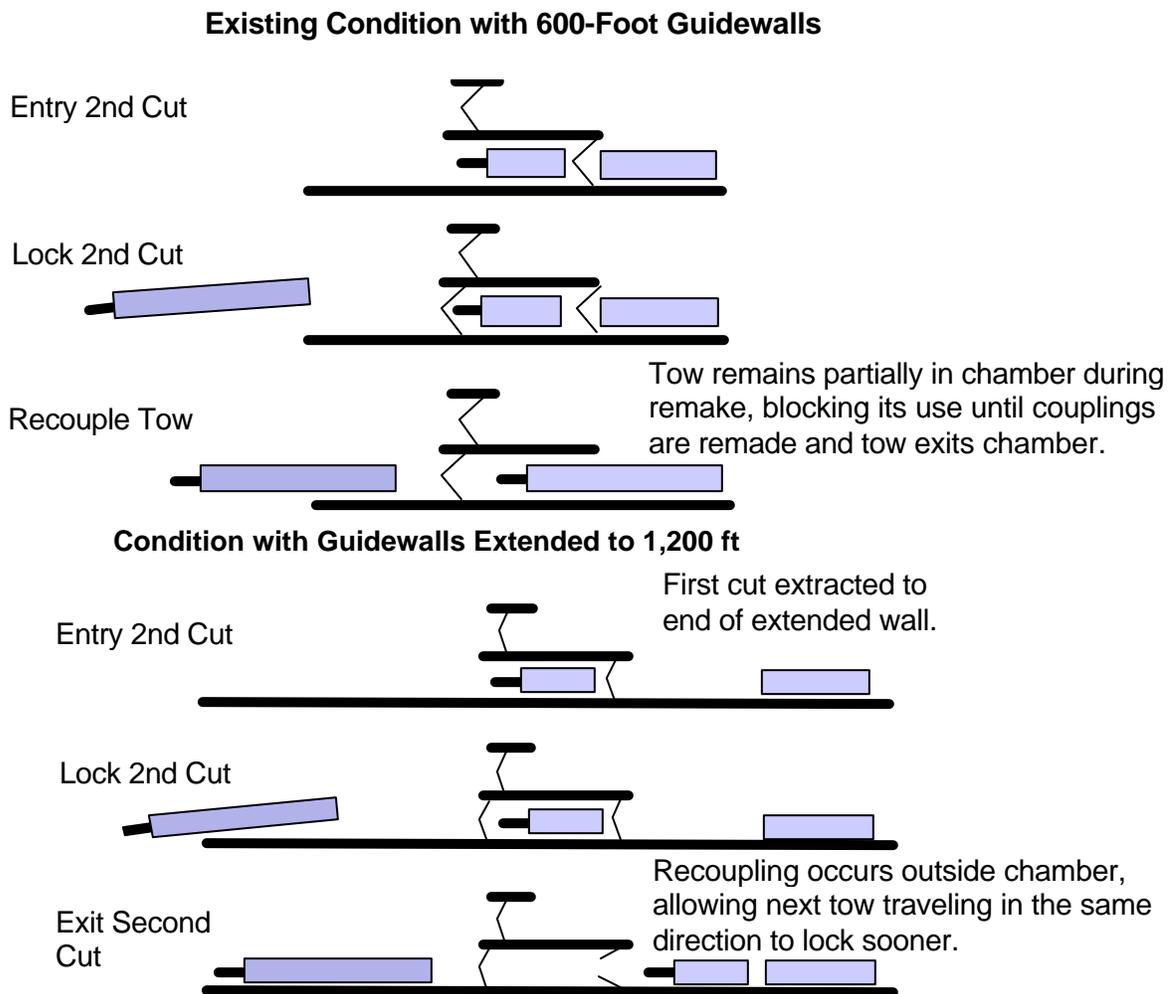


Figure 27. Existing and improved with extended guidewalls operating conditions at Upper Mississippi River System locks.

The remake time savings only applies to turnback lockages where the next tow is heading in the same direction. The remake benefits also do not accrue to the actual tow using the lock since it still must remake even if the chamber is available. The time savings for powered kevels and switchboat options are summarized in Tables 19 and 20.

Table 19. Estimated average time savings for powered traveling kevels with guidewall extensions at UMR-IWW Locks 11-25 with provision of two additional deckhands.

<b>Delay Reduction</b>	<b>Double Lockages Benefits to Tows Waiting in Queue</b>	<b>Double Lockages Benefits to the Locking Tow</b>
Pulling the Unpowered Cut	5 min both directions	5 min both directions
Remaking the Tow (with extended guidewalls - turnback lockages only)	15 min upbound 18 min downbound	Tow still remakes, location is moved to end of guidewall
Total Time Savings Potential	20 min upbound 23 min downbound	5 min upbound 5 min downbound

Table 20. Estimated average time savings for switchboat with guidewall extensions at UMR-IWW Locks 11-25

<b>Delay Reduction</b>	<b>Double Lockages Benefits to Tows Waiting in Queue</b>	<b>Double Lockages Benefits to the Locking Tow</b>
Pulling the Unpowered Cut	7 min upbound 9 min downbound	7 min upbound 9 min downbound
Remaking the Tow (with extended guidewalls - turnback lockages only)	15 min upbound 18 min downbound	Tow still remakes; location is moved to end of the guidewall
Total Time Savings Potential*	22 min upbound * 27 min downbound *	7 min upbound 9 min downbound
* Total does not include approach assistance, but assumes extended guidewalls.		

The average first cost for the guidewall extension at UMR locks is \$23 million for upstream guidewalls and \$12 million for downstream walls. However, costs vary per lock site. Powered kevel first cost (pull/retard system) is \$1.5 million per lock site (\$750,000 per guidewall) including haulage for the lock chamber. Additional personnel are estimated to cost \$518,000 annually per lock (two additional staff people, 24 hours per day, 270 days per year). The need for additional staff to ensure lock efficiencies may be reduced through design of the powered kevel system. An additional first cost of \$100,000 per lock site also was included, associated with start up of the measure associated with contracting or hiring employees, training requirements, and miscellaneous expense. The annual cost of a 1,800 to 2,000 hp switchboat is approximately \$1,129,000 for 270 days of use. At most locks, two switchboats and upstream and downstream guidewall extensions would be required to provide maximum benefits. These costs are generally constant for all lock sites.

In order to avoid impacts to navigation, guidewalls would be constructed during winter closure periods. However, at IWW locks, which do not have a definite winter closure period, significant impacts to navigation are anticipated.

2.4.1.1.1.2 Adjacent Mooring Facilities.

New mooring facilities above or below the lock could consist of mooring cells or buoys with a mooring line. These structures provide waiting areas where tows can be tied off to improve efficiency (Figures 28 and 29). They can provide a waiting area closer to the lock where a tow can safely wait clear of a narrow approach, allowing a tow exiting in the opposite direction to pass. By waiting closer, the exchange approach and exit times can be reduced. Cost and time savings for these measures at applicable sites are itemized in Table 21.

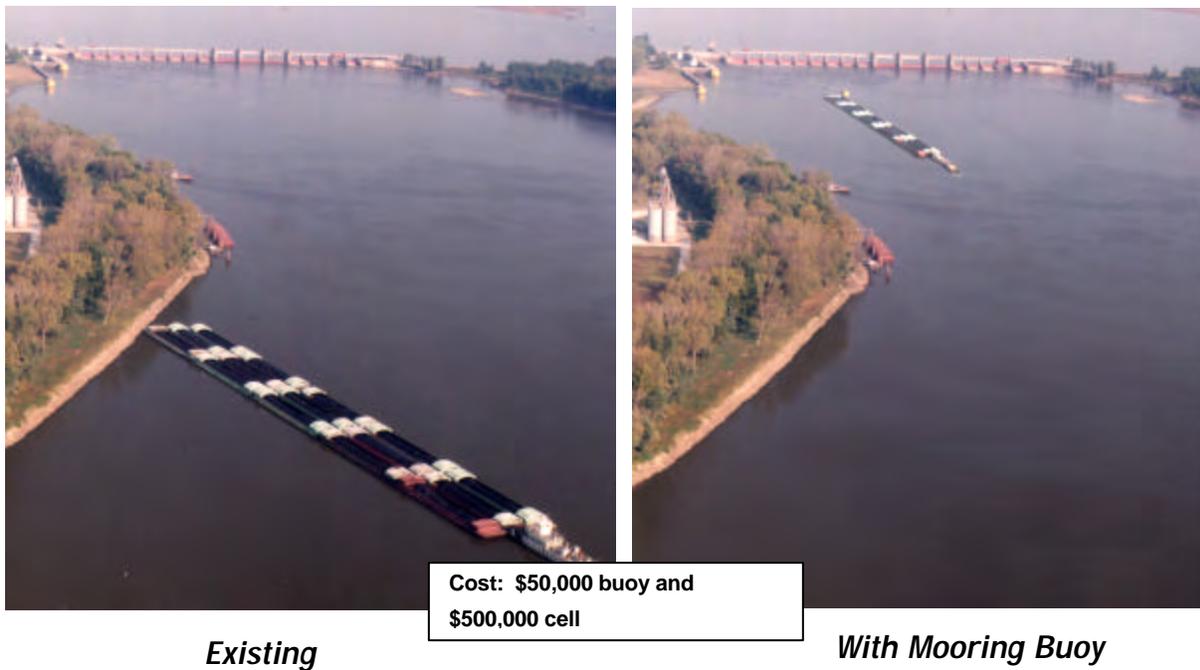


Figure 28. A simulation of an adjacent mooring at Lock 25.

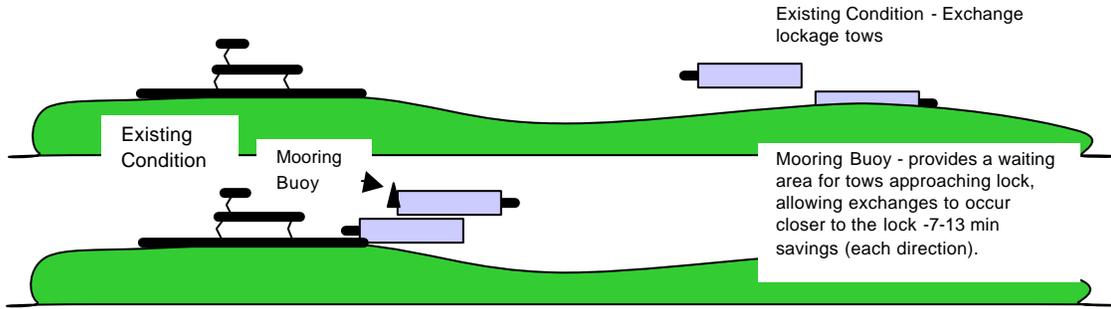


Figure 29. Diagram of adjacent moorings benefits - downstream of a lock.

Table 21. Cost and performance of adjacent mooring facilities.

Upper Mississippi River							
Lock	Miter Gate RM	Dir.	Wait at RM		Cost (\$1,000's)	Miles Closer	Time Savings (min) Doubles <sup>1/</sup>
			Exist	New			
12	556.6	UB	555.0LC	556.0LC	50	1.0	13
14	493.3	DB	494.6RC	493.7RB	500	0.9	12
14	493.3	UB	489.7LC	492.5LC	500	2.8	37 (35% of the time)
18	410.5	UB	409.0RB	409.7RC	50	0.7	9
20	343.2	UB	342.0LC	342.8LC	50	0.8	11
22	301.2	UB	300.3RB	300.8LC	50	0.5	7
24	273.4	DB	274.5RB	274.0RB	500	0.5	7
25	241.5	UB	240.6RB	241.3LC	50	0.7	9
Melvin Price	201.6	UB	199.6LB	200.6LB	50	1.0	13
Illinois Waterway							
La Grange	80.2	DB	80.9RB	80.4RB	500	0.5	7

UB-upbound mooring, located downstream of lock, DB-downbound mooring located upstream of lock  
 L-left descending side, R-right descending side, C-location along navigation channel, B-location along bank.

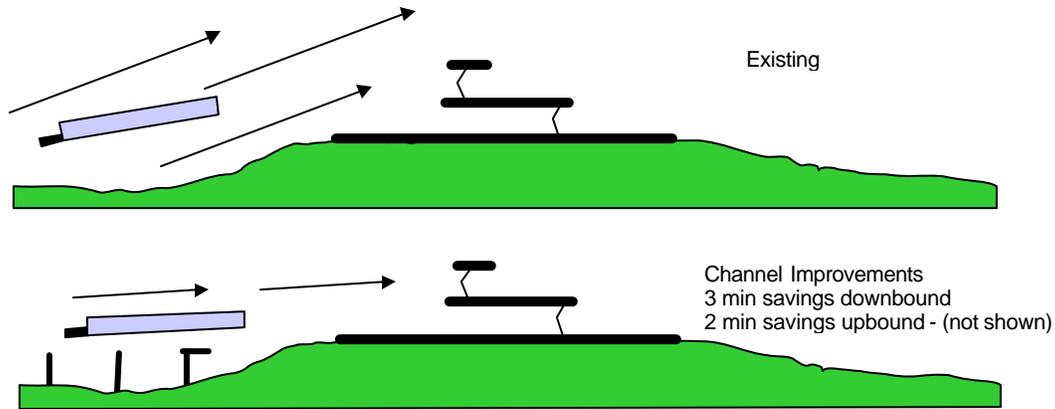
<sup>1/</sup> Approach time savings shown are for exchange of double lockage tows. Similar savings for exchange exits are anticipated. Savings of roughly one-half this amount are anticipated for single lockage tows.

Based on past historical data, the average cost for a mooring buoy is estimated at \$50,000 installed.

The average cost for a mooring cell is estimated at \$500,000, based on historical costs. This cost was used for both rock- and pile-founded sites, but some site-specific differences in cost are anticipated.

### 2.4.1.1.1.3 Channel Improvements.

This measure includes a variety of possible modifications including dike fields, submerged dikes, vane dikes, dredging, bank filling, bank excavation, and channel relocation—all designed to control channel currents and improve the path of a tow as it enters a lock (Figure 30). Such improvements have been found to reduce approach times and make conditions safer, depending upon the location, combination of improvements, and river conditions.



Improvements shown are only examples, specific improvements would be identified for each site.

#### Arrows Indicate General Direction of Currents

-  Indicates Outdraft Currents - Pulling tow towards dam.
-  Indicates No Outdraft Currents - Flow aligned with the lock approach.

Figure 30. Benefits of channel improvements - existing and improved conditions.

The time savings for typical exchange approaches average 3 minutes downbound and 2 minutes upbound at UMR locks. Outdraft is not as severe a problem at locks on the IWW, except under certain flow conditions at Peoria and La Grange.

Initial implementation costs vary significantly from approximately \$200,000 to \$5 million for most sites, based upon the individual site and flow conditions. In addition, annual maintenance costs also would be required, averaging \$170,000 and \$65,000 for upstream and downstream approaches, respectively. At most sites, model studies would be required to identify optimal improvements. Some potential environmental impacts were identified, but are not included in these costs. Disposal of potential dredged material is of concern, especially when large quantities are involved. In addition, real estate impacts may be substantial where extensive channel widening is anticipated, for example, at Lock 20. There are no anticipated impacts to navigation during the construction of channel improvements. In addition, there is some potential that approach improvements could reduce costs to industry by reducing or eliminating the need for and cost of helper boat assistance on approaches.

2.4.1.1.1.4 Congestion Tolls/Lockage Time Charges.

Tolls and time charges could be collected to alter the distribution of towboat traffic on the system and to create an incentive to improve efficiency, reducing delays at the locks. These measures could be implemented only if a current Federal law prohibiting charging of tolls for watercraft passing through locks is changed. If implemented, tolls would be collected from tows using congested locks. It assumes that a fee could be charged at locks experiencing significant delay or that a licensing fee would be charged for use of the system.

The primary costs associated with this measure include developing a congestion toll structure, setting the level of the tolls, and ongoing toll collection. The initial cost of developing a toll structure and initial implementation is estimated at \$465,000. In addition, ongoing toll collection is estimated to cost \$235,000 annually (Table 22). These cost estimates result in an average annual cost of \$280,000 to implement congestion tolls for the system. This measure would produce revenue in excess of costs for the Federal Government. Tolls on recreational craft would need to be set at a lower level, but would still be highest at those locks with the greatest delay and lower at locks with less traffic and delay. A potential major cost to the Nation and region is the possibility of reducing transportation options; and secondly, negatively impacting recreation, a significant economic activity in the study region.

Table 22. Small-scale measure cost and performance.

Measure	Mean Time Savings for Double Lockage Tows	Initial Implementation Cost <sup>3</sup>
2 Switchboats with Guidewall Extension <sup>1</sup>	22 min upbound <sup>2</sup> 27 min downbound <sup>2</sup>	\$36 million + annual boat cost \$2.2 million
Guidewall Ext with Powered Kevel	20 min upbound <sup>2</sup> 23 min downbound <sup>2</sup>	\$37 million + additional personnel
Adjacent Mooring Facilities	7-13 min at applicable sites	\$50k - \$500k
Approach Channel Improvements	3 min downbound 2 min upbound	\$200k to \$5 million
Congestion Tolls/Lockage Time Charges	Unquantified	\$465k
Notes: <sup>1</sup> Potential to provide additional approach time savings for downbound lockages. <sup>2</sup> Only applicable to turnback lockages. <sup>3</sup> Costs reflect the initial cost to construct/implement improvements and purchase necessary equipment for UMR locks. The costs exclude environmental costs, but improvements avoid significant impacts to navigation during construction.		

2.4.1.1.1.5 Scheduling & Tradable Permits.

Scheduling constitutes a nonstructural measure designed to address lock congestion by means of demand management. Due to the random and unpredictable nature of towboat arrivals at locks, congestion can be highly variable. By managing demand, arrivals at locks could theoretically become more regular and system capacity could be increased.

Tradable permits represent a form of market-based scheduling. As described by the NRC, with a system of tradable lockage permits the task of smoothing arrivals at locks would be given to towboat operators. The most direct way to accomplish the task of smoothing would be to give towboat operators clear property rights to lockage times at different locks.

This would be done by investigating the historical pattern of lock usage, and allocating to each operator the same percentage of 5-minute blocks throughout each day as they used in the historical period. The 5-minute slots throughout each day would be allocated at random to each operator. The remainder of the lock minutes throughout each day would be retained by the Corps of Engineers. Before the beginning of the navigation season, any operator could swap an assigned 5-minute slot for one held by the Corps. The key to demand smoothing is to encourage the swapping of slots among operators to assemble a clear sailing path through each lock. Circumstances would be evaluated, and penalties assessed if deemed appropriate, in those cases where an operator occupied a lock for longer than the time reserved. New operators would buy lockage slots from either existing operators or from the Corps of Engineers.

#### 2.4.1.1.2 LARGE-SCALE MEASURES.

The initial universe of large-scale measures was defined in the reconnaissance report and included 16 potential lock sites (Locks 11 - 25 on the UMR and Peoria and La Grange on the IWW). Six alternative locations in each existing dam, four different design types, and a variety of lock sizes were evaluated. The first iteration of a two-part screening process used to select the most promising measures concluded that the only viable large-scale options should include a 1,200-foot by 110-foot lock. At most lock sites, the surviving alternatives include options for just one 1,200-foot lock, extending the existing locks, and one option that would result in a new 1,200-foot lock in addition to the existing 600-foot lock.

##### 2.4.1.1.2.1 Locations.

Six lock locations were initially considered: Location 1 landside of the existing lock, Location 2 extension of the existing lock, Location 3 in the auxiliary lock chamber, Location 4 in the gated section of the dam, Location 5 in the overflow section of the dam, and Location 6 landside on the opposite shoreline (Figure 31).

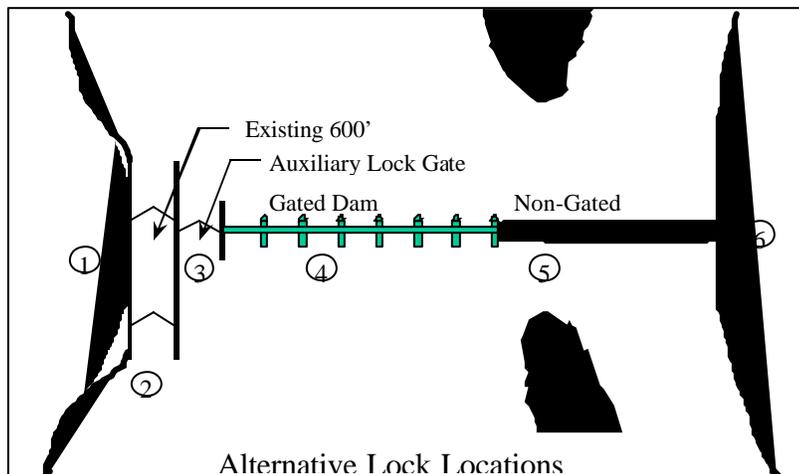


Figure 31. Example of alternative new lock locations at a typical existing lock and dam site.

#### 2.4.1.1.2.2 Sizes.

Lock sizes were evaluated in 200-foot increments from 200 feet to 1,200 feet and also as widths of 110 feet to 220 feet. Based on further system constraints related to the channel as well as downstream locks, 1,200-foot by 110-foot lock sizes were selected to represent full range of feasible options.

#### 2.4.1.1.2.3 Types.

Four conceptual lock design types were considered to provide an array of cost performance and risk (Table 23). Construction approaches ranged from traditional lock construction (with somewhat higher performance) to locks of low first cost (with reductions in performance). Traditional lock construction involves cofferdams around the site, allowing essentially land-based construction techniques to be used. This type of approach has a high cost and potentially huge adverse impacts to existing navigation. In order to reduce these costs and impacts, design criteria and construction standards were reevaluated. Several innovative construction techniques, such as float-in and lift-in technologies where large components of the lock would be fabricated off-site and then brought in and placed in the water, were estimated to provide substantial cost savings compared to traditional lock construction.

### 2.4.1.1.3 LOCK ALTERNATIVE SCREENING.

#### 2.4.1.1.3.1 Location.

A qualitative screening was used to eliminate alternative lock locations. It was obvious that some lock placements are not feasible. The process employed a multi-disciplined study team that included construction, environmental, geotechnical, hydraulic, operations, real estate, civil engineering, and structural engineering expertise. The location screening work took place concurrently with the development of the lock concepts and is documented in an interim report entitled, *Large-Scale Measures of Reducing Traffic Congestion, Location Screening* (USACE 1999b). This effort reduced the range of alternative lock locations to 43 from a potential 96 locations under initial consideration (Table 24).

### 2.4.1.1.4 AVERAGE COST AND PERFORMANCE.

Given the systemic nature of this study, site-specific evaluations were not possible for the wide range of sites under consideration. Table 25 includes average cost and performance information for the design types and locations remaining after the screening process. Cost estimates for Locks 22 and 25, locations 2 and 3 were independently reviewed and validated. This information will be updated and included in the feasibility study for inclusion into the economic analysis.

Table 23. Lock construction measures.

<p><b>Type A.</b> A “Type A” is a lock designed according to current design standards and traditional construction methods for locks. It would be constructed within a dewatered cofferdam. This lock type would typically have concrete gravity or U-frame walls, a side port filling and emptying system, and a downstream miter gate and either an upstream miter gate or a lift gate. A Type A lock would be expected to have the highest performance levels and durability, but also the highest first cost. Construction risks would be low for this type of lock.</p> <p><b>Type B.</b> A “Type B” is a lower cost lock using construction techniques proven in marine construction but that have not commonly been used in lock construction. Use of these construction techniques, float-in and lift-in, would be innovative in the lock construction arena. A Type B lock would present slight reductions in performance but similar durability compared to a Type A lock. A Type B lock would present moderate risks to construct.</p> <p><b>Type C.</b> A “Type C” lock design has the lowest first cost, using cellular sheet pile construction with precast concrete lockwall panels, that still is safe and achieves predictable performance. This lock type would be expected to be less durable and less reliable than Types A and B locks. To accomplish the cost savings, certain design standards were relaxed with resulting tradeoffs in performance (sill depths, filling and emptying, etc.). A Type C lock would typically present low to moderate risks to construct.</p> <p><b>Type R.</b> A “Type R” lock was developed in FY 98 for use at Location 2, the extension of the lock to 1,200 feet. However, similar savings were identified at Location 3 as well. Again, it is a lowest first cost design using cellular sheet pile construction with precast concrete lockwall panels. However, additional design modifications were included to reduce the impacts to navigation during construction and to further lower construction costs. These design features include: not extending the filling and emptying culverts into the extension, utilizing the existing lower guidewall by strengthening it for use as the landside lockwall, maintaining the same sill and floor depth as the existing lock, using float-in lower gate monoliths, not improving the approach, and only constructing a 600-foot downstream guidewall. By not extending the filling and emptying system, extending the upstream guidewall, or making channel improvements, time savings were reduced approximately 2 to 4 minutes. A Type R lock would present low to moderate risks to construct.</p>
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Table 24. Remaining locations for further study.

Lock and Dam Site	Location Number					
	1	2	3	4	5	6
L/D 11		X	X			
L/D 12		X	X	X		
L/D 13		X	X	X		
L/D 14 <sup>1</sup>		X		X		
L/D 15 <sup>1</sup>		X	X			
L/D 16		X	X	X		
L/D 17	X	X	X	X		
L/D 18		X	X	X		
L/D 19 <sup>1</sup>			X			
L/D 20 <sup>2</sup>		X	X	X		
L/D 21		X	X	X		
L/D 22 <sup>1</sup>		X	X	X		
L/D 24 <sup>2</sup>		X	X	X		
L/D 25	X	X	X	X		
Peoria	X	X				
La Grange	X	X				

<sup>1</sup>These sites have rock foundations. All others (except for note 2) are sand-founded sites (requiring piles).

<sup>2</sup>These sites have mixed foundations; some locations would be rock-founded and some pile-founded.

Table 25. Average costs and lockage time by lock type and location.

Lock Site/Length	Lock Alternative	Type	Avg Lockage Time <sup>1</sup>	Costs (\$1,000)			
				Const. Cost (lock and guidewalls) <sup>2</sup>	Impl. Cost Channel Work and Levees	Real Estate and Relocations	Total Cost w/o Env or Impacts to Nav <sup>3</sup>
<b>Averages New 1,200-foot Locks</b>							
1,200 ft	Loc 1	1C	59	\$151,000	\$12,600	\$5,650	\$179,650
	Loc 2	2B	54	\$133,533	\$3,953	\$822	\$138,309
		2C	57	\$107,600	\$5,300	\$764	\$113,664
		2R	57	\$104,000	\$1,433	\$472	\$105,905
	Loc 3	3B	59	\$146,750	\$4,375	\$773	\$162,298
		3C	53	\$175,833	\$5,067	\$403	\$191,703
		3R	53	\$175,417	\$5,067	\$403	\$191,286
	Loc 4	4B	52	\$249,455	\$5,745	\$173	\$265,773
		4C	52	\$236,273	\$5,745	\$173	\$252,591
<b>Averages New 600-foot Locks</b>							
600 ft	Loc 1	1C	107	\$137,500	\$14,675	\$5,650	\$167,525
	Loc 3	3B	106	\$121,750	\$4,375	\$773	\$136,598
		3C	100	\$142,583	\$5,067	\$403	\$157,753
	Loc 4	4B	99	\$209,909	\$5,745	\$173	\$225,527
		4C	99	\$211,000	\$5,745	\$173	\$226,618

Notes:

<sup>1</sup> Average lockage times shown are based on equal percentages of fly, exchange, and turnback lockages. The numbers assume turnback approaches occur during the lockage of the previous tow; this may understate overall lockage times slightly.

<sup>2</sup> Cost estimates prepared for these conceptual designs were prepared to the same level of detail as those presented in the *Conceptual Lock Designs Report*. The project element costs are based on 1996 prices and include 25% contingencies.

<sup>3</sup> The total costs shown are not all inclusive. They do not include the costs related to environmental impacts, cultural impacts, or impacts to navigation during construction.

#### 2.4.1.1.5 SUMMARY OF LARGE-SCALE EFFORTS.

The only remaining lock size alternative was the 1,200-foot by 110-foot lock (Table 26). At most lock sites, the surviving alternatives include an option that provides for just one 1,200-foot lock, extending the existing lock (Location 2), and one option that would result in a new 1,200-foot lock in addition to the existing 600-foot lock. In most cases, any new lock would be placed in the auxiliary gate bay (Location 3). Exceptions include Lock 14 where a Location 3 lock was not available; Locks 17 and 25 where new locks landward of the existing lock (Location 1) were carried forward as well; and Lock 19 where a 1,200-foot lock is already in place in Location 2. At the IWW locks, Location 1 locks appeared to be the preferred options, but Location 2 locks were also carried forward for further consideration.

These remaining large-scale measures will be used together with the surviving small-scale measures to develop various alternative plans for analysis to eventually identify a recommended plan.

Table 26. Surviving lock locations and types following the secondary screening.

Lock and Dam Site	Location Number and Viable Types					
	1	2	3	4	5	6
L/D 11		X	X			
L/D 12		X	X			
L/D 13		X	X			
L/D 14 <sup>1</sup>		X		X		
L/D 15 <sup>1</sup>		X	X			
L/D 16		X	X			
L/D 17	X	X	X			
L/D 18		X	X			
L/D 19 <sup>1</sup>			X			
L/D 20 <sup>2</sup>		X	X			
L/D 21		X	X			
L/D 22 <sup>1</sup>		X	X			
L/D 24 <sup>2</sup>		X	X			
L/D 25	X	X	X			
Peoria	X	X				
La Grange	X	X				

<sup>1</sup>These sites have rock foundations. All others (except for note 2) are sand-founded sites (requiring piles).

<sup>2</sup>These sites have mixed foundations; some locations would be rock-founded and some pile-founded.

#### 2.4.1.1.6 SITE-SPECIFIC ENVIRONMENTAL COSTS.

Associated with any major construction, there would be some environmental impacts at the specific construction location due to the actual placement, construction activities, staging areas, etc. These impacts are separate from the system impacts associated with incremental increases in traffic. These costs are habitat replacement values associated with replacing any habitat lost. Detailed efforts have been undertaken to develop site-specific costs associated with the lock alternatives at UMR Locks 20-25 and Peoria and La Grange, using Habitat Evaluation Procedures (HEP) modeling. This analysis is documented in the *Site-Specific Habitat Assessment* (USACE 1998b). Table 27 shows the estimated habitat replacement costs an example set of measures. These results will be extrapolated to the other sites and for small-scale measures.

As noted, the site-specific costs are shown for upstream and downstream portions of potential small-scale, while for the large-scale lock options only one cost is shown for the lock. The last column summarizes costs for primarily Location 3 locks, except 14 which is a Location 4 lock, Locks 17 and 25, (two options shown are 3C and 1C, respectively), and Peoria and La Grange, which only have a Location 1 lock.

Table 27. Site-specific habitat replacement costs.

Lock Site	Dir	Cost by Direction			Cost by Lock Site	
		Guidewall Extensions	Channel Improv.	Adj. Moorings	Lock Extensions (2R)	Other Lock Options As Noted
11	US	70,000	100	NA	500,000	600,000
	DS	70,000	NA	NA		Type 3C
12	US	70,000	NA	NA	2,500,000	2,500,000
	DS	500,000	200	TBD		Type 3C
13	US	70,000	NA	NA	1,600,000	1,600,000
	DS	250,000	NA	NA		Type 3C
14	US	1,170,000	4,000	TBD	5,000,000	5,000,000
	DS	490,000	30	TBD		Type 4C
15	US	NA	200	NA	600,000	600,000
	DS	70,000	30	NA		Type 3B
16	US	70,000	7,500	NA	600,000	8,100,000
	DS	70,000	0	TBD		Type 3C
17	US	70,000	800	NA	2,700,000	3,500,000
	DS	2,500,000	2,500	NA		7,500,000
18	US	70,000	100	NA	500,000	600,000
	DS	425,000	NA	TBD		Type 3C
19	US	NA	NA	NA	1,600,000	1,600,000
	DS	NA	1,000	NA		Type 3B
20	US	70,000	400	TBD	843,175	1,106,815
	DS	70,000	400	TBD		Type 3B
21	US	70,000	2,500	NA	2,715,750	3,995,750
	DS	854,000	NA	NA		Type 3C
22	US	70,000	4,500	TBD	3,083,344	5,333,344
	DS	420,000	NA	TBD		Type 3C
24	US	70,000	1,500	TBD	527,940	597,940
	DS	420,000	0	NA		Type 3C
25	US	70,000	200	NA	633,360	1,058,400
	DS	490,000	400	TBD		3,123,750
Mel Price	US	NA	NA	NA	NA	NA
Aux Lock	DS	NA	NA	TBD		
27	US	70,000	NA	NA	NA	NA
Aux Lock	DS	NA	NA	NA		
Lockport	US	NA	NA	NA	NA	NA
	DS	NA	NA	NA		
Brandon	US	70,000	NA	NA	NA	NA
Road	DS	70,000	NA	NA		
Dresden	US	70,000	NA	NA	NA	NA
Island	DS	NA	NA	NA		
Marseilles	US	70,000	400	NA	NA	NA
	DS	70,000	NA	NA		
Starved	US	70,000	NA	NA	NA	NA
Rock	DS	250,000	NA	NA		
Peoria	US	70,000	NA	NA	646,000	576,000
	DS	210,000	NA	NA		Type 1C
La Grange	US	450,000	NA	TBD	4,834,141	5,245,266
	DS	70,000	NA	NA		Type 1C
Average	US	161,667	1,982	TBD	1,560,714	2,418,450
UMR 11-25	DS	509,923	445	TBD	2,740,071	2,910,633

Note: For other lock options column, Locks 17 and 25 two options shown are 3C and 1C, respectively. Peoria and La Grange Locks only have a Location 1C lock.

#### 2.4.1.1.7 SYSTEMIC MITIGATION PLANNING.

In order to complete preliminary economic analyses and plan formulation, a draft mitigation implementation strategy (MIS) and successive draft adaptive mitigation plan (AMP) were developed to address potential mitigation requirements for systemic environmental impacts. Fundamental to development of the MIS was the identification of three elements: significant resources, impact assessment endpoints, and significant effects. The study scoping process, initial design of component impact assessment studies, interagency coordination, and the intended incorporation of an adaptive implementation approach combined to describe and refine these elements.

Mitigation planning efforts to date have focused on structural measures that, though intended to provide reach-wide or systemic benefits, would be implemented on a site-specific basis. Operational or ‘systemic’ measures, which could include commercial traffic regulation or alternative river regulation, were also discussed.

The mitigation plan describes how the proposed measures would be implemented over the 50-year planning period, both spatially and temporally. A funding stream for this implementation is also presented which considered the construction schedules for the alternatives proposed at the time, when mitigation measures would need to be in place, and how funds would be allocated for operations and maintenance, monitoring, and overall program administration.

Any mitigation actions for the Navigation Study would be adaptive in nature, and an authorized mitigation plan and costs would have leeway to modify mitigation features and measures based on field results and future river conditions. An adaptive process is well suited for the temporal and spatial scales of the Navigation Study. The planning horizon for the Navigation Study includes the next 50 years, during which technological and scientific advancements will likely improve our ability to identify and compensate for adverse impacts. The adaptive approach would rely on a formalized monitoring and re-evaluation program, and this was designed into the mitigation plan and cost estimates. In-place avoid and minimize measures would be re-evaluated for their effectiveness in meeting overall mitigation goals. It is envisioned that re-evaluation and decisions on mitigation direction and prioritization would be made in some type of interagency forum.

Initial mitigation planning activities identified suitable measures to avoid, minimize, or compensate for significant environmental impacts, and also developed cost estimates for implementing these measures over the 50-year planning period. Structural avoid and minimize measures were emphasized, such as revetments to prevent wave effects on plants or to prevent sediment movement into backwaters, or riprap protection for potential erosion sites. However, for fish, habitat improvement measures such as increased structure, side channel restoration, water level management, or fish passage opportunities were also recommended. Opportunities to avoid impacts by alternative operational measures, such as seasonal traffic closures, speed restrictions, or designated avoidance zones, were also considered but not fully evaluated. Implementation of any recommended mitigation plan would need to be conducted in an adaptive manner, allowing evaluation

and revision as necessary to achieve maximum effectiveness. An adaptive mitigation plan will be developed as part of the continuing Feasibility Study.

#### *2.4.1.2 Ecosystem Restoration – Modifications to Navigation System Operation and Maintenance*

Operation of the 9-Foot Channel Navigation Project requires significant infrastructure and maintenance of equipment and channels. The methods used to operate and maintain the project, however, impose impacts on the environmental resources of the UMR-IWW. Review of operating practices has revealed that some aspects of project operation and maintenance can be modified to achieve the desired channel maintenance results while reducing adverse environmental impacts. Some measures discussed previously are explained in more detail below. A summary of measures was presented in Table 9; a more comprehensive list of actions is presented in Appendix 4. While current attempts to reduce impacts are beneficial, a much more substantial commitment is required to begin to affect environmental conditions on a large scale. While the designs of new navigation structures incorporate avoid and minimize principles, the greatest opportunities for environmental restoration of those areas directly and significantly impacted by the project require the statutory addition of a second project purpose, environmental restoration.

Through experience gained over the last 100 years, the Corps has become proficient at predicting how traditional channel maintenance structures can be used to manage sedimentation and focus water flows to help maintain the navigation channel. A growing realization of the role these structures play in altering and creating habitat can be seen as far back as 1972 when the Corps began notching dikes to increase habitat diversity. All three UMR Corps districts have wing dike notching programs. Those programs are funded through each district's existing Operations and Maintenance (O&M) dollars and work is usually completed as a matter of opportunity in concert with other routine O&M repair activities or through the Avoid and Minimize Program in the St. Louis District. In the 1980's and 1990's, several habitat improvement measures were constructed as part of O&M projects. In the northern reaches of the UMR, where floodplain conveyance is high, these measures usually involved the construction of closure structures such as those at Weaver Bottoms to keep sediment out of backwaters. In 1996, the St. Louis District began a program to construct and monitor innovative river training structures, like chevron dikes, bendway weirs, off-bankline revetment, multiple round-point structures, and bullnose dikes.

The goal of the UMR Corps districts' channel maintenance program is to create and maintain a safe and dependable navigation channel in an environmentally sustainable manner. Ideally, this would be accomplished using both traditional and innovative designs that achieve the objectives of both channel maintenance and ecosystem enhancement. In the feasibility study, an inter-agency collaborative planning process will establish system-wide goals and objectives for the environmental sustainability of the UMR. As those goals and objectives are defined, the Corps' existing channel maintenance programs will be evaluated and revised to determine how structural improvements and modifications, and new and existing authorities and funding mechanisms, can be used to achieve those goals.

#### 2.4.1.2.1 CHANNEL TRAINING STRUCTURES.

##### 2.4.1.2.1.1 Restoring Backwater/Main Channel Connectivity.

The three Corps districts on the UMR already have the technical expertise and experience to improve the connection between the main channel and backwaters. Opportunities for enhancement using channel maintenance structures include modifying and creating training structures to improve backwater connectivity and creating new side channel and off-channel areas using tools like chevron dikes, unrooted dikes, or notched dikes. Past projects have proven that channel maintenance structures can be successful in helping achieve this objective. Examples include the creation of the Pool 8 islands using rock structures, the Mile 100 islands created by notched dikes, and the Ackerman's cut (stabilization of a slough entrance in Pool 11).

##### 2.4.1.2.1.2 Management of Sediment Transport, Deposition, and Side Channels.

Channel maintenance structures help focus flow and manage sediment deposition in the river channel. In traditional wing dike fields, this deposition occurs between the dikes. High levels of deposition, through both man-made and natural processes, are also very evident in most of the side channels of the UMR. Measures for ecosystem improvement include: island creation and stabilization, selective flow introduction, selective backwater isolation, and side channel modification. All of these alternatives could be accomplished with a combination of channel maintenance tools (river training structures and dredging) already at the Corp' disposal, if coupled with new authorities and additional funding. Many of the locations of concern and opportunity are outlined in existing plans for the UMR and in the side channel restoration plan for the river below St. Louis.

#### 2.4.1.2.2 CHANNEL MAINTENANCE.

##### 2.4.1.2.2.1 Existing Modifications.

Channel maintenance practices have improved over the years. Each UMR district completed an Environmental Impact Statement (EIS) in accordance with the National Environmental Policy Act (NEPA) in 1974 and 1975. These documents discussed the impact of methods of channel maintenance, especially dredging and placement, on the backwaters, marshes, and sloughs for which the UMR-IWW is famous.

The start of the Great River Environmental Action Team (GREAT) studies in 1974 resulted in increased coordination of input from river biologists into the Corps' dredged material placement decisions. The On Site Inspection Teams (OSITs), composed of natural resource managers and Corps staff, were initiated by the GREAT. The OSIT makes recommendations to the Corps regarding their dredging and placement activities. This type of field-level coordination was enhanced by the development of the River Resources Forum (RRF) in the St. Paul District, the River Resources Coordinating Team (RRCT) in the Rock Island District, and the River Resources Action Team (RRAT) in the St. Louis District. These groups are coordinated during long-term dredged material placement alternative identification, evaluation, and site selection process. Endorsements of proposed annual dredging plans are sought from these groups.

As a follow-up, St. Paul District has completed their Channel Maintenance Management Plan (CMMP), a long-term program for dredging and dredged material placement. This plan was further refined by a supplemental EIS for O&M activities. The Rock Island

District began a 404(b)(1) evaluation in 1996 to collect data in an attempt to further identify impacts of dredged material placement. This effort continues. The St. Louis District developed Dredge Disposal Guidelines in 1996. As an update to these guidelines, the St. Louis District will be coordinating its high frequency dredge cuts several months prior to the 2002 dredging season. In addition, the St. Louis District's Applied River Engineering Center has been looking at ways to avoid and minimize impacts to the environment, through changes in O&M activities. This has been ongoing since 1994.

Other ongoing environmental protection measures include the reduction of routine overdepth dredging in the Rock Island and St. Paul Districts, along with bend width reductions where possible, better channel control structures, and navigation aids. The St. Louis District is using longer, flexible discharge pipe on dustpan dredges to increase placement options. An increase in mechanical dredging has also expanded placement options. Also, since the 1980's the Rock Island District has required the use of smaller cutterhead dredges along the IWW (e.g., 14"-16" size) to reduce impacts to the bankline during placement.

#### 2.4.1.2.2.2 Potential Future Modifications.

1. Integrating channel maintenance dredging more with existing environmental programs (e.g., EMP and Section 1135 or 206)
2. Seek ways to reduce dredging needs and manage to support ecosystem integrity
  - a. Expand A&M (Avoid and Minimize) activities
  - b. Island creation
  - c. Chevrons/berms built out of dredged material to control flow and sedimentation
  - d. Side channel dredging/create wetlands
  - e. Modify navigation channel in biologically sensitive areas
  - f. Enforce a maximum 9-foot draft for navigation traffic
  - g. Restrict traffic until buoys are in place at the start of each towing season
3. Creative utilization of dredges
  - a. Work on "seamless" districts – make better use of equipment, reduce cost, coordinate opportunities for environmental work.
  - b. Work with natural forces of the river (e.g., channel alignment) - Analyze dredging locations to ensure that navigation channels are aligned to take advantage of natural depths to the maximum extent possible – make better use of equipment, reduce cost, coordinate opportunities for environmental work.
  - c. Investigate innovative dredging technologies – potentially reduce cost, coordinate opportunities for environmental work.
4. Continue existing coordination efforts and enhance where possible
  - a. Regional Dredging Team
  - b. Work on Pool Plans and try to include channel maintenance activities.

5. Enhance Beneficial Use Program (for both environmental improvements and commercial removal).
  - a. Increase funding for WRDA 1992 (Public Law 102-580) Section 204 Programs

#### 2.4.1.2.3 WATER LEVEL MANAGEMENT.

In 1994, the St. Louis District launched an innovative water level management scheme on the three southernmost locks and dams on the UMR. This new concept is called Environmental Pool Management (EPM). This concept adapts dam operations to the natural hydrograph to provide a safe and dependable navigation channel in an environmentally sensitive manner. If the flows are not within a well-defined band, it is not possible to achieve this drawdown without navigation impacts. Since 1994, both the Rock Island and St. Paul Districts have also used EPM on selected pools within their district. Unlike the EPM effort in the St. Louis District, the temporary drawdown in Pool 8 in 2001 in the St. Paul District involved advance channel dredging (over and above normal dredging) to maintain navigation during the drawdown. This was considered an acceptable cost for this pilot project; however, the benefits of future drawdowns will have to be weighed against O&M costs. This overdraft dredging will be monitored to determine if it results in decreased dredging in future years, which would therefore reduce the overall cost of the drawdown.

All three UMR-IWW Corps districts have used the EPM concept to identify opportunities to modify dam operations to benefit the environment while maintaining safe navigation conditions. The Corps of Engineers' principal focus in ecosystem restoration is on those ecological resources and processes that are directly associated with the hydrologic regime of the ecosystem.

Wetland vegetation response to EPM has been outstanding. Native vegetation in seed banks sprouted during drawdowns and survived inundation upon return to controlled pool stages. In addition, the exposed mudflats and sandbars that are created immediately after a drop in water level provide a form of habitat missing from the lower reaches of many of the navigation pools. The many resource agencies that deal with the Mississippi River issues on a daily basis are impressed with the results.

The IWW has several unique water level management issues. First, water levels in the upper portions of the river basin can fluctuate rapidly in response to flood control operations in the Chicago Metropolitan area. When heavy rainfall is anticipated, the water level of the Lockport Pool is drawn down to maximize storm water discharge in the river. Second, rapid water level changes occur at Peoria and La Grange Dams when the wicket gates are placed into, or are taken out of, operation. Water level fluctuations of over 2 feet in a 6-hour period are not uncommon.

EPM has been a success in all reaches where it has been attempted. Essentially, EPM consists of modifying dam operations for the benefit of fish and wildlife habitat without diminishing navigation channel capacity, which in most cases involves partial restoration

of the low water conditions that occur in a natural river. Future goals for EPM include expanding the program in scope to include holding water levels high to augment fish spawning and overwintering, which probably mostly impacts the three southernmost locks and dams on the Mississippi River, and by expanding the geographic distribution of EPM to more UMR-IWW pools.

#### 2.4.1.2.4 NAVIGATION.

Numerous studies and resultant reports (see reports on the Navigation Study web page [http://www2.mvr.usace.army.mil/umr-iwwsns/index.cfm?fuseaction=home.reports&PDFDocTYpe\\_ID=3&sort=](http://www2.mvr.usace.army.mil/umr-iwwsns/index.cfm?fuseaction=home.reports&PDFDocTYpe_ID=3&sort=)) have investigated the physical and environmental effects of commercial vessel passage and related operations and maintenance practices. Most recently, detailed studies of these effects were conducted as part of the ecological risk assessment for the UMR-IWW System Navigation Study. Identification and description of vessel effects is the first step in determining possible measures to avoid, minimize, or compensate the impact of these effects on the river environment.

A major effort in this regard was undertaken as part of the Record of Decision (ROD) for the Lock and Dam 26 (Second Lock) Environmental Impact Statement (EIS), resulting in the establishment of the St. Louis District (MVS) Avoid and Minimize (A&M) program (USACE 1992). Details of this program may be found in MVS Design Memorandum No. 24, Melvin Price Locks and Dam, Mississippi River – Missouri and Illinois, Avoid and Minimize Measures, dated October 1992.

Briefly, the program sought to avoid and minimize the possible impacts of increased traffic as a result of the second lock, utilizing measures suggested by the U.S. Fish and Wildlife Service (in their Coordination Act Report) and MVS. A long list of proposed measures was coordinated with Federal and state agencies, industry, and the Coast Guard, and 8 measures were agreed upon for implementation, beginning in 1995. Some measures were informally implemented between 1988 and 1992, including mooring facilities, the “Biologist on Board” program, an information campaign, and innovative dredge material placement and training structure design.

Of the 8 recommended measures, one was classified as related to tow operation “Develop a nonstructural alternative to reduce waiting times (measure B-8).” This measure essentially recommended further investigation of operational measures such as industry self-help, N-up/N-down, scheduling, and enhanced boat-to-lock communications. These suggested measures have been investigated as part of the Navigation Study. Several other of the recommended A&M measures, classified under “operation of the locks and navigation channel” dealt with tow operation. These are listed in Table 28.

Table 28. Selected measures related to O&M/navigation (from MVS Design Memorandum #24 USACE 1992).

- A-1. Modify navigation channel in biologically sensitive areas.
- A-2. Implement monetary fines for navigation outside marked channels, during hazardous conditions, and for negligence in spills.
- A-3. Designate locks approach waiting areas or provide special mooring sites.
- A-4. Monitor channel depth more frequently in known problem areas.
- A-5. Limit and/or close navigation based on water stage, ice conditions, level of turbidity.
- A-6. Enforce a maximum 9-foot draft in channel.

Three objectives that could be addressed in the future include:

**a) Regulated/designated fleeting and mooring areas.** A brief analysis of current and projected fleeting activity on the UMR is found in USACE 2000e. Fleeting is regulated to some extent via the §10/404 permit process, in the case where some type of facility (e.g., deadmen) is to be constructed. Otherwise, fleeting activities have generally been described as “casual” in that operators will fleet barges opportunistically when and where required, often anchoring to mature trees and, in many cases, causing resource damage. This practice also occurs with tows moored while waiting to transit locks. In this case, mooring facilities have been instituted at some sites, but have had mixed levels of usage. The Navigation Study identified 5 additional lock and dam sites where mooring facilities would benefit tows in terms of reducing waiting times. If implemented in a manner acceptable to tow captains, these facilities would also reduce resource damage.

**b) Seasonal/temporal/locational restrictions on navigation.** Design Memorandum No. 24 indicates Coast Guard authority to close the river, set up safety zones, or mandate reduced tow size during low water (e.g., drought conditions). Past activities under A&M measure A-1 (Table 28) included provision of “Resource Alerts” to commercial vessels. The alerts noted location of ecologically sensitive areas. A recommendation was made at the time to periodically update these alerts. With the recent update and GIS application of the USFWS Upper Mississippi River System Natural Resource Inventory, it may be possible to have this information incorporated into existing navigational charts or other information used by the towing industry, thus providing a “real-time” reference.

**c) Modification/increased regulation of the navigation channel itself.** The original project authorization mandates a 9-foot depth and 300-foot width for the navigation channel. As noted in Design Memorandum No. 24, the Corps maintains

the depth, but the Coast Guard has enforcement authority over vessels that may become grounded due to being overloaded. The idea of shifting the channel away from sensitive ecological areas was discussed during mitigation planning activities for the Navigation Study; it was considered impractical due to the cost of constructing/maintaining a new channel segment, along with the possibility of shifting the problem elsewhere (e.g., to the opposite bank).

#### 2.4.1.3 *Additional Ecosystem Restoration Opportunities*

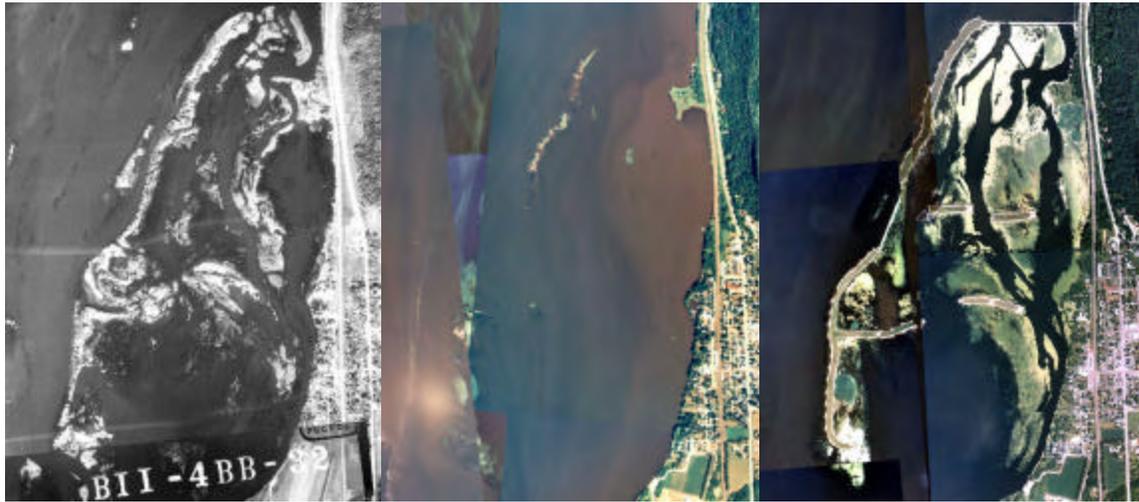
##### 2.4.1.3.1 BACKWATER, SECONDARY, AND ISLAND RESTORATION.

The measures discussed in the previous section relate primarily to traditional operation and maintenance issues. There are, however, aspects of the ecosystem that are intimately connected to the 9-Foot Channel Navigation Project, but fall outside of the O&M realm. Backwater, secondary channel, and island rehabilitation are prime examples of habitats impacted by the project for which the Corps does not have authority to maintain or improve. Several backwater restoration projects have been completed through the Environmental Management Program (EMP), but under current funding scenarios the EMP cannot meet the restoration needs of the system. The projects typically involve dredging deepwater habitat in areas they have filled with sediment, dredging channels to improve connectivity (Figure 32), and installing water control devices to manipulate water levels for habitat management.



Figure 32. Andalusia Refuge Habitat Rehabilitation and Enhancement Project connecting channels and water control structure.

Island construction is another restoration technique that has been successfully demonstrated through the EMP. Some projects aim to restore islands that have been lost to erosion (Figure 33), others construct islands to dispose of dredged sediments in backwater dredging, and some construct islands to provide wave breaks. The techniques are quite beneficial and can be implemented in a variety of areas to serve a variety of purposes.



October 1961

August 1994

August 2000

Figure 33. Island loss and replacement near Stoddard, Wisconsin.

#### 2.4.1.3.2 TRAFFIC MANAGEMENT FOR ENVIRONMENTAL BENEFITS.

Traffic management to increase lockage efficiency has been proposed as a small-scale measure for navigation improvements. The topic also presents opportunities for environmental restoration. Two prominent ideas are proposed: draft depth restrictions to allow drawdowns and springtime closures to allow larval fish development. A 6-foot draft restriction during mid-summer would increase the likelihood of success of drawdowns and Environmental Pool Management discussed earlier. A system-wide restriction might allow system-wide benefits without the expense incurred in overdepth dredging necessary to draw down a single pool and permitting full draft traffic throughout the rest of the system.

Seasonal traffic closures have been considered to improve conditions for larval fish survival and to allow system-wide drawdowns beyond what can be achieved under Environmental Pool Management and other water level management actions. The issue has merit as larval fish can be entrained in towboat propellers. It is a very complicated issue through, because of differences in the timing of different species spawning requirements and differences in the timing of the spawn for the same species at northern and southern ends of the river. Economic impacts would, of course, need to be fully

considered in the feasibility analysis of such measures. Modifications to existing authorities would be required to implement such measures.

#### *2.4.1.4 Ecosystem Enhancements*

Natural resource managers have a variety of tools to manipulate landscapes to enhance plant and animal populations and to improve their habitats. Many have been discussed above and can be implemented by the Corps. There are a number of Federal, state, and private programs to fund wildlife habitat management and restoration that are not available to the Corps. There are few simple solutions for effective large river habitat management, but some of the available tools or actions available to restore river function and form were presented in Table 9 (also see Appendix 5 for a more comprehensive list). The sections above discuss opportunities that might be undertaken as part of system operations and maintenance, but they still do not address the full range of restoration needs because many of the needs are in floodplain terrestrial areas that are owned by other public or private entities.

Examples of actions involving floodplain habitats and non-Federal property include timber stand improvements, native plantings, and land acquisition. Presently, the Corps does not have ready authority for land acquisition for environmental restoration, but the Corps can give cost-share credit to partners that can purchase land. The array of potential actions is endless, but ecosystem enhancements outside of the 9-Foot Channel Navigation Project area currently require cost-share partners.

#### *2.4.2 Formulation of Alternatives*

Alternative plans will be a combination of management measures formulated to meet the dual objectives of navigation efficiency (reduction of lock congestion) and ecosystem restoration (an environmentally sustainable system). Each alternative plan will be formulated with respect to the Principles and Guidelines criteria of completeness, efficiency, effectiveness, and acceptability. The formulation of alternatives is an iterative process that will change based on outputs from economic and environmental modeling. The initial set of navigation efficiency and ecosystem restoration alternatives is listed below.

##### *2.4.2.1 Navigation Improvement Alternatives*

Alternatives to address navigation system needs are listed below in Table 29. These alternatives reflect an initial assessment to be evaluated in detail for the feasibility report. However, the ultimate list of alternatives may expand or contract once detailed evaluations are initiated and impact assessment information becomes available. The objective of this listing is to provide a sense of the types of measures that may realistically be combined to construct likely alternatives.

Table 29. Preliminary navigation improvement alternatives.

**Alternative 1:** No Action.

**Alternative 2:** Congestion Fees (imposed on commercial traffic).

**Alternative 3:** Traffic Scheduling.

**Alternative 4:** Moorings (at various locations), 1,200' Guidewall Extensions at Locks 20-25.

**Alternative 5:** Moorings (at various locations), 1,200' Lock Extensions at Locks 20-25, 1,200' Guidewall Extensions at Locks 14-18, 1,200' Guidewall Extensions at La Grange and Peoria.

**Alternative 6:** Moorings (at various locations), New 1,200' Locks at Locks 20-25, 1,200' Lock Extensions at Locks 14-18, 1,200' Guidewall Extensions at Locks 11-13, New 1,200' Locks at La Grange and Peoria.

**Alternative 7:** Moorings (at various locations), New 1,200' Locks at Locks 20-25, New 1,200' Locks at Locks 14-18, 1,200' Lock Extensions at Locks 11-13, New 1,200' Locks at La Grange and Peoria.

Structural alternatives 4-7 were developed in consideration of system traffic patterns, existing and proposed lock processing capability, and the range of unconstrained waterway traffic demand reflected in the scenarios. (The traditional formulation process would include the evaluation of these alternate plans against a single without-project condition to assess the impacts. In the restructured study, multiple without-project conditions exist, one for each scenario.) The groupings of improvement measures by waterway segments (Locks 20-25, Locks 14-18, Locks 11-13, La Grange and Peoria) reflect portions of the system where it is anticipated that similar capacity expansion will be required in order to realize a significant gain in system efficiency. The progression from alternative 4 to alternative 7 provides additional system capacity in response to increasing levels of unconstrained demand. This progression of capacity expansion starts with 1,200-foot guidewall extensions, moves next to 1,200-foot lock extensions, and moves finally to new 1,200-foot locks. The specific level of capacity expansion on a waterway segment for a given scenario reflects the fact that traffic density declines as one moves upstream. This progression across scenarios is reflected in Table 30.

Table 30. Structural alternatives development.

	Alternative 4	Alternative 5	Alternative 6	Alternative 7
Locks 20-25	Guidewall Ext.	Lock Ext.	New Lock	New Lock
Locks 14-18	-	Guidewall Ext.	New Lock	New Lock
Locks 11-13	-	-	Guidewall Ext.	Lock Ext.
La Grange & Peoria	-	Guidewall Ext.	New Lock	New Lock

#### 2.4.2.2 Ecosystem Restoration Alternatives

The ecosystem restoration and improvement measures will be formulated by combining measures for the environmentally beneficial adjustments to system operation and maintenance activities, environmental restoration opportunities, and environmental enhancement opportunities related to the navigation system. During planning for application of the measures, incremental analysis will be used to assess the best approach to achieve desired results for a specific project. The initial list of alternatives is contained in Table 31.

Table 31. Preliminary environmental alternatives (each element is additive, such that alternative D includes alternatives B and C also, etc.).

- 
- Alternative A:** No Action – Ongoing lands management, Environmental Management Program (EMP), Avoid and Minimize, Environmental Continuing Authorities Program (CAP), and dredging programs continue at present level of effort.
- Alternative B:** Traffic Impact Prevention and Reduction (TIPR) – Measures to prevent impacts altogether, such as installing moorings to keep barges from nosing into sensitive shoreline habitats and establishing closed areas.
- Alternative C:** Channel Modifications for Environmental Benefit – Wing dam notching, dike field realignment, over dredging for deepwater habitat, alternative training structures, and woody debris placement.
- Alternative D:** Systemic Fish Passage and Water Level Management – Provide fish passage beginning with the most prohibitive structures (i.e., the dams that experience open river condition the least). Implement environmental pool management (i.e., drawdowns) and alternative water level management strategies system-wide.
- Alternative E:** Backwater, Secondary Channel, and Island Rehabilitation – Dredging deepwater habitat, low levees and water control structures, closing structure notching, island replacement, seed islands, and other measures.
- Alternative F:** Traffic Management for Environmental Benefits – Impose draft depth restrictions during mid-summer to allow system-wide drawdowns to consolidate sediments and promote emergent plant growth on an infrequent basis (every 4 to 8 years), limiting traffic during fish spawning periods.
- Alternative G:** Ecosystem Improvements – Implement measures or actions that improve the UMR-IWW ecosystem condition outside of the river channels and backwaters. Actions may include timber stand improvements, wetland management, and other restoration activities that would likely be conducted with public or private partners.
- 

The alternatives are structured such that the ones that appear on the first part of the list (Alternatives B to D) affect the everyday activities of river use and management. The traffic impact prevention and reduction measures affect where tows travel and direct them away from environmentally sensitive areas. Channel modifications for environmental

benefit affect the structures that are integral components of the navigation system. Fish passage and alternative water level management restore some of the migratory pathways and ecosystem functions that are constrained by the navigation system.

Alternatives E and F address restoration needs that are a result of the navigation system and other stressors, but not necessarily a part of routine operating procedures. Non-channel dredging and island restoration do not fall under typical Corps maintenance actions, but they do involve the same techniques in many cases. Through advanced planning, and with additional authority, equipment brought into an area for channel maintenance might also be used to dredge in a backwater. Another possibility would be to build islands adjacent to dredge cuts, or to build chevron dike disposal areas. Traffic scheduling for environmental benefit could impact commercial and recreational boaters.

The last category, ecosystem improvements, would expand beyond Corps-owned land and waters. Actions might be taken on adjacent floodplain terrestrial areas and even into the watershed if benefits to the navigation system sustainability (i.e., reduced O&M) can be demonstrated.

These environmental alternatives are structured such that alternative D could include alternatives B and C also, etc. The expectation is that relatively simple and inexpensive measures could be implemented first, with more complicated projects initiated through time. Appropriate scaling for each alternative will be developed in the Feasibility Study and implemented in an adaptive, or sequential, fashion so the response to early actions can be evaluated and factored into the need or level of implementation of later actions.

Figure 34 builds on the diagram used to represent ecosystem condition in earlier sections of this report. The no action alternative presumes that ecological conditions will continue on the current trajectory of increasing degradation. There is a risk though, as illustrated, that critical thresholds or breakpoints might be reached where the ecosystem collapses rapidly. This occurred on the Illinois River in the mid 1950's when the cumulative effects of severe pollution, sedimentation, and development combined to cause the rapid destruction of the aquatic environment.

Alternatives B through D address ecosystem operation and maintenance issues. Individually these alternatives may not greatly alter the current trajectory of ecosystem degradation. Implemented in combination system-wide, they could alter the ecosystem trajectory and perhaps begin to reverse past effects.

Alternatives E and F address ecosystem restoration to a degree that significant progress toward the desired ecosystem state would be realized. The success of these types of measures has been demonstrated locally in many projects (e.g., EMP, O&M, Env. CAP, etc.), but they need to be implemented system-wide adaptively.

Alternative G would begin to address impacts outside of the river banks and into the floodplain through partnerships with other public and private entities as has been successfully done through EMP and is occurring through the Environmental CAP. Actions

considered under alternative G would still not achieve the system-wide objectives because there would still be floodplain areas that would not be considered. There is also a broad array of upland sediment, nutrient, and contaminant delivery issues that would not be addressed. Until the full spectrum of factors affecting the river ecosystem are considered, there will always be an unmet need that prevents achieving a desired and sustainable ecosystem condition.

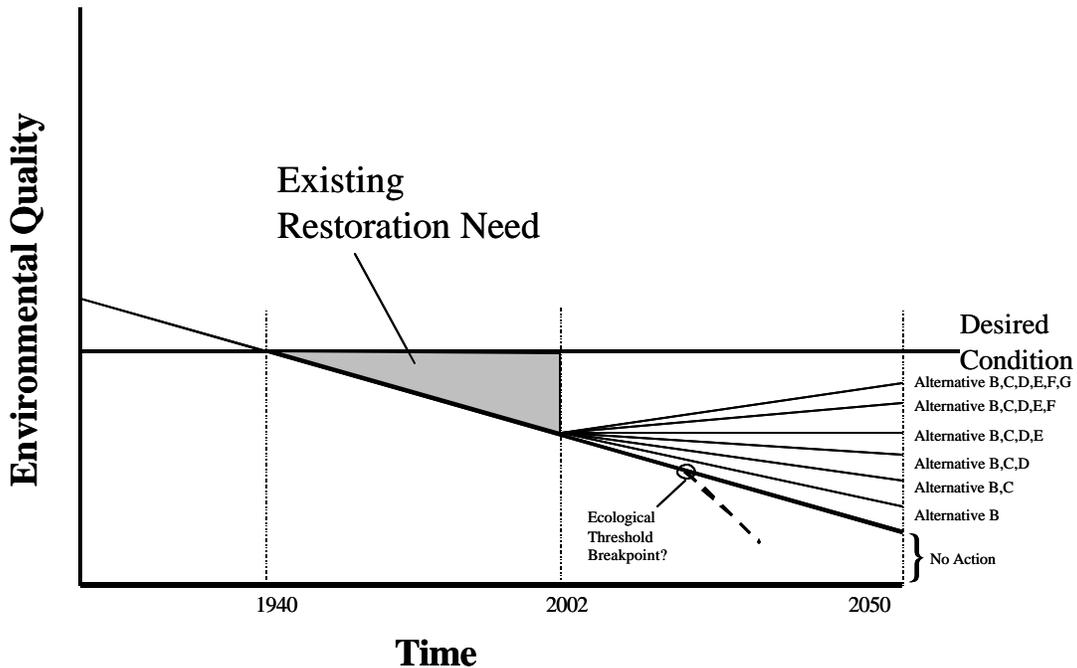


Figure 34. Schematic representation of how various environmental alternatives help achieve desired ecosystem conditions (no scale implied).

#### 2.4.3 Alternative Evaluation Process

The traditional formulation process includes the evaluation of alternative plans against a single without-project condition to assess the impacts. In the restructured study, multiple without-project conditions exist, one for each scenario. For each scenario, an integrated alternative plan will be evaluated in terms of its contribution to National Economic Development (monetary impacts to the national economy, both positive and negative), and contributions to National Ecosystem Restoration (non-monetary effects both positive and negative on ecological, cultural and aesthetic resources). Integrated alternatives that include combinations of ecosystem improvement and navigation improvement alternatives are not necessarily interdependent. The environmental and navigation improvements that are combined must be compatible and internally consistent such that no component of the alternatives constrains the ability to implement the other. Examples of possible integrated alternatives are shown below:

**Alternative 1**

Ecosystem Improvement Alternative D (includes Alts. B - C):

- Traffic impact prevention and reduction
- Channel modifications for environmental benefit
- Systemic fish passage and water level management

Navigation Improvement Alternative 4:

- Moorings and guidewall extension at Locks 20 - 25

**Alternative N**

Ecosystem Improvement Alternative F (includes Alts. B - E):

- Traffic impact prevention and reduction
- Channel modifications for environmental benefit
- Systemic fish passage and water level management
- Backwater, secondary channel, and island improvement
- Traffic management for environmental benefits

Navigation Improvement Alternative 6:

- Moorings, new locks at Locks 20 - 25, lock extensions at Locks 14 - 18, guidewall extension at Locks 11 - 13, and new locks at Peoria and La Grange Locks

The evaluation of these integrated alternatives will take the form of an evaluation matrix as outlined below:

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Alternative 1	(Sample combination alternatives will be displayed)				
Alternative 2					
Alternative 3					
Alternative n					

Each cell of this matrix will contain the impact assessment described above. For each scenario, a plan will be identified which maximizes net contributions to National Economic Development (NED) and National Economic Restoration (NER). A recommended integrated alternative will be selected from this array of NED and NER alternative plans and possibly other alternative plans utilizing the NED/NER criteria as well as the criteria listed below:

**Robustness.** Alternatives or combination of alternatives that make positive contributions to NED/NER under a range of scenarios.

**Risk.** Relative risk of selecting, or not selecting, a plan considering the variability in expected performance across all scenarios.

**Acceptability to Basin Interest.** The degree to which the plan is supported. The goal would be a consensus recommendation.

**Flexibility/Adaptability.** The degree to which the plan could be adjusted and modified to respond to new information.

The full evaluation for each integrated alternative across each scenario will be conducted in the feasibility study. It is likely that optimization of Environmental Restoration Alternatives will result in aspects of alternatives B - F being integrated and scaled for the greatest return on investment. For example, the most urgent needs for the environment may be met with training structure modifications in three pools, fish passage at two sites, and backwater/secondary channel restoration at five sites.

The Tow Cost Model (TCM) will be the economic model used in the feasibility study to evaluate the NED transportation impacts associated with the various alternatives. TCM is an existing Corps model that has been used in numerous Corps feasibility studies. However, TCM differs in some significant ways from the economic model initially employed in the earlier stages of this study.

The framework of TCM assumes that individual waterway movements are not sensitive to the price of water transportation until the level of the next least costly mode of transportation is reached. At that point, zero quantity will be shipped. Alternative uses of the commodity (typically associated with a different destination and perhaps a different mode) and the possible substitution between supply regions are not recognized. Earlier efforts attempted to incorporate these concepts of a spatial equilibrium approach to the modeling by introducing the notion that individual waterway movements are sensitive to the price of water transportation before the threshold level of the next least costly transportation mode is reached. Said differently, individual waterway movements have a downward sloping demand for water transportation—quantity shipped is responsive to price. By specifying the degree of price responsiveness, the earlier modeling efforts acknowledged the possibility of alternative uses and shifting regions while not explicitly modeling these considerations.

The implication of these differences with respect to NED transportation benefits is potentially quite large. The measure of NED benefit is based on the notion of willingness-to-pay for use of the waterway. The recognition of alternative commodity uses (that may not involve water transportation), the possibility of substitution between supply regions, and, in general, the price responsiveness of waterway demand, bears directly on willingness-to-pay. As a general proposition, and with other factors equal, the more responsive quantity is to price and the greater the degree of “flexibility” that exists in the overall transportation network, the lower will be the willingness-to-pay for use of the waterway. These considerations would affect not only the magnitude of the NED transportation savings that would be associated with a particular alternative, but could also potentially affect the scale of alternatives that must be evaluated in the effort of identifying the alternative that maximizes net contributions to the NED account.

#### 2.4.4 Preliminary Observations

The full evaluations will not be completed until the feasibility study; however, the following general observations can be made based on completed work to date.

##### 2.4.4.1 Navigation

- 1) The greater the unconstrained waterway traffic demand, the greater the potential base of transportation savings to be realized.
- 2) The magnitude of the investment required to realize a gain in system efficiency is directly related to the level of unconstrained waterway traffic demand.
- 3) In addressing the issue of structural measures to accomplish capacity expansion, the lower portion of the system, where traffic is the greatest, must be addressed first if an improvement in system efficiency is to be realized. This is true for both the Mississippi River (above Lock 26) and the Illinois Waterway.
- 4) While it is possible that capacity expansion at Locks 20-25 may be economically justified under a number of scenarios, it is not possible to identify the specific nature of the improvements at this time. This is due to the fact that the magnitude of the required capacity expansion (i.e., guidewall extension, 1,200-foot lock extension, or new 1,200-foot lock) at Locks 20-25 may vary by scenario. For example, while several scenarios may result in economically justified capacity expansion at Lock 25, not all of these scenarios may result in economic justification for a 1,200-foot lock extension. Some scenarios may require the additional capacity associated with a new 1,200-foot lock in order to achieve economic justification. In addition, the accompanying locations upstream of Locks 20-25 requiring expansion, and necessary to achieve economic justification, may also vary by scenario.
- 5) Navigation traffic increases are anticipated as a result of the current infrastructure and any improvements. Based on previous investigations, navigation traffic is expected to have the following direct effects on natural resources. NOTE: Previous studies have not evaluated the level of traffic that may result from the present analysis.
  - a) **Fish:** Little or no impact to fisheries due to tow hull shear and pressure changes, and displacement from overwintering habitats; propeller entrainment of larvae, and resultant equivalent adults lost, was significant for certain sport and commercial species and in certain pools. Additional data collection or studies are being conducted to assess entrainment of adults, larval fish density, and to assess drawdown effects on backwaters.
  - b) **Submersed aquatic plants:** Direct impacts (breakage due to wave action) and indirect impacts (reduced growth due to sediment resuspension) occurred in all Mississippi Pools 4 to 13. Spatial extent and magnitude varied widely between pools, but impacts were generally greatest in Pool 13 (considered the southern limit for significant plant growth, and thus in a “threshold” state), and for those alternatives that

would result in the highest levels of increased traffic. Effects on vegetative reproduction due to sediment resuspension were not assessed. Additional data on plant occurrence in Mississippi Pools 14-19 are being collected in 2002; data for further verification of the plant growth model will also be collected.

c) **Freshwater mussels:** Traffic-induced velocity changes, sediment resuspension, and propeller scour effects on mussel physiology and reproduction were considered minimal for traffic levels investigated to date.

d) **Backwaters and side channel sedimentation:** An increased risk for sediment delivery due to tow passage was predicted for 22 sites on the Illinois Waterway (out of 74 sites analyzed), and 16 sites on the Mississippi (243 sites analyzed). Major causative factors include distance from sailing line to the backwater/side channel opening, sediment type at the opening, angle of the opening relative to the channel, and flow characteristics at a given site. The IWW is narrower and also tends to have more fine sediments that are more susceptible to resuspension and transport. Additional field data collection is targeted at verification of sediment resuspension and distribution models.

e) **Bank erosion:** Areas on the system where additional traffic disturbances may contribute to further erosion were identified. Significant natural and cultural resources impacts were evaluated. Generally, it was concluded that bank erosion resulting from commercial navigation is most prevalent in areas where channel sizes are smallest or in larger channels where navigation is close to erodible banklines.

#### *2.4.4.2 Environmental*

- 1) Measures identified in the Ecosystem Restoration alternatives have been demonstrated to contribute to habitat diversity and environmental sustainability.
- 2) A systemic and adaptive evaluation and implementation of these measures promise to go well beyond their site-specific application to date in achieving ecosystem objectives.
- 3) Collaborative planning is required to establish reach-specific ecosystem objectives.
- 4) Integrated planning for navigation and the environment is essential to achieving a sustainable system.

#### *2.4.4.3 Engineering*

Extending existing locks on the Mississippi River is a feasible alternative, although there are risks and uncertainties associated with impacts to navigation during construction and potential weather delays during wintertime closure periods. These uncertainties have been incorporated into the cost estimates; however, risks of disruption to navigation are still a reality.

#### 2.4.5 Additional Activities

This Interim Report does not contain all activities that will be accomplished in the feasibility study. Additional activities include a real estate plan outlining real estate requirements for potential improvements, a public involvement plan outlining remaining public meetings, and the development of appendices for engineering, economics, and environmental activities.

### 3 FEASIBILITY STUDY COMPLETION STRATEGY

#### 3.1 Introduction.

This section provides a summary of the general activities, issues, and strategies that will be addressed in the feasibility study. The full listing of activities, schedule, and funding requirements can be found in the Restructured Feasibility Study Project Management Plan (PMP), dated July 2002. This PMP contains the work requirements to complete the study in accordance with all applicable Federal guidelines and the restructuring outlined in this Interim Report. The PMP is a dynamic document that will evolve throughout the study process. The basic list of milestones for completion of the feasibility study is found in Table 32. This schedule assumes unconstrained funding for FY 03 and FY 04.

Table 32. Feasibility study schedule.

<b>Activity</b>	<b>Milestone</b>
Complete Tow Cost Model	Apr 03
NEPA impact analysis and mitigation planning	Sep 03
Tentative plans with BCRs identified	Oct 03
Public meetings - evaluation of alternatives	Oct 03
Alternative Formulation Briefing	Nov 03
FWCA coordination	Dec 03
Draft Feasibility Report and NEPA document	Apr 04
90-day public review	Apr-Jun 04
Study conclusion public meetings	May 04
Finalize feasibility report w/EIS	Aug 04
Division Commander's Notice	Sep 04
File final EIS with EPA	Sep 04
30-day state, agency, and interested party review	Oct 04
Chief of Engineers' Report signed	Nov 04

The study Quality Control Plan (QCP), dated December 1997, will be revised to reflect the restructuring of the study. The revised QCP will outline the requirements for internal control and independent technical review for the remaining products under development. It will also include a recommendation for a peer review to be performed on the draft feasibility study. During the course of the feasibility study, methods for accomplishing this peer review will be explored, including possible re-engagement of the NRC.

### **3.2 Corps of Engineers Authorizations.**

Work completed to date has indicated a potential for inclusion of a wide variety of measures formulated to meet the goals of economic and environmental sustainability. As discussed in the previous section, this will be accomplished by evaluating combinations of navigation improvements and environmental restoration measures. Implementation of these measures will require a thorough review and understanding of the Corps of Engineers authorizations and may require additional authorization. The authorization discussion will be refined throughout the formulation process and be fully documented in the feasibility study.

#### **3.2.1 Navigation**

Congress authorized the Upper Mississippi River and Illinois Waterway 9-Foot Channel Projects for the single purpose of providing a commercially viable navigation channel on the Upper Mississippi and Illinois Rivers (Rivers and Harbors Act [RHA] of 1927, January 21, 1927; RHA of July 3, 1930, 46 Stat. 918; RHA of February 24, 1932; RHA of August 30, 1935, 49 Stat. 1011; RHA of August 26, 1937, 50 Stat. 844; RHA of March 2, 1945, 59 Stat 10). The congressionally authorized navigation purpose provides the basis for the budgeting and appropriation of funds for the operation and maintenance of the navigation system. This operation and maintenance responsibility extends to the stewardship of the land and water resources of the Federal projects making up the system. The congressional authority to operate and maintain the navigation system also provides the legal basis for the major rehabilitation of the locks and dams and other structural features of the system. A wide variety of navigation improvements is being evaluated in this study process. Navigation efficiency improvements evaluated may be recommended in the feasibility study for implementation under new specific authorization.

#### **3.2.2 Ecosystem Restoration**

Ecosystem restoration is not a specifically authorized purpose of the 9-Foot Channel Navigation Project. Ongoing environmental activities include avoid and minimize measures accomplished in conjunction with the construction of the Melvin Price Lock and Dam and under the operation and maintenance authority of the existing projects. In addition, several statutes authorize the Corps to undertake limited ecosystem restoration measures in the basin. Authorities available to address the ecosystem needs of the system include the Environmental Management Program (EMP) authorized by the Water Resources Development Act (WRDA) of 1986 (Public Law 99-662, 100 Stat. 4082), and the national ecosystem restoration programmatic authorities such as Sections 1135 (WRDA 86), 204 (WRDA 92, Public Law 102-580, 114 Stat. 1441), and 206 (WRDA 96, Public Law 104-303, 110 Stat. 3658). These programs, along with the ongoing ecosystem restoration and management programs of other agencies, such as for the National Wildlife Refuges and state management areas and species-specific efforts such as rare and endangered species management and recovery, have provided a limited framework under which ecosystem restoration needs at the system level have been partially addressed. However, the current level of authority and appropriations in the EMP and national programmatic authorities, and the limited environmental management activities available

under a single purpose navigation project, has been insufficient to halt the ecological degradation of the system.

### 3.2.3 Corps of Engineers Regulatory Programs

The Corps operates two regulatory programs relevant to the system. The 1899 Rivers and Harbors Act created a program by which the Corps regulates activities that impact the navigable capacity of navigable waters. The Clean Water Act of 1972 (Public Law 92-500), as amended, created a similar program for regulation of placement and disposal of dredged and fill material in “waters of the United States,” to include wetlands.

### 3.2.4 Single Purpose Versus Multiple Purpose Authorization

An agency of the Federal Government is empowered to act only as authorized by Congress and can expend project funds for authorized project purposes and which have been appropriated by Congress. All funds appropriated by Congress must be spent as directed by Congress; that is, in accordance with the authorized purposes of the appropriation. The water resources development program of the Corps of Engineers is comprised of projects Congress authorized for specific purposes. Project purposes define the outputs of the project and limitations on the Corps’ authority to expend funds. These purposes vary, depending upon the authorization for each individual project. There may be cost sharing and other non-Federal implementation requirements associated with each purpose that is prescribed by law. Projects may have single authorized purposes or multiple purposes. The purposes of an individual project are defined in the feasibility report that forms the basis for a project’s congressional authorization.

The authorized purposes of a project limit appropriated construction and operation and maintenance funds to uses that support those project purposes. The Upper Mississippi River and Illinois Waterway System projects have a single authorized purpose of inland navigation. Therefore, funds appropriated for operation and maintenance of the system are limited to supporting the navigation purpose. This operation and maintenance responsibility must comply with environmental laws and policies regulating all Federal activities and responsible environmental stewardship of the system’s land and water resources. This enables the Corps to minimize environmental impacts from operations and maintenance activities; however, ecosystem restoration is not an authorized purpose in the UMR-IWW projects.

In contrast, many Corps projects are authorized for multiple project purposes. For example, Corps reservoir projects may be authorized and operated for flood control, municipal and industrial water supply, and hydropower production. A number of projects authorized since WRDA 96 (Public Law 104-303) have incorporated ecosystem restoration as a project purpose, including the Comprehensive Everglades Restoration Plan authorized in WRDA 2000 (Public Law 106-541, 114 Stat. 2572) which modified the Central and South Florida project to include restoration of the environmental resources of South Florida and the Everglades National Park. The addition of ecosystem restoration as a project purpose to the Upper Mississippi River and Illinois Waterway System, coupled

with the formulation and authorization of projects and programs to implement the ecosystem restoration purpose, will allow for the modification of the system in the interest of ecosystem restoration and the operation and maintenance of the system for both inland navigation and ecosystem restoration.

### 3.2.5 Preliminary Conclusions

The Corps of Engineers will evaluate the addition of ecosystem restoration as a project purpose of the UMR-IWW navigation projects in the feasibility study. This could provide for dual project purposes of navigation and ecosystem restoration and include justified navigation improvements, operation and maintenance for both navigation and the environment, and authorities to provide for ecosystem restoration projects to meet ecosystem restoration goals and objectives. A dual purpose project will provide better focus and flexibility to adaptively manage the system for dual purposes. The feasibility study will provide a full evaluation to compare the implementation effectiveness of existing authorities and policies against a new specific dual purpose authority. The feasibility study will also analyze whether the EMP would continue as a separate project or be combined into the ecosystem restoration component of the broader dual purpose project.

## 3.3 Funding and Cost Sharing.

The Water Resources Development Act of 1986 (WRDA 86; Public Law 99-662) firmly establishes the partnership concept in the water resources development program of the Corps of Engineers. The premise of WRDA 86 (Public Law 99-662, codified at 33 U.S.C. §2212) is that water resource development projects should be accomplished in cooperation with states and local governments including financial commitment to the project by a non-Federal partner. Since WRDA 86, the partnership principles have been extended for some programs to enable not-for profit, non-governmental organizations to serve as project sponsors. Another important partnership principle of WRDA 86 is that the users and beneficiaries of water resources projects should bear part of the cost of constructing or operating and maintaining the projects.

### 3.3.1 Navigation

The operation and maintenance of the inland navigation system is 100% federally funded. Since 1986, the funding for construction of inland navigation improvements is funded one-half from the Inland Waterways Trust Fund and one-half from the general fund of the Treasury in accordance with Section 102 of WRDA 86 (Public Law 99-662). The Inland Waterways Trust Fund consists of amounts collected under the Inland Waterways Tax assessed on fuel used in commercial transportation on the inland waterways. The implementation of mitigation measures to avoid, minimize, or compensate for the adverse environmental impacts of future navigation improvements to the Upper Mississippi River and Illinois Waterway System would also be funded 50/50 between the Inland Waterways Trust Fund and general fund of the Treasury in accordance with Section 102 of WRDA 86. Possible impacts to be addressed would include site-specific construction impacts such as loss of habitat and impacts of increased traffic levels, including fish mortality, turbidity,

sedimentation and erosion. These mitigation measures would be authorized and implemented under project-specific appropriations in conjunction with any proposed efficiency improvements, as described in Section 3.2 above.

### 3.3.2 Ecosystem Restoration

The environmental goal for the Upper Mississippi River System under a new dual purpose project authorization would consist of achieving the long-term sustainability of the ecological integrity of the system. This involves addressing connectivity of backwaters to main channels; creation of habitat through opening of side channels, island creation, and restoration of shoals and sandbars; reduction in erosion and sedimentation; water level management to provide seasonal variation; provision of fish passage; and other measures. The planning for the ecosystem restoration will be accomplished in a collaborative process of setting goals and objectives, formulating measures to address these goals, assessing the cost effectiveness of the measures, and combining the measures into plans. While these plans will be formulated holistically and in an integrated way to meet the ecosystem objectives, policy and cost-sharing considerations dictate that the environmental measures be categorized for efficient management. As discussed in paragraph 3.3.1, measures to address the incremental impacts of navigation improvements and site-specific impacts will be shared as inland navigation costs. For the remaining measures to address the new sustainability goals and objectives, there are three primary funding options under consideration: cost sharing as ecosystem restoration; 100% Federal cost under a concept of addressing any ongoing and cumulative impacts of the existing system; and cost sharing in accordance with the existing or a modified Environmental Management Program. Some stakeholders have expressed a belief that ecosystem restoration should be cost shared with the Inland Waterways Trust Fund. Since the existing system was constructed before the creation of the Inland Waterways Trust Fund with construction funded from the general fund of the Treasury, this option is not an appropriate funding mechanism for ecosystem restoration and will not be further evaluated.

**Option 1.** Section 103 of the WRDA 86 (Public Law 99-662), as amended by WRDA 96 (Public Law 104-303), established ecosystem restoration cost sharing at 65% Federal and 35% non-Federal with the non-Federal sponsor providing all lands, easements, rights-of-way, disposal areas and relocations for the ecosystem restoration project and operating and maintaining the completed project. Ecosystem restoration is normally implemented either through the programmatic authority of Section 1135 of the Water Resources Development Act of 1986, as amended, Section 206 of the Water Resources Development Act of 1996, or through specific authorization as in the case of the Comprehensive Everglades Restoration Plan.

**Option 2.** Assuring the ecological integrity of the UMR-IWW could include implementation of measures that can be addressed through modification of the existing structures and operations on existing project lands. These measures could address post-impoundment impacts such as loss of connectivity, loss of seasonal variation, loss of connectivity to backwaters, and loss of habitat diversity. Potential measures include fish passage, pool level fluctuations, modification of structures and environmental dredging.

This option proposes that the costs of these measures to modify the operation of the existing navigation project for environmental restoration purposes would be 100% federally funded. These 100% Federal costs could be funded through the Operations and Maintenance account or budgeted and appropriated from the Construction, General account since the measures are project modifications.

In general, the Corps has not implemented measures under the limited scope and funding authority for mitigation of existing projects contained in Section 906(b) of WRDA 86 (Public Law 99-662) nor sought specific authority and funding for mitigation at existing projects. There have been exceptions to this general policy, particularly in the cases of projects that were constructed or partially constructed without compensatory mitigation but with an unfulfilled commitment or requirement for mitigation measures. Examples of these projects include the Missouri River and Bank Stabilization and Navigation project and the Columbia River Fish Mitigation Project. Thus, option 2 would involve additional authorization for the Corps to modify current structures and utilize project plant and operations at 100% Federal cost to address impacts that are clearly attributable to the navigation project, as determined by the Corps.

**Option 3.** The Environmental Management Program provides a third model for funding ecosystem restoration. EMP projects are generally shared in accordance with the “environmental enhancement” cost-sharing provisions of Section 906(e) of WRDA 86 (Public Law 99-662) except for adjustments made in WRDA 96, Section 210 (Public Law 104-303) and WRDA 2000, Section 224 (Public Law 106-541). The EMP cost sharing under current policy provides for 100% Federal costs for construction on lands managed as a national wildlife refuge and 65-35 cost sharing for other projects. The Federal or state agency that manages the land on which the project is located is responsible for operating and maintaining the project. The existing EMP program will likely continue to meet a part of the ecosystem restoration needs of the system. Modifications of the EMP program including cost-sharing modifications could be included in the required EMP Report to Congress scheduled for completion in 2004.

### 3.3.3 Preliminary Conclusions

It has been tentatively concluded that implementing ecosystem restoration measures to assure the sustainability of the system will require a combination of 100% Federal and cost-shared measures. Criteria for application of options 1, 2, or 3 will be developed in the feasibility study.

Some parties feel that future ecosystem impacts of operation and maintenance of the existing navigation system would be most effectively addressed through a programmatic authority 100% federally funded under the Construction, General account since the solutions to address the impacts would involve modifications to the operations and structures of the existing projects. The basis for this position is that the navigation project impacts to be addressed are primarily a result of the construction and operation and maintenance of the existing navigation system, a 100% Federal investment. Another significant factor is the established national importance of the resources to be addressed.

The Mississippi Flyway is used by more than 40% of the migratory waterfowl traversing the United States and contains more than 200,000 acres of National Wildlife Refuge lands. These species and lands, as well as Federal threatened and endangered species in the region, are held in Federal trust by the Department of the Interior and are the focus of considerable Federal wildlife management activity. The scope, limits, and criteria for new programmatic authority, as well as the viability of a programmatic authority, will be defined as the feasibility study progresses.

It is also recognized that changes to the ecosystem have multiple causes. The recognition of the multiple stresses on the ecosystem and the need for a holistic and comprehensive restoration approach leads to the conclusion that ecosystem restoration measures should not be limited to those related to the operation and maintenance of the existing navigation system and its structures. In addition, the Administration and Congress have recognized the importance of the partnership between the Federal Government and the benefiting states and local governments in the Corps water resources program, and Section 103(c) of WRDA 86 (Public Law 99-662), as amended, establishes 65% Federal and 35% non-Federal cost sharing for ecosystem restoration. Any new system authority should include a cost-sharing component for implementation of measures that would be outside the scope of a program to address the ongoing and cumulative effects of operating the existing system, including measures requiring additional land acquisition. This expanded ecosystem restoration authority could be addressed through modifications to the existing Environmental Management Program through the ongoing process for the upcoming Report to Congress or adding ecosystem restoration as a project purpose. The scope, limits, and criteria for this cost-sharing component will be defined as the feasibility study progresses.

Potential local sponsors have expressed concern about their ability to cost share the ecosystem restoration. During the navigation feasibility study, various non-traditional options for financing the ecosystem restoration component will be evaluated. These options will include, non-government project sponsors, expanded credit for work-in-kind, carry over of credits between cost-sharing agreements, a Federal trust fund and associated funding sources, and the possibility of additional long-term funding from other Federal agencies. The UMRS states will be encouraged to continue to pursue innovative ways and means to generate the state funds that would be required to cost share ecosystem restoration features.

A cost-sharing issue that will be addressed in the feasibility study is cost sharing for land acquisition. Reconnection of the river and the floodplain will be evaluated as one of the environmental sustainability goals. If the feasibility study determines that it will be included, it may require the ability to implement additional land acquisition. Modified or new cost-sharing authorities will be addressed in the feasibility study.

### **3.4 Other Agency and Organization Contributions.**

There are many other Federal, state, and local agencies, and non-governmental organizations that contribute to the management of the UMR-IWW. Meeting the

sustainability goals will require that all these groups join in a partnership to support integrated river management. The feasibility study will explore opportunities for improving this partnership. Some of the major contributors are listed below.

### 3.4.1 Governmental

#### 3.4.1.1 *U.S. Fish and Wildlife Service*

The U.S. Fish and Wildlife Service is congressionally authorized to manage national fish and wildlife refuges located throughout the Upper Mississippi River System. Each refuge was established through separate legislation, so there are many statutes pertaining to the refuge system. These lands include those covered by the 2001 Amended Cooperative Agreement between the Department of the Army, Corps of Engineers and the Department of the Interior, U.S. Fish and Wildlife Service, for lands acquired by the Corps for the navigation project and made available to the Service (and subsequently three UMR states) for management "...consistent with the National Wildlife Refuge System." Under the Endangered Species Act, the Service is also authorized by Congress to undertake prelisting, listing, and recovery activities for federally threatened and endangered species, in partnership with the states, federal agencies and private organizations and individuals. There are currently seven federally listed species in the UMR-IWW. The Service is highly involved with recovery activities for these species, especially the Higgins' eye pearly mussel and the pallid sturgeon. The Service also is very active in cooperative, interagency management actions to benefit interjurisdictional fishes, such as the paddlefish. The Service is also very active in the implementation of its Partners for Fish and Wildlife Program, which is focused on habitat restoration on private lands within the mainstem UMR-IWW and its watersheds. The Service also provides water quality and contaminant technical assistance to US EPA and the states. The Service is also responsible for identifying, in cooperation with the states, adverse impacts to fish and wildlife and their habitats, as well as needed mitigation that might result from Federal civil works projects, under the Fish and Wildlife Coordination Act (submitted by USFWS).

#### 3.4.1.2 *U.S. Environmental Protection Agency*

The U.S. Environmental Protection Agency has the responsibility to review and comment on all major Federal actions that may have a significant impact on the environment pursuant to Section 309 of the Clean Air Act. In the Clean Water Act, the U.S. Environmental Protection Agency was also given authority to regulate activities in wetlands and riparian areas, point source discharges, dredged material disposal, stormwater discharge, and nonpoint source pollution (submitted by USEPA).

#### 3.4.1.3 *U.S. Department of Agriculture*

The USDA helps ensure the well-being of U.S. agriculture through efficient and equitable administration of farm commodity programs; farm operating, ownership, and emergency loans; conservation and environmental programs; emergency and disaster assistance; domestic and international food assistance; and international export credit programs. These programs help producers maintain viable operations, compete for export sales of commodities, and contribute to the year-round availability of low-cost, safe, and nutritious foods. The Agricultural Marketing Service (AMS) of the USDA facilitates the strategic marketing of agricultural products in domestic and international markets, while ensuring

fair trading practices and promoting a competitive and efficient marketplace. AMS has been the lead agency on most of this effort.

USDA, Natural Resource Conservation Service (NRCS) provides national leadership in a partnership effort to help people conserve, maintain, and improve America's natural resources and the environment. NRCS provides leadership for conservation activities on the Nation's 1.6 billion acres of private and other non-Federal land. This agency provides technical assistance and information to individuals; communities; tribal governments; Federal, state and local agencies; and others. The NRCS staff partners with staff of the local conservation district and state agencies and with volunteers. NRCS also offers financial assistance, surveys the Nation's soils, inventories natural resources conditions and use, provides water supply forecasts for western states, and develops technical guidance for conservation planning. NRCS also administers a small watershed program; plant materials program that provides effective solutions to conservation problems using plant materials; Resource Conservation and Development program (RC&D), a program which combines private and federal enterprises to address social, economic and environmental concerns; and emergency watershed protection program, which was established by Congress to respond to emergencies created by natural disasters. NRCS also provides technical assistance to the Commodity Credit Corporation programs such as the wetland reserve program (WRP), Environmental Quality Incentives Program (EQIP), Wildlife Habitat Incentives Program (WHIP), Farmland Protection Program (FPP) Conservation Reserve Program (CRP), and others. The benefits of these activities include sustaining and improving agricultural productivity; cleaner, safer, and more dependable water supplies; reduced damage caused by floods and other natural disasters; and an enhanced resource base to support continued economic development, recreation, and other purposes (submitted by USDA).

#### *3.4.1.4 Department of Transportation, Maritime Administration*

The Maritime Administration administers Federal laws designed to promote and maintain a national merchant marine capable of meeting our Nation's shipping needs for both domestic and foreign waterborne commerce and national security. Some of the programs that the Maritime Administration (MARAD) is responsible for are: The Maritime Security Program. This program has as its goal the continued presence of a fleet of U.S. flag vessels engaged in international trade that is able to meet national security sealift requirements in times of war or national emergency. The Title XI Program. This program is the centerpiece of our shipbuilding revitalization initiative. Title XI loan guarantees enable ship and barge owners as well as U.S. shipyards to borrow private sector funds on more favorable terms than might otherwise be available. The National Defense Reserve Fleet and Ready Reserve Fleet. These fleets are located in strategic locations around the world and are available for short-term activation to support the Department of Defense. Jones Act. The Jones Act incorporates U.S. Cargo Preference Laws that help ensure that a privately owned and operated U.S. flag fleet of merchant ships remains available to support our Nation's economic and national security. Marine Transportation System Initiative. Congress recognized the importance of the Marine Transportation System (MTS) when, as a part of the Coast Guard Authorization Act of 1998, it tasked the Secretary of Transportation - through MARAD and the Coast Guard - to establish a task

force to assess the adequacy of our Nation's marine transportation system to operate in a safe, effective, secure, and environmentally sound manner. Through this effort, MARAD will advise the Secretary of Transportation on current and future matters relating to inland and coastal waterways, ports, and their inter-modal connections. MARAD will also be responsible for advising the Secretary on strategies to ensure a safe, environmentally sound and secure marine transportation system that improves the global competitiveness and national security of the United States (submitted by MARAD).

#### *3.4.1.5 Coast Guard*

*Environmental Protection:* The Coast Guard has initiated several programs to reduce pollution in U.S. waters through preventative measures and proactive risk assessments. The spread of Aquatic Nuisance Species (ANS) is a growing national and international problem. Ships increasingly introduce ANS to U.S. waters through ballast water operations and hull fouling. When established, some ANS can disrupt native ecosystems, thus degrading natural resources and costing billions of dollars due to lost production and control efforts. The primary intent and purpose of the Coast Guard's role is to eliminate environmental damage associated with maritime transportation operations and to reduce the threat to the aquatic environment from the introduction and translocation of ANS by ships and ship operations.

*Navigation:* The Service's Aids to Navigation Program and Vessel Traffic Services help to ensure safe vessel movements. Today, 25% of U.S. domestic/intercity trade moves by water; more than 134 million passengers transit U.S. waters in ferries, cruise ships, and gaming vessels; some 110,000 commercial fishing vessels harvest waters under U.S. jurisdiction; and millions of Americans and foreign tourists use 16 million recreational craft and frequent thousands of miles of U.S. beaches. Greater numbers of ultra-large, deep-draft ships will soon call at "mega-ports," cruise ships carrying 6,000 or more people will head for more remote areas, and maritime trade will likely double if not triple during the next quarter-century. These trends put a premium on the effective control of waterborne flow of ships, boats, and people.

*Safety:* The Coast Guard's job of ensuring maritime safety and security will become even more challenging in the years ahead, a fact of life driven by today's and tomorrow's trends: domestic and ocean-borne trade and cruise ship demand are poised for explosive growth in the size and number of ships plying inland, coastal, and deepwater waterways; fishing vessels and offshore platforms venture farther offshore in search of the sea's bounty; and a dramatic increase in personal watercraft and recreational boating fuels ever greater congestion on the Nation's waters. Prevention, founded on expert risk assessments to reduce the probability of mishaps, will be the watchword of the future, and advance technologies will continue to be embraced to increase the probability of success.

#### *3.4.1.6 States*

The states of Minnesota, Wisconsin, Illinois, Iowa, and Missouri have a long-standing and strong commitment to the balanced management of the UMR as a multi-purpose system. In 1997, a Joint Governors' Proclamation committed the states to the "pursuit of unified economic and environmental policies," and management of the river "to ensure the needs

of present generations are met without compromising the ability of future generations to meet their needs.” The restructured study focus on sustainability is consistent with the Governors’ Proclamation. The major state authorities and responsibilities on the UMRS include:

Water quality management

Set standards

Regulate point source discharges

Administer nonpoint source pollution control programs, including cost-shared incentive programs

Administer revolving loan funds to support wastewater treatment plan construction and improvements

Issue fish consumption advisories

Regulate public drinking water supplies

Floodplain management programs (Note: Missouri does not regulate floodplains at the state level.)

Regulate water withdrawal and other activities affecting state waters

Manage state lands, including parks, scientific and natural areas, recreation facilities, etc.

Fish and wildlife management

Regulate hunting and fishing

Administer game and non-game programs

Protect state listed threatened and endangered species

Coordinate with industry and Federal agencies to maintain commercial navigation as part of a multi-modal transportation system

Participate in the Environmental Management Program

Design and prioritize habitat projects in consultation with other agencies

Staff field stations engaged in the Long Term Resource Monitoring Program

Boating safety programs

State-level wetlands protection and regulation

Various state level programs designed to promote soil conservation, protect water quality, and take marginal agricultural land out of production

Emergency response operations for floods and other natural disasters

Response to oil and hazardous materials spills

Historic property oversight through the State Historic Preservation Officer.

The states will continue to serve a critical role in the management of the UMR-IWW. The critical issue for the states will be their willingness and ability to cost-share on ecosystem restoration opportunities. The specifics of the potential cost-sharing arrangements will be fully evaluated in the feasibility study (submitted by the Upper Mississippi River Basin Association).

## 3.4.2 Nongovernmental Organizations

### 3.4.2.1 *Environmental Non-Governmental Organizations*

Environmental NGOs have long been involved in on-the-ground habitat protection work, river education, and advocacy work on behalf of the river's natural resources. For example, the Izaak Walton League took a lead role in advocating for the Upper Mississippi National Wildlife and Fish Refuge in the 1920's. The National Audubon Society, established in 1905, has long supported bird conservation work through its offices and chapters along the river. In the 1970's through the present, several environmental NGOs, with strong foundation and private support, established full time UMR project offices and have been actively engaged in the work of the Great River Environmental Action Teams in the 1970's, the Upper Mississippi Master Plan in the 1980's, and the current Navigation Study in the 1990's and through the present. Organizations with project offices on the river have included American Rivers, Audubon, the Institute for Agriculture and Trade Policy, the Mississippi River Basin Alliance, the Mississippi River Revival, the Nature Conservancy, the Sierra Club, and several statewide and local land trusts and watershed groups. Several other organizations are engaged in reviewing and commenting on projects on the Mississippi River and/or advocating for and against legislation affecting the ecological health of the river.

In 2000, in response to the restarted Navigation Study, several NGOs jointly produced a report entitled "Finding Balance - a new vision for the lands, communities and future of the Upper Mississippi River." That report, available for review at [www.UpperMississippi.info](http://www.UpperMississippi.info) is meant to be informational, but also describes the key elements of a new, more sustainable strategy for management of the river and its watershed. Environmental NGOs have a long tradition of engagement in the UMR and there is every indication that, as more definitive plans, programs, authorities and funding emerge for restoring and protecting the ecological health of the river, that they will continue to be involved in education, advocacy, and on-the-ground restoration work (submitted by the Audubon Society).

### 3.4.2.2 *Economic Non-Governmental Organizations*

The Midwest Area River Coalition 2000 (MARC 2000) has been the leading representative of economic interests for the UMRS during the Navigation Study process. MARC 2000 is composed of leading agricultural producer groups, grain and industrial shippers, cement manufacturers, utilities, waterway transportation companies, labor unions, economic development entities, rail feeder systems, and other organizations and individuals concerned with the vitality of the Midwest. MARC's industry and agricultural coalition members generate over \$125 billion in economic activity from the Midwest, and employ or self-employ a conservative estimate of over 130,000 people in 24 states. Its organized labor coalition supporters represent over 280,000 workers in the basin.

MARC 2000, along with American Waterways Operators (AWO) and other participating groups, have also been leading proponents for environmental restoration, to be achieved

through WRDA legislative action. This feasibility study has invested \$26 million in reviewing biological impacts of waterway traffic, along with an additional \$76 million in the Environmental Management Program, which produced a Habitat Needs Assessment report. These organizations support and promote addressing environmental restoration beyond mitigation, and establishing a reliable, workable approach to address environmental restoration. MARC 2000 members are environmentalists, conservationists, and recreationists who appreciate the natural aesthetics of the river as well as its role as an economic resource for the region.

AWO's safety efforts to educate recreational boaters, in conjunction with the U.S. Coast Guard, save lives each year. AWO produces and distributes "Lifelines" brochure and video that provides safety tips and information for recreational boaters on how to operate in harmony with commercial traffic. AWO's Responsible Carrier Program (RCP), a premiere safety management system that exceeds Federal regulations, encompasses management, operations, and human factors. AWO's safety committees are the forum for safety professionals in the towboat, tugboat, and barge industry.

The River Industry Action Committee (RIAC), a working group of Port Captains and other towing company representatives, works with MARC 2000, AWO, MARAD, the Corps, the U.S. Coast Guard, and local and state governments to resolve issues that arise due to high water, low water, aids to navigation, lock and dam repairs, dredging, new bridge pier replacements and/or old bridge replacements. RIAC works with environmental groups to improve the water quality in a manner that protects the environment without adversely affecting navigation. RIAC works to protect levees and prevent accidents that could cause fatalities, property damage, or spills.

The Inland Waterway Users Board (IWUB) set focused priorities for Congress and the Administration for waterway infrastructure improvements. This set of priorities can be used to properly allocate our Nation's resources for long-term economic growth.

The Illinois River Carriers Association (IRCA) coordinates with RIAC, the Corps, the USCG, local municipalities, and states to ensure that levees are not damaged by passing tows during high water and coordinates traffic stops when river conditions make it unsafe to operate, minimizing the potential for accidents. IRCA has also participated and funded, with the State of Illinois, River Sweep and Illinois River 2000 to increase awareness of the river environment and support environmental restoration.

Several barge companies and associations, including, but not limited to, American Commercial Barge Line, American River Transportation Co., Blackhawk Fleet (Alter Barge Line, Inc), Bunge Towing Inc., Cargo Carriers, Ingram Barge Company, MARC 2000, MEMCO Barge Line, Marquette Transportation, Riverway Co., Teco Barge Line, and Upper River Services, have been key sponsors with money, labor, and property to the premiere river cleanup project, *Living Land and Waters, Inc.*

The River Industry Executive Task Force (RIETF) works with the Corps and the Coast Guard when problems are multi-district or multi-division. The group of waterway

executives offers advice and direction to facilitate quick resolutions to various problems with limited resources, saving the taxpayers millions of dollars.

The Upper Mississippi Waterways Association (UMWA) consistently looks for ways to facilitate the multi-uses of the river system. UMWA provides boating safety classes and has facilitated planning discussions on how to integrate green spaces in large urban areas while allowing thriving businesses to exist and expand.

The Propeller Clubs of the Quad Cities, Chicago, and the Twin Cities work to educate recreational boaters and also look for ways to work towards a harmonized multi-use river.

Our regional river industry supports hundreds of thousands of jobs; only a small percentage of these are directly related to the river. The hundreds of millions of dollars saved by agriculture and industry producers as a result of shipping goods on the river, are invested back into community “main street” goods and services, creating additional jobs in the basin. With international trade expected to double by 2020, higher transportation costs due to infrastructure inefficiencies would result in a loss of export markets and lower domestic prices. This puts the economic vitality of millions of citizens in peril, both in the basin and across the U.S.

Compared to rail or truck, water transportation increases the quality of life in the Midwest through lower air and noise pollution and lower fossil fuel consumption. Limiting train and truck traffic also staves off unnecessary road repairs and construction, as well as higher rail and auto-related accidents and fatalities.

According to the Inland Waterways User Board, commercial carriers have been contributing to some -.20 cents/gallon fuel tax for infrastructure improvements since 1986. To date, this region contributes to 40% of the Inland Waterways Trust Fund, yet only receives a 15% return for waterway improvements.

Flood control, promoted by the Upper Mississippi, Illinois & Missouri Rivers Association (UMIMRA), saves not only lives and property, but provides stability for regional economic and ecosystem functions. The existing flood control projects protect railways, roads, approaches to bridges, telecommunications, gas and electric utilities and water treatment systems. The results of this protection are healthy local economies that benefit from uninterrupted interstate commerce. Other economic benefits include providing access for recreational and commercial use of the rivers and allowing for a diverse combination of improved property that supports publicly funded local and state services. Improved properties range from agriculture to residential to managed recreational areas to industrial centers.

The majority of flood control projects, many of which began shortly after the U.S. Civil War, are maintained by contributions of funds and time of private landowners and businesses through the daily operations of levee and drainage districts. The UMIMRA is the primary not-for-profit membership organization that represents the interests of these levee and drainage districts, as well as the numerous beneficiaries of flood protection,

including businesses, communities, affiliate organizations and economic development entities throughout the UMRS.

Levee and drainage districts provide ongoing services to conserve and enhance ecosystem values. Thousands of acres of Federal and state wildlife refuges and parks are protected through flood control. Structures provide stability for water table variations and other natural cues to be managed for desired outcomes of targeted species. Acres of privately owned habitat areas are used for recreational purposes such as waterfowl hunting, bird watching, and fishing. For example, it is common for many levee and drainage districts to have thousands of acres of habitat that ranges from open water to wooded wetlands scattered throughout the district. One of the most important functions of levee and drainage districts is the self-funded effort to remove sediment from district drainage ditches and reservoirs before it reaches the river. This function alone has saved the Nation millions of dollars and slowed the river from being choked by sediment.

### 3.4.3 Preliminary Conclusions

Maintaining the ecological integrity of the Upper Mississippi River System extends beyond sound environmental stewardship in operation of the navigation project and modification of navigation structures. It includes interdependent issues of water quality, sedimentation, habitat protection and restoration, wildlife and fishery management and land management that are within the purview of other Federal agencies and the states. The Federal agencies and the states that manage resources and have regulatory responsibilities on the UMR-IWW will have important roles to play in this new integrated plan. The non-governmental organizations will also have an important role in the advocacy of this new integrated plan. The feasibility study will explore opportunities where programs and potential projects could be coordinated and integrated into a comprehensive synergistic plan. Authorities and funding priorities and limits of the USDA, USFWS, USGS, DOT and EPA need to be identified and the potential for using crosscut budgeting among Federal agencies should be considered. The feasibility study will not seek new authorities or funding mechanisms for these agencies; however, the recognition of the need for these agencies to participate will be highlighted. The Federal agencies and states will be encouraged to review their existing authorities and funding streams to determine if changes are needed to better support the sustainability goals established in this restructured effort.

Managing the UMR-IWW as a multi-purpose resource will require a thorough review of existing institutional arrangements. The existing institutional arrangements consist of varied coordination committees composed of Federal, state, and non-governmental involvement, and their many layers create a challenge to developing a common vision for integrated management of the UMR-IWW. While acknowledging that considerable progress has been made in the region's management framework over the past decades, there is room for improvement, especially with respect to addressing sustainability level problems and opportunities. Some of the areas commonly identified in need of improvement, include:

- Collaborative planning and decision-making,
- Coordinated partner funding requests and cross cut budget support,

- Development of common vision with consensual buy-in and support,
- Clear delineation of responsibilities among partners and stakeholders,
- Balance or equity in competing interests,
- Inter- and intra-agency communication,
- Evaluation process,
- Acceptance of risk and uncertainty,
- Integration, alignment, or leveraging of authorities and resources,
- Overcoming the legacy of conflict and controversy.
- Jurisdictional border issues,
- Public understanding, involvement, and support, and
- Better coordination of partners' and stakeholders' programmatic authorities.

The feasibility study will include a review of existing institutional arrangements and identify all problems and opportunities for improvement. The process for this review will be accomplished collaboratively with the stakeholders of the system. Recommendations for new institutional arrangements will not be made until completion of a recommended plan.

### **3.5 Scenario Development.**

The development of traffic forecasts over the 50-year planning horizon has been a challenge to the study effort. The NRC acknowledged that predicting with confidence 50 years into the future is a difficult proposition because of the uncertainty involved. They suggested many methods to address this uncertainty including a scenario analysis. The Federal Principals Task Force endorsed this approach for forecasting of future traffic and this method was incorporated into the restructured study. This interim report contains the results of the scenario development that outlines five different plausible future worlds that have varying impacts on the unconstrained demand for waterway transportation. The unconstrained demand must be processed through the waterway system economic model in order to identify the level of traffic “constrained” by the processing capability of the waterway system. This will result in multiple representations of the without-project condition that will serve as the basis for evaluating with project alternatives.

As currently constructed, individual scenarios will not be evaluated with respect to numerical probability or likelihood of occurrence. A single most probable without-project condition therefore will not be identified. The intent is to evaluate alternatives across all scenarios and search for those that work well across a broad range. Such identification is uncommon in Corps feasibility studies; however, the scenario-based approach is consistent with the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (P&G), the procedural and analytical framework for Corps feasibility studies.

Paragraph 1.4.13 of the P&G presents guidance on dealing with risk and uncertainty in the evaluation of alternative plans and Supplement 1 – *Risk and uncertainty –Sensitivity analysis* presents additional guidance. Paragraph 1.4.13 describes a situation of uncertainty as those in which potential outcomes cannot be described in objectively known probability distributions. The guidance indicates that plans and their effects should be

examined to determine the uncertainty inherent in the data or various assumptions and “A limited number of reasonable alternative forecasts that would, if realized, appreciably affect plan design should be considered.” The guidance goes on to endorse performing a sensitivity analysis of the estimated benefits and costs of alternative plans using these alternative forecasts.

Supplement 1 to the P&G also deals with this subject of assigning probabilities in some detail. It recognizes that there are situations of uncertainty where outcomes cannot be described in objectively known probability distributions because future demographic, economic hydrologic, and meteorological events are essentially unpredictable because they are subject to random influences. The Corps believes that this describes the situation with respect to 50-year forecasts of traffic on the UMR-IWW System. While the P&G certainly allows for assigning subjectively based probabilities to random future events, it does not endorse the approach and is very cautious in describing subjective probabilities indicating such approach must be justified on a case-by-case basis and carefully qualified as subjective. The discussion in Supplement 1 indicates that P&G would clearly allow the treatment of alternative forecasts as equally probable for purpose of sensitivity analysis.

Finally, the P&G indicates that the planner’s primary role in dealing with risk and uncertainty is “to characterize to the extent possible the different degrees of risk and uncertainty and to describe them clearly so that decisions can be based on the best available information.” The Corps and the Federal Principals Task Force believe that the scenario-based analysis as described in the Interim Report is the best way to accomplish that objective.

### 3.5.1 Preliminary Conclusions

The Corps has agreed to further evaluate the feasibility of developing scenario probabilities that could be applied as a sensitivity analysis in the feasibility study. The “Delphi” approach has been suggested by some stakeholders as a possible methodology. The Corps will be open to input from the stakeholders on the application of probabilities to the scenarios.

## 3.6 Economic Modeling.

The NRC concluded that the spatial model utilized in the original study was a step in the right direction; however, it contained flawed assumptions and data. Their recommendation was not to use the ESSENCE model in the feasibility study. They did, however, recommend that further development of the spatial model and additional data collection should be accomplished to support the feasibility study. The initial estimate to fully comply with the NRC recommendations was many years and considerable funding. There was some question as to whether their recommendations were even possible. This left the Corps with the challenge of how to move forward with the feasibility study in a timely manner. The Corps, in coordination with the Federal Principals Task Force, concluded that further development of a spatial model was a good idea; however, it should be performed in a research and development setting outside the study process. They also concluded that an existing model should be used to complete the feasibility study as soon

as possible. The existing model selected as the tool to evaluate the NED transportation impacts associated with the various alternatives is the Tow Cost Model (TCM).

The TCM is the evolutionary product of efforts begun in 1968 to recognize the interdependence of the waterway system's locks. In 1970, the Inland Navigation Systems Analysis (INSA) program was created. Under this program, the Corps of Engineers Planning Directorate, Office of the Chief of Engineers was given the responsibility of coordinating the work of the Corps, other government agencies (most notably the U.S. Department of Transportation), and contractors in developing a system for optimizing the planning, design, and operation of the inland navigation system. One of the major products of INSA was a system of models intended to "...mimic the national market system and the role of inland waterway transportation within that market system." (USACE 1976) This system of models was intended to be a general model "within a dynamic space-economy...[where]... geographic patterns of production and consumption generate commodity traffic as goods move to satisfy domestic final demand, export demand, and industrial demand for raw materials." (USACE 1976) Within this context, individual shippers decided modal choice based upon least cost routings, thereby determining the transportation demands for each mode. Transportation market supply and demand determined market price and service levels.

The Multimodal Network Model allocated demands generated by the Commodity Flow Model among the four modes. This allocation was based on output from the Navigation Simulator, which supplied waterway capacity information; the Flotilla Model, which supplied waterway cost information; and costing and capacity models for rail, truck and pipeline. The integrated application of the INSA models proved to be an insurmountable task; however, two of the four models were moved forward—the Navigation Simulator and the Flotilla Model. These two models became the primary tools in the partial equilibrium, system analysis used by the Corps' Ohio River Division beginning in the late 1970's and early 1980's. Under the guidance of the Huntington District's Navigation Planning Support Center, the Navigation Simulator became the Waterway Analysis Model (WAM). Refinements of the Flotilla Model were first sponsored by the U.S. Department of Transportation and then by the Louisville District's Navigation Planning Support Center, where it became the TCM. CACI, Inc. played an integral role in the further development of both models. The Huntington District was largely responsible for developing the model features that allowed the TCM to go from a straight costing model to a model capable of finding system equilibrium, first through the creation of a Marginal Economic Analysis post-processor routine and finally through the development of the Equilibrium Model. The Tow Cost and Equilibrium models are now referred to collectively as the TCM.

Given a particular system configuration and traffic level, the TCM has two essential functions: (1) estimating waterway transportation costs at the movement level and (2) finding that combination of movements with positive rate savings that maximize system tonnage. Movements are represented by the annual tonnage of a commodity moving between a unique origin and destination pair. The model begins by estimating waterway transportation costs at the movement level. It recognizes that each system movement has a per ton base rate savings as established by the transportation rate analysis.

This rate savings is the difference between the waterway rate and the least cost alternate route. The product of total tons times the base rate savings represents each movement's total rate savings, or total benefit. At higher levels of traffic demand, the demand curve shifts out to the right. This shift may push the intersection of waterway supply and demand beyond the supply curve's horizontal reach and into the upward sweeping portion of this cost curve. If this is the case, quantity moved increases, but the waterway rate at which it moves also increases. The TCM estimates the amount of that cost increase—the amount by which base rate savings per ton decrease, by calculating the increase in movement trip time caused by the increased system congestion. The increase in the movement's cost is then found by multiplying the increase in trip time (hours) by the hourly shipping costs. Dividing this cost increase by the movement's tonnage yields the cost per ton increase in the movement, which is then added to the base waterway rate. The rate savings for the movement is lowered as the waterway rate increases and the alternate overland rate remains constant. The movement's new total waterway benefit becomes the product of this higher traffic and the lower rate savings.

TCM differs in some significant ways from the economic model initially employed in the earlier stages of this study. The framework of TCM assumes that individual waterway movements are not sensitive to the price of water transportation until the level of the next least costly mode of transportation is reached. At that point, zero quantity will be shipped. Alternative uses of the commodity (typically associated with a different destination and perhaps a different mode) and the possible substitution between supply regions are not recognized. Earlier efforts attempted to incorporate these concepts of a spatial equilibrium approach to the modeling by introducing the notion that individual waterway movements are sensitive to the price of water transportation before the threshold level of the next least costly transportation mode is reached. Said differently, individual waterway movements have a downward sloping demand for water transportation—quantity shipped is responsive to price. By specifying the degree of price responsiveness, the earlier modeling efforts acknowledged the possibility of alternative uses and shifting regions while not explicitly modeling these considerations.

The implication of these differences with respect to NED transportation benefits is potentially quite large. The measure of NED benefit is based on the notion of willingness-to-pay for use of the waterway. The recognition of alternative commodity uses (that may not involve water transportation), the possibility of substitution between supply regions, and, in general, the price responsiveness of waterway demand, bear directly on willingness-to-pay. As a general proposition, and with other factors equal, the more responsive quantity is to price and the greater the degree of “flexibility” that exists in the overall transportation network, the lower will be the willingness-to-pay for use of the waterway. These considerations would affect not only the magnitude of the NED transportation savings that would be associated with a particular alternative, but could also potentially affect the scale of alternatives that must be evaluated in the effort of identifying the alternative that maximizes net contributions to the NED account.

TCM is a benefit model that will provide information to help formulate alternatives; however, it is not the decision model. The recommended plan will be developed through a

collaborative process with the stakeholders of the system and other Federal interests. Additional information that will be considered in this process includes the net contributions to the National Ecosystem Restoration, Regional Economic Benefits, robustness of the alternatives across scenarios, risk of selecting the wrong plan, flexibility and adaptability of the plan, acceptability to basin interests including other Federal and state agencies as well as the general public, and funding constraints including cost-sharing issues. The Corps will make the final decision on selection of the recommended plan in accordance with all Federal guidelines.

### 3.6.1 Preliminary Conclusions

The Corps will continue development of the feasibility study utilizing TCM as the benefit model. The Corps will explore opportunities for incorporating spatial concepts into a sensitivity analysis during development of the recommended plan. The Corps will also continue development of a new spatial model on a parallel effort through its research and development program. As new methodologies become available, consideration will be given to incorporating them into the restructured navigation feasibility study.

## 3.7 Adaptive Management.

Making decisions to address or resolve the complex assortment of structural and functional problems within the UMR-IWW ecosystem will require a long-term commitment to a policy of adaptive management (Figure 35). The adaptive management concept was developed in the mid-1970's, and has been described in numerous papers and books (see, for example, Holling 1978; Walters 1986; Lee 1993; Volkman and McConnaha 1993; Johnson 1999; Lee 1999; NRC 2001). Adaptive management is an iterative approach to managing ecosystems, where the methods of achieving the desired objectives are unknown or uncertain.

Adaptive management is experimental in that it tests hypotheses about management uncertainties, and uses management tools to not only change the system, but to learn about the system. How much we learn (in this case, about the UMR-IWW ecosystem) may determine how quickly development becomes sustainable.

An adaptive management approach, by necessity, marries the scientific, social, and political spheres, and its success will require an open management process that includes stakeholders during the planning and implementation stages. It needs to create and maintain political openness. As noted above, the feasibility study will include a review of existing institutional arrangements, and an evaluation of how these arrangements may need to be modified to manage and implement the study recommendation(s). A key responsibility of the institutional framework or body will be to bring together the three elements mentioned above—the scientific, the social, and the political. Each of these elements will need to clearly inform the others as to what is required to adaptively manage the UMRS—the information and resources that science requires to experiment, the acceptance of risk and uncertainty by the public and decision-makers, and the long-term commitment to learning and then management based on this learning.

### 3.7.1 Preliminary Conclusions

An adaptive management framework will be developed with the stakeholders in the feasibility study.

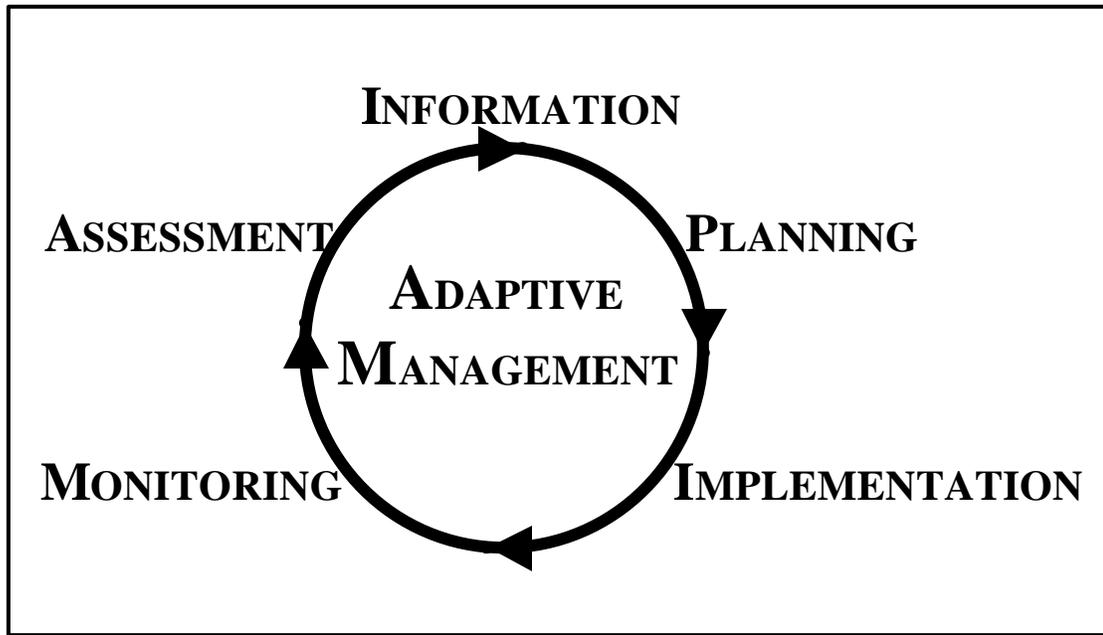


Figure 35. The iterative adaptive management process.

## 4 STAKEHOLDERS' PERSPECTIVES ON THE RESTRUCTURED NAVIGATION STUDY

The UMR-IWW has a long history of controversial issues and polarization of stakeholder groups. This will continue to be a challenge throughout the development of the feasibility study. The restructuring of this study has been accomplished in the spirit of collaboration including providing a draft Interim Report (13 May 2002) to the stakeholders, to allow them input into the study process. The majority of respondents indicated a general agreement with the restructuring of the study and have pledged to continue the collaboration process through the feasibility study. Position letters received from the stakeholders are included at the end of Section 4. Listed below are those groups who provided comments on the 13 May 2002 Draft Interim Report.

Wisconsin Department of Natural Resources

Upper Mississippi River Basin Association (representing Iowa, Minnesota, Wisconsin, Illinois, and Missouri)

Missouri Department of Conservation

Maritime Administration, Department of Transportation

Mississippi River Basin Alliance

Midwest Area River Coalition 2000  
American Soybean Association  
Illinois Corn Growers Association  
Audubon Association  
Public Employees for Environmental Responsibility  
Mississippi River Citizen Commission  
Illinois Soybean Association  
Department of the Interior, Fish and Wildlife Service  
American Rivers  
Upper Mississippi, Illinois and Missouri Rivers Association  
Upper Mississippi River Conservation Commission  
Department of the Interior, U.S. Geological Survey  
Missouri Corn Growers Association  
Environmental Protection Agency  
National Corn Growers

#### **4.1 Summary of Comments and Responses on Draft Interim Report.**

The Interim Report was produced in a collaborative atmosphere with several early drafts being reviewed by the stakeholders. The final Draft Interim Report was circulated for stakeholder review on 13 May 2002. The majority of stakeholders returned comments to the Corps by the requested date of 7 June. Approximately 500 comments were received and reviewed. These comments were categorized as editorial, those beyond the scope of the Interim Report, and those that would enhance the content of the Interim Report. This last category of comments is summarized below with appropriate responses. Responses to all the comments received will be available for viewing on the Navigation Study website at [www2.mvr.usace.army.mil/umr-iwwsns](http://www2.mvr.usace.army.mil/umr-iwwsns), after submission of the Interim Report.

**Comment 1:** Interim Report should include a “what’s next” section to outline the follow-on activities for completion of the feasibility study.

**Response 1:** Many comments were received that recognized that the most challenging work would be contained within the feasibility study. A Project Management Plan for completion of the feasibility study has been developed and will be shared with the stakeholders.

**Comment 2:** Where is the “low hanging fruit”?

**Response 2:** The guidance for restructuring of the Navigation Study allowed for identification of measures that could be recommended for implementation prior to completion of the feasibility study. This document does not contain any recommendations for moving forward with interim measures. Many comments were received that suggested small-scale measures such as mooring cells and guidewall extensions be considered for immediate implementation. These measures have been discussed in past efforts; however, the evaluation of small-scale measures has not been completed. In addition, the environmental analysis describing the impacts of incremental traffic increases from these

types of measures is also not complete. Both of these evaluations will be included in the feasibility study to allow for selection of a recommended plan.

An interim measure also mentioned is the initiation of additional environmental restoration activities that could be accomplished under existing authorities. The Corps is exploring opportunities for funding of additional ecosystem restoration.

**Comment 3:** Navigation and the environment are not addressed equally in the Interim Report.

**Response 3:** The intent of the Interim Report is to provide a framework for moving forward with the feasibility study. The biggest change in scope resulted from the broadening in the environmental area. Additional information has been added to the Interim Report to further address the consideration of navigation and economic sustainability. Measures for improving economic conditions such as navigation improvements will be evaluated for environmental impacts; and ecosystem restoration improvements will be evaluated for economic consequences. This balanced approach will be fully developed in the feasibility study.

**Comment 4:** The discussion of implementation issues in the draft report is confusing and should be reformatted.

**Response 4:** The identification of implementation issues cannot be finalized until a recommended plan is developed in the feasibility study. The complexities of implementation warrant early identification in the planning process. This section has been revised and reformatted to incorporate many of the comments received. The use of conclusions and recommendations has been misinterpreted and will not be stated in this report. Final conclusions and recommendations will not be provided until completion of the feasibility study.

**Comment 5:** The draft Interim Report contains confusing eco-terms including ecosystem restoration, enhancement, on-going cumulative effects, O&M for the environment, etc.

**Response 5:** The final Interim Report will attempt to use consistent terms. Many of these terms have technical and programmatic meanings within the Corps of Engineers and across different organizations. The Interim Report will include a glossary of terms and the definitions will be fully resolved in the feasibility study.

**Comment 6:** The development of scenarios should include assignment of probabilities.

**Response 6:** The scenarios are used to develop unconstrained traffic forecasts for the UMR-IWW. These unconstrained forecasts will be evaluated in an economic model to determine the without-project forecasts that will serve as the basis for evaluating with project alternatives. The original intent of the Federal Principals Task Force was not to select the most probable scenario, but to evaluate alternatives across all scenarios and search for those that work well across a broad range. However, options for identifying

probabilities as part of a sensitivity analysis will be explored in the feasibility study. An Independent Technical Review is also underway that will include exploring the practicality of identifying probabilities for each scenario.

**Comment 7:** Describe the difference between the Tow Cost benefit model and the spatial model previously used in the original study.

**Response 7:** The full description of the Tow Cost Model is provided in the Interim Report including the limitations of this model and the differences with the spatial model concept. A description of how this model will be used in the decision process is also provided. In addition, a discussion of the on-going research effort within the Corps to produce a spatial model is provided.

**Comment 8:** There needs to be a better explanation of how integration of efforts within the Corps and outside the Corps will be accomplished.

**Response 8:** The Navigation Study will act as the vehicle for the establishment of goals and objectives for a sustainable system. These base levels goals and objectives will serve as the basis for all on-going Corps studies and programs including EMP, the Comprehensive Study, Illinois Ecosystem Study, and the Operations and Maintenance Program. Efforts outside Corps activities such as the USFWS comprehensive refuge management plan, could also be involved in this process. The feasibility study will include the development of these base conditions; however, each study or program will develop implementation details for their own area.

**Comment 9:** The Corps has a narrow interpretation of their existing authorities.

**Response 9:** The Corps will provide opportunities in the Feasibility Study process to evaluate existing authorities and the benefits of a dual purpose authority.

#### **4.2 Stakeholders Views on Interim Measures.**

The guidance for restructuring of the Navigation Study allowed for identification of measures that could be recommended for implementation prior to completion of the feasibility study. This document does not contain any recommendations for moving forward with interim measures; however, many comments were received from the stakeholders concerning near term recommendations including:

- Increased funding for the Environmental Management Program
- Increased funding for the Operations and Maintenance Program
- Implementation of small-scale structural and nonstructural measures
- Implementation of ecosystem restoration measures
- Flow Frequency and Comprehensive Plan should proceed on schedule

### **4.3 Public Involvement.**

The general public is a very important stakeholder of the UMR-IWW. Informational public meetings were held at five locations in the region during March 2002 and designed to provide an update on the restructuring of the study and to get public feedback on the new direction of the study. The meetings were held in Peoria, Illinois; St. Louis, Missouri; Bloomington, Minnesota; La Crosse, Wisconsin; and Davenport, Iowa. Attendees were eager to learn about the restructured study and actively participated in the meetings and the feedback process. During these five meetings, attendees submitted a total of 258 questions, issued 120 statements, and returned 305 comments sheets (an additional 28 comments were received via the study newsletter comment sheet).

The majority of those who responded agreed with the balanced focus of the restructured study and encouraged the Corps of Engineers to continue collaborating with the stakeholder groups.

When asked to provide input on what the goals of the restructured study should be, nearly 79% of the responders agreed with having a balanced, sustainable approach to navigation and the environment, and only 4% disagreed; 77% agreed and 11% disagreed with improving the efficiency of the navigation system; 75% agreed and 11% disagreed with sustaining a healthier ecosystem; and 66% agreed, while 5% disagreed, with restoring river habitat.

The complete record of these public meetings can be found on the Navigation Study website at [www2.mvr.usace.army.mil/umr-iwwsns](http://www2.mvr.usace.army.mil/umr-iwwsns).

### **4.4 Letters from Stakeholders.**

This section contains the letters and general comments on the restructuring of the Navigation Study. The complete listing of all comments will be posted to the Navigation Study website after submission of the report.



IN REPLY REFER TO:  
FWS/AES

## United States Department of the Interior

**FISH AND WILDLIFE SERVICE**  
Bishop Henry Whipple Federal Building  
1 Federal Drive  
Fort Snelling, MN 55111-4064

June 11, 2002

Brigadier General Edwin J. Arnold, Jr.  
U.S. Army Corps of Engineers  
Mississippi Valley Division  
P.O. Box 80  
Vicksburg, Mississippi 39181-0080

Dear General Arnold:

This letter responds to distribution of the Draft Interim Report for the Restructured System Navigation Feasibility Study (Draft Interim Report) dated May 10, 2002. While we have worked with your staff during preparation of some portions of this document, we wish to provide you with additional comments to clarify the position of the U.S. Fish and Wildlife Service (Service) as we proceed with the feasibility study.

The Service strongly supports the Corps of Engineers' (Corps) effort to implement ecosystem management and restoration as an equal project purpose with commercial navigation support. We believe the Navigation Feasibility Study is headed in the right direction (i.e., a balance between Upper Mississippi River System (UMRS) navigation infrastructure and ecosystem management). As noted in a June 2002 draft Upper Mississippi River Conservation Committee document and as reported in Interim Report Section 3.2.2, there have been disparate investments in maintaining both the navigation and environmental benefits of the 9-foot channel project. We welcome the report's recommendation to manage the UMRS for multiple purposes. While existing Federal authorities, regulations, and guidance could bring us close to meeting the goals of multipurpose management, you have presented a compelling argument for analyzing potential changes to existing authorities, institutional arrangements, and implementation strategies in the feasibility study. We commend the Corps for its willingness to "think outside of the box."

Further, we welcome the collaborative approach you have instituted and believe it is working well. More stakeholders are actively involved than ever before. Although we anticipate some growing pains, your agency has created an effective process to move forward.

Your draft report generally fulfills your guidance to prepare the Interim Report as a blueprint or guide for proceeding with the feasibility study. The foundation for the process outlined in Section 2 was started during the preceding study period, and we now anticipate that in-depth assessment of 9-foot channel project effects underlying incremental traffic effects will complete that foundation.

To assure success of the process you have outlined, implementation issues will need to be addressed fully. Two of these issues are particularly challenging. The first issue is the multi-purpose management approach implicit in development of "...a plan for sustainable communities, economies, and ecosystems" referenced on page 36. Such a plan relies on integration of navigation ecosystem stewardship and flood damage reduction. Unfortunately, references to flood damage reduction, flood control, and floodplain management are relegated to a nebulous category "...related to navigation features." At other points, the Draft Interim Report indicates that floodplain management will be addressed in the concurrent Comprehensive Plan effort. This peripheral treatment of flood damage reduction as a significant system component seems to downplay the multipurpose management theme.

The second issue is that of institutional arrangements necessary to implement integrated river management for multiple purposes. Under our current institutional arrangements summarized in Table 1, stakeholders have not been fully represented. In addition, some of those that are represented appear to have chosen, at the administrative level, to maintain a distance between the restructured navigation study and other system needs. You have captured this concept in the 12 bullets in Section 3.5 of the May 30 draft of Implementation Issues.

In addition, under current institutional arrangements there is no element that coordinates plans or partner funding requests, or provides for cross-cut budget support, that would allow complementary execution of partner agency programs. This type of partner support appears to have worked well elsewhere in the nation and would demonstrate consensus on system management goals. We believe that for all stakeholders to be represented in multipurpose planning and project implementation, substantial effort must be made to assure adequate funding across agencies.

We believe it is time to integrate the many parallel, interrelated activities currently underway for management of the UMRS. Until such time that specific legislation is provided for an Upper Mississippi River System authority to address ecosystem stewardship, navigation, and flood damage reduction, we recommend that the Corps work with partner agencies to develop a project management plan that incorporates those management plans in place for the Environmental Management Program, the environmental Continuing Authorities Program elements, the restructured Navigation Study, and the project management plan being developed for the Comprehensive Plan. Public Law 99-662 stated that the system "shall be administered and regulated in recognition of its several purposes." However, subsequent language in that Act referenced the 1981 Master Plan, which dealt only with ecosystem and navigation issues and lacked integration of floodplain management and flood control issues.

We do not suggest cessation of activity in any one of your four program areas referenced above but suggest that actions, timelines, and budgeting begin to reflect the Federal intent to execute these programs in a cohesive, complementary fashion to reach our Tier I goal.

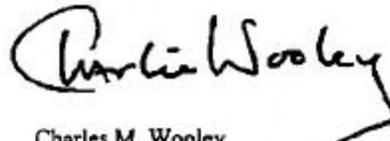
As we proceed with the feasibility study phase, we expect these issues will be fully explored and that decisions presented will balance the needs of stakeholders with the capability to meet those needs. The capability of various existing and potential authorities and institutional arrangements

must be fully analyzed to support those decisions. At a minimum, we suggest consideration of the Comprehensive Everglades Ecosystem Restoration Program, a rechartered Mississippi River Commission or new Upper Mississippi River Commission, a WRDA 1965 Title II Basin Commission, or a Federal-State compact such as Cal-Fed. We expect that the final Feasibility Study will contain a proposal to streamline existing coordination groups and establish a collaborative management architecture that supports multipurpose management both administratively and fiscally. The future of the UMRS deserves no less.

We understand the Draft Interim Report to serve primarily as a status report, with the majority of the work and decisions occurring in the feasibility phase. Therefore, we view your preliminary conclusions and recommendations as helping to shape additional analyses in the feasibility phase of the Restructured Navigation Study. During our participation in many of the field level collaboration efforts undertaken to prepare this document, it became apparent that there are many expectations that cannot be met in a project status document of this type, your guidance notwithstanding. You and your staff have done a commendable job of trying to respond to the array of expectations without foreclosing the decision-making process.

We look forward to working with you and our partners in the feasibility phase, especially the development of tiered system goals and objectives. Additional editorial comments on specific sections of the Draft Interim Report will be provided by our Rock Island Field Office (RIFO). The Service's point of contact for this study remains Richard Nelson of the RIFO; he can be reached at 309/793-5800, extension 519, though please contact me directly if you would like to discuss this further.

Sincerely,



Charles M. Wooley  
Assistant Regional Director  
Ecological Services



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 5  
77 WEST JACKSON BOULEVARD  
CHICAGO, IL 60604-3590

JUN 13 2002

REPLY TO THE ATTENTION OF:

B-19J

Mr. Denny Lundberg  
Department of the Army, Corps of Engineers  
Rock Island District  
Clock Tower Building  
Post Office Box 2004  
Rock Island, Illinois 61204-2004

Dear Mr. Lundberg:

Thank you for the opportunity to review and provide comments on the Draft Interim Report (Interim Report) for the Upper Mississippi River and Illinois Waterway Restructured System Navigation Feasibility Study. The purpose of this report is to describe how the study has been restructured to provide equal consideration to fish and wildlife resources along with navigation improvement planning. This approach will call for a robust strategy that will be comprehensive and holistic. Our agency looks forward to having the opportunity to participate in future planning and analysis that will be presented in the Feasibility Report and Environmental Impact Statement.

Overall, we support the Corps efforts to implement ecosystem management and restoration at the same level of effort as addressing the navigational needs. Therefore, we believe that the approaches identified and presented in the Interim Report by your agency strike a good balance between these needs. We also appreciate and look forward to our continued participation in the collaborative approach that your agency has been implementing over the past year. We offer the following comments to be included in the final version of the Interim Report. These comments are on the institutional arrangements, adaptive management, guidance for restructured feasibility study, goals setting, operation and maintenance, and authorizations.

Section 3.4, Institutional Arrangements. The Interim Report is not clear on how many authorization options are in the array that would be pursued to achieve the stated goals and objectives of this Interim Report. It appears that new authority is the only option that is being recommended or considered by your agency. The Interim Report discusses existing programs and authorities that provide some coverage of the issues at hand. However, there is no discussion that addresses the potential option to expand existing authorities. Therefore, we recommend that the Interim Report be revised to include options that expand or modify the existing authority to create the regulatory ability necessary to carry forward the comprehensive plan that has been described in this document.

On page 124, conclusion number 7, third bullet, states that the feasibility report will seek ways to address the ecosystem and flood plain management needs related to navigation. In order to have a full understanding of this river complex and to have the ability to achieve an environmentally sustainable system, all aspects must be taken into consideration, rather than just focusing on the ones that are related to navigation. Therefore, we recommend that this bullet should be rewritten to reflect overall evaluation of ecological and flood plain management.

Section 1.8, Guidance for Restructured Feasibility Study. The Interim Report states that the your agency will consider interim measures to partially achieve the objectives while the feasibility study is being completed. The report was not clear on what would constitute a interim measure. The Interim Report needs to clarify what types of actions would be considered as interim. For example, we are interested in knowing if nonstructural for navigation measures and/or pilot projects for ecosystem restoration would be considered as interim measures. The final Interim Report must discuss the approach and the criteria that will be used to make such recommendations. Section 1.8.5 Integrated and Adaptive Management. The Interim Report identifies the need for an integrated and adaptive management approach to address the complex problems facing the river system. However, the Interim Report did not clearly explain what is adaptive management and what are the steps necessary to capture this approach. Discussion on how the adaptive management approach will be applied would also be beneficial. The Interim Report should also identify any needs that would have to be addressed in order for this approach to be effective in river management. For example, the foundation of adaptive management is to have on an ongoing basis the ability to collect and analyze environmental and economic trends data.

Section 2.3.2, Ecosystem, Flood plain, Social Goals. The Interim Report did not relate how the various studies and surveys listed are relevant to the development of the various ecological goals. It seems the purpose of these sections are 1) to inventory work that has been done to date that could be valuable, and 2) to set a baseline for future collaboration with other stakeholders when defining goals and objectives. Since none of these goal sections actually define the goals, we recommend that the title reflect that the Interim Report establishes the framework for setting these goals. For example this section could be titled "Process for Defining Ecosystem Goals."

Section 2.5.1.2, Modifications to Operation & Maintenance (O&M). As we have been stating in our meetings, funding for an ecosystem operation and maintenance program is needed. We understand that for large scale modifications additional funding would be required. However, in order for the Corps to fully embrace good environmental stewardship, O&M must be broadened to mean O&M of the river system, not just the navigation system. Your agency should actively seek opportunities to continue implementing small-scale modifications and pilot projects, such as pool drawdowns and notched dikes. If achieving sustainability is totally contingent on funding, then the success of future more inclusive O&M which incorporates ecological needs, is based only on a conditional commitment. In light of this, your agency should also investigate the

opportunities to fund research on large-scale O&M projects that would seek to increase the environmental benefits while addressing navigational needs.

Section 3.2, Authorizations U.S. Environmental Protection Agency. The Interim Report must be changed to read, “The U.S. Environmental Protection Agency has the responsibility to review and comment on all major Federal actions that may have a significant impact on the environment pursuant to Section 309 of the Clean Air Act. In the Clean Water Act, the U. S. Environmental Protection Agency was also given authority to regulate activities in wetlands and riparian areas, point source discharges, dredged material disposal, stormwater discharge, and nonpoint source pollution.”

Once again, thank you for the opportunity to provide comments on the Interim Report. If you have any questions or comments, please contact Al Fenedick of my staff. Al can be reached at (312) 886-6872 or by E-mail [fenedick.al@epa.gov](mailto:fenedick.al@epa.gov).

Sincerely,  
Kenneth Westlake, Chief  
Environmental Planning and Evaluation Branch  
Office of Strategic Environmental Analysis Standard

Maritime Administration  
Comments on the Navigation Study Draft Interim Report

General Comments

The collaborative process proposed as an integral part of the revised Navigation Study is an innovative and timely attempt by the Corps of Engineers to include the Mississippi and Illinois River Basin Stakeholders in the Study Process. We concur that this is a responsible approach to include those who have an interest in the river basins in this effort. However, we are concerned that the Navigation Study Draft Interim Report has shifted its' emphasis toward systemic environmental issues, and does not contain more information pertaining to navigation and the Study's effort to reduce congestion at the locks. The Interim Report does not reflect the ten years of information developed concerning congestion to commercial navigation. Nor does it project qualitatively the potential need for large-scale navigation improvements or recommend small -scale measures that could be implemented in the near term to alleviate congestion on an interim basis.

Due to the fact that this study was authorized specifically to investigate the congestion at the Locks on the Upper Mississippi and Illinois Rivers and the fact that the Corps is concurrently initiating work on the Mississippi River Comprehensive Basin Study: We are also concerned that, while we recognize the importance of including environmental mitigation in the revised study effort, environmental issues that are not site specific to potential navigation improvements are being given disproportional attention. Systemic environmental issues should be addressed as a part of the Comprehensive Basin Study that is currently authorized. Navigation improvements and their concurrent site -specific environmental impacts should then be included as a component of the Comprehensive Basin Study.



OFFICE OF THE GOVERNOR  
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[www.gov.state.mo.us](http://www.gov.state.mo.us)

BOB HOLDEN  
GOVERNOR

STATE CAPITOL  
ROOM 216  
(573) 751-3222

June 20, 2002

Colonel William J. Bayles  
District Commander  
U.S. Army Corps of Engineers  
Rock Island District (PM-M)  
Clock Tower Building  
P.O. Box 2004  
Rock Island, IL 61204-2004

Dear Colonel Bayles:

I am writing to you to submit the State of Missouri's preliminary comments on the Draft Interim Report for the Upper Mississippi River and Illinois Waterway Restructured System Navigation Feasibility Study. As you are undoubtedly aware, this project is extremely important to the State of Missouri.

The State of Missouri relies heavily on the Inland Waterways System to transport commercial and agricultural products to markets throughout the world. With the Port of St. Louis being the third largest inland port in our nation, the Mississippi River navigation system is a significant contributor to the state's economy. That being the case, **the citizens of Missouri obviously have a keen interest in the findings of the feasibility study.** In fact, during the last legislative session, both the Missouri House of Representatives and the Missouri Senate adopted resolutions supporting extensions to the Locks and Dams on the Mississippi River.

The Draft Interim Report for the Upper Mississippi River and Illinois Waterway Restructured System Navigation Feasibility Study dated May 10, 2002 provides a good framework for proceeding with the feasibility study. Specific comments on the Draft Interim Report were provided through the Upper Mississippi Basin States Association (UMRBA) comment letter. The State of Missouri is pleased that the restructured study incorporates a balanced consideration of both navigation and ecosystem needs. The Missouri Departments of Agriculture, Economic Development, Conservation, Transportation, and Natural Resources have reviewed the Draft Interim Report and support the direction the Corps is going in addressing the many needs and uses of this

Colonel William J. Bayles  
June 20, 2002  
Page Two

great river system. We were especially pleased to see the inclusion of the Middle Mississippi River Reach (St. Louis to Cairo) in the study area. While this reach of the river has suffered some of the greatest ecosystem losses, it has only received limited support for restoration from the Environmental Management Program (EMP).

I appreciate the collaborative effort the U.S. Army Corps of Engineers has embraced in the restructured study, and I look forward to working with your agency as well as with the other Mississippi River basin states to improve this great river system.

Sincerely,



Bob Holden  
Governor

BH:CW:se

c: Brigadier General Edwin J. Arnold, Jr.  
Colonel Michael R. Morrow  
Holly Stoerker



*Denny*

## MISSOURI DEPARTMENT OF CONSERVATION

*Headquarters*

2901 West Truman Boulevard, P.O. Box 180, Jefferson City, Missouri 65102-0180  
Telephone: 573/751-4115 ▲ Missouri Relay Center: 1-800-735-2966 (TDD)

JERRY M. CONLEY, Director

June 3, 2002

Colonel William J. Bayles  
District Engineer, Corps of Engineers  
Clock Tower Building  
P.O. Box 2004  
Rock Island, IL 61204-2004

Dear Colonel Bayles:

Re: Upper Mississippi River - Illinois Waterway Navigation Study

The Missouri Department of Conservation appreciates the opportunity to provide the following on the restructured Navigation Study.

In our August 5, 1999, letter on the Navigation Study, we had concerns that environmental impacts/costs of current and future activities were not being fully investigated and therefore were not going to receive equal consideration. We expressed concerns with the high uncertainty contained in the models used to predict environmental impacts of current and increased traffic, the incomplete analysis of the environmental costs in the benefit/cost calculations for the proposed alternatives, the exclusion of cumulative effects of navigation-related impacts on the environment, the huge discrepancy between funding for Operation and Maintenance (O&M) and the Avoid and Minimize program, and the need for an updated EIS for the Nine-Foot Channel Project.

In the August 2, 2001, Project Guidance Memorandum, the Mississippi Valley Division was instructed to resume the Navigation Study under new guidelines. There are to be two products of the re-structured Study; an Interim Report due by July 2002, and a detailed, comprehensive implementation plan developed within a framework outlined in the Interim Report. Inclusion of environmental considerations relative to ecosystem sustainability in the Feasibility Study is a necessary first step toward addressing some of our previous concerns and achieving goals stated in several recent documents; for example, *A River That Works* and *A Working River*.

In the Memorandum, the national significance of the UMR ecosystem and navigability is noted as are the problems associated with aging locks and the decline in ecosystem balance. However, historically, and currently in some forums, the ecosystem is referred to as a constraint on the navigation system. It is important that all recognize the UMR ecosystem has been constrained by adverse impacts associated with navigation since the mid-nineteenth century.

COMMISSION

STEPHEN C. BRADFORD  
Cape Girardeau

ANITA B. GORMAN  
Kansas City

CYNTHIA METCALFE  
St. Louis

HOWARD L. WOOD  
Bonne Terre

Colonel William J. Bayles  
Page 2  
June 3, 2002

The National Research Council (NRC), in its evaluation of the original Navigation Study, recommended abandoning methods used in that effort to produce traffic forecasts because uncertainty inherent in the models was not considered. Study managers were directed to produce a range of future condition scenarios to be evaluated for inclusion in the final report. Those results are to be used by "decision-makers to consider relative risks and impacts of selecting a particular plan for implementation." The scenarios forecast traffic levels to 2050. The Department is concerned that such long-term scenario forecasts contain just as much uncertainty and may lead to bad decisions. We are more comfortable with scenarios that predict short-term (10 - 20 year) conditions.

The Memorandum gives guidance to the Corps to evaluate alternatives that would modify the navigation system, given reasonable opportunity, for ecosystem improvement or restoration. Within that item is a recommendation to address the Environmental Management Program (EMP) "to plan and implement ecosystem restoration measures that might be identified in this study." Given the fiscal and policy limitations within the EMP, we are not confident that ecosystem improvement or restoration funding in that program would ever be at a level that will ensure a sustainable system. The Department prefers to see a program that is tied directly to Navigation appropriations, guaranteeing that it will be fully funded, that adequately addresses ecosystem scale restoration or improvement and provides for expanding the long-term monitoring effort currently in place.

Many of the concerns expressed in the August 5, 1999, Statement of Concern from the Department to the Rock Island District Engineer have not been addressed: uncertainty in the models likely to be used that predict environmental impacts of traffic; the inaccuracy of the benefit/cost calculations due to incomplete analysis of the environmental costs; and the need for an updated Environmental Impact Statement for the Nine-Foot Channel Project. We are pleased that the restructured study will address the cumulative impacts of navigation system operation and maintenance on the ecosystem, and give equal consideration to environmental and navigation issues.

Thank you for the opportunity to comment on the study. You can be assured of our continued involvement and commitment to the natural resources of the Upper Mississippi River.

Sincerely,

  
for JERRY M. CONLEY  
DIRECTOR

c: Governor Bob Holden  
Steve Mahfood, Department of Natural Resources  
Upper Mississippi River Basin Association  
Upper Mississippi River Conservation Committee



Upper  
Mississippi River  
Basin Association

ILLINOIS, IOWA, MINNESOTA, MISSOURI, WISCONSIN

**Comments  
of the  
Upper Mississippi River Basin Association  
on the  
May 10, 2002 Draft Interim Report  
for the  
Upper Mississippi River and Illinois Waterways  
Restructured System Navigation Feasibility Study  
(May 30, 2002)**

The Upper Mississippi River Basin Association (UMRBA) outlined its preliminary views on the restructured Navigation Study in a February 27, 2002 document entitled "Upper Mississippi River Basin States' Perspectives on Refocused UMRS Navigation Study." A copy of that document is attached and serves as the basis for these comments on the draft Interim Report. In short, the states support the direction being taken in the restructured navigation study, whereby the scope of the study has been expanded to include both navigation and environmental needs and a collaborative process is being employed for conducting the study and developing the plan.

**Overview Comments**

- The states are pleased that the draft Interim Report generally reflects the concepts set forth in the February 2002 states' perspectives document. It is clear that the Corps of Engineers has earnestly sought to respond to the concerns that have been expressed about this study and to develop a more integrated approach.
- Despite the fact that considerable progress has been made in reshaping the study, much of the most challenging work still lies before us over the next two years in the feasibility study. Unfortunately, the Interim Report does not clearly describe how those challenges will be met. The remaining tasks, the process for evaluating and resolving implementation issues, and the schedule of decision points and study milestones must all be clearly defined. In short, the Interim Report should describe the "pathway" for bringing this complex study to a successful conclusion.
- Contrary to expectations engendered by General Griffin's August 2001 study guidance, the report offers no recommendations for "interim measures to partially achieve the...objectives while the feasibility study is being completed." The states believe that the Interim Report offers an opportunity to advance some discrete near-term recommendations,

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particularly regarding funding for existing programs, such as the Environmental Management Program and Operation and Maintenance, for which there is broad concurrence, or for small scale navigation improvements recommended 20 years ago in the Master Plan, but never implemented.

- Collaboration has been a central theme in the restructured study and a welcome approach to this complex study. Broad distribution of early drafts of study products has offered study participants opportunities to be more fully engaged in the process. Yet the success of the collaborative process will ultimately be judged not on the timing and quantity of review materials, but on whether there are meaningful ways in which the study participants can be involved in the decision-making process. Particularly as the study moves forward, it will be critical to clearly establish a mechanism for achieving consensus that is both timely and substantive. In addition, the states would note that the interagency and interstate coordination inherent in this collaborative process will take time. We would hope that the relatively short review time for preparation of comments on the Interim Report is not going to be the standard for the balance of the study process.
- The states recognize that restructuring the study to address environmental sustainability required expanding the scope of the study to include much broader consideration of ecosystem conditions, needs, and management issues. Yet this expanded effort seems to have resulted in a report that is not equally thorough in its treatment of navigation and environmental issues. Presumably this is not intended to suggest a departure from the commitment to equal consideration. However, the states urge the authors to keep navigation and environmental sustainability in balance.

In addition to the above general observations, the states offer the following specific comments on the May 10, 2002 draft Interim Report, including comments on sections of the report devoted to Plan Formulation, Implementation Issues, and Conclusions and Recommendations:

(Remainder of comments available upon request)



June 7, 2002

4469 - 48<sup>th</sup> ave ct.  
Rock Island, IL 61201

Telephone 309/793-5800, ex 522

Col. William J. Bayles  
US Army Engineer District, Rock Island  
Attention: Mr. Denny Lundberg  
Clock Tower Building, PO Box 2004  
Rock Island, Illinois 61201-2004

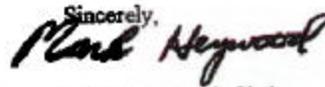
Dear Col. Bayles,

The Upper Mississippi River Conservation Committee (UMRCC) has been actively following the progress of the Upper Mississippi and Illinois Rivers System Navigation Study since it began more than ten years ago. The UMRCC welcomes the recent expansion of the study's purpose to include environmental sustainability as well as navigation. This change is an important first step toward achieving an Upper Mississippi River System (UMRS) that can sustain both commercial navigation and natural resource uses.

Although the UMRCC received a copy of the draft Interim Report for review and comment, we do not intend to provide any specific comments. Instead, we offer the attached report entitled "*A Preliminary Description of Habitat Objectives and Estimated Costs Needed to Achieve a Desired Level of Ecosystem Integrity on the Upper Mississippi River System*". This report is a follow-up to the UMRCC's year 2000 report, "*A River That Works and a Working River*". The "*Working River Report*" described nine critical habitat objectives needed to restore the natural resources of the Upper Mississippi River system to a sustainable condition. The enclosed report describes an initial assessment of specific habitat measures/actions (and estimated costs) needed to accomplish these nine objectives. We believe the report sets the stage for describing habitat needs for a sustainable environment and should become a focal point of the UMRS navigation feasibility study report.

Managing the UMRS for both navigation and natural resources will require cooperation between the people and entities who use it. Undoubtedly, there will be considerable discussion around the recommendations in the attached report, and the need to prioritize and develop an implementation plan will be part of this process. We look forward to this dialogue, and believe a continued collaborative approach between the UMRCC, Corps of Engineers, navigation industry, and other river partners will help balance the river's many uses and ensure a healthy ecosystem.

Encl.

Sincerely,  


Mark Heywood, Chair  
Upper Mississippi River  
Conservation Committee



## **Comments on Navigation Study Draft Interim Report**

Submitted, June 7, 2002

These comments are submitted on behalf of the Midwest Area River Coalition 2000 (MARC 2000). MARC 2000 is a coalition of agricultural, industrial and labor entities in the Mississippi, Illinois and Missouri River valleys concerned with the modernization of the inland river transportation system in an environmentally responsible fashion.

MARC 2000 is joined in this submission by the American Waterways Operators, Carpenters' District Council of Greater St. Louis and Vicinity, and these member companies:  
ADM/American River Transportation Co., Ag Processing Inc., Agribusiness Association of Iowa, Agricultural Retailers Association, Agrium, All American Coop, Alliant Energy, Alter Barge Line, Ameren, Ameren Energy Generating, American Commercial Lines, American Farm Bureau Federation, American Soybean Association, Amity Investments, Inc., Aon Risk Services of Missouri, BCI, Inc., Big Soo Terminal, Blackhawk FS, Inc., Blaske Marine, Inc., Borchers Oil, Inc., Brennan Marine, Inc., Brenntag Mid-South, Inc., Bunge North America, Inc., Bussen Terminal, Cahokia Marine Service, Cargo Carriers/Cargill, Caterpillar Inc., Cenex Harvest States, Ceres Consulting, L.L.C., CF Industries, Inc., CGB Enterprises, Inc., City of Keokuk, CoBank, Colusa Elevator Company, Consolidated Blenders, Inc., Continental Cement Company, Inc., Cora Terminal, L. P., Dairyland Power Cooperative, Dakota Bulk Terminal, Inc., Dakota, Minnesota & Eastern Railroad Corp., DeBruce Grain, Inc., Determann Industries, Inc., Dyno Nobel Inc., Eagle Marine Industries, Inc., East Side River Transportation, Inc., Economy Boat Store, Fabick Power Systems, Farm Country Co-op, Farmers Coop Association, Farmers Cooperative Elevator Company, Farmers Elevator Company of Traverse, J. Russell Flowers Inc., Garvey Marine, Inc., Gateway Arch Riverboats, Gateway FS, Inc., Grain and Feed Association of IL, Grain Processing Corporation, Great River Economic Development Foundation, Green Bay Farms L.P., Grundy County Farm Bureau, Grundy Economic Development Council, Harber, Inc., Harmony/Preston Agri Services, Inc., Hawkins Chemical Company, Holcim (US) Inc., Horner & Shifrin, Inc., Howard/Cooper County Reg. Port Auth., Humco Marine Products, Inc., IEI Barge Services, Inc., Illinois Corn Growers Association, Illinois Farm Bureau, Illinois Fertilizer & Chemical Assn., Illinois Marine Towing, Inc., Illinois River Carriers Assn., Illinois Soybean Association, Ingram Barge Company, Inland Detroit Diesel-Allison, Interstate Marine Terminals, Inc., Iowa Corn Growers Association, Iowa Farm Bureau Federation, Iowa Gateway Terminal, Iowa Soybean Association, Jacobs/Sverdrup, Jebro Incorporated, Jefferson Barracks Marine Service, Inc., Jersey County Economic Development Corp., Jersey County Grain Company, Kansas City Power & Light, Kaskaskia Regional Port Authority, Kindra Lake Towing, L.P., Kirby Corporation, Lafarge Corporation, Lewis & Clark Marine, Lewis, Rice & Fingersh, L.C., Limited Leasing Company, Linwood Mining & Minerals Corp., Lone Star Industries, Inc., Luhr Bros., Inc., Magnolia Marine Transport Co., Marquette Transportation Co.,

Inc., Massman Construction Co., MEMCO Barge Line, Merrill Marine Services, Mertel Gravel Company, MFA, Inc., Midland Enterprises, Midwest Industrial Fuels, Inc., Mid-West Terminal Warehouse Company, Miller, Robert B. & Associates, Inc., Minneapolis Grain Exchange, Minnesota Agri-Growth Council, Inc., Minnesota Corn Growers Association, Minnesota Crop Production Retailers Assn., Minnesota Farm Bureau Federation, Minnesota Grain and Feed Association, Minnesota Ports Association, Minnesota Soybean Growers Association, Minnesota Wheat Research and Promotion Council, Mississippi Chemical Corporation, Mississippi Welders Supply Co. Inc., Missouri Ag Industry Council (MO-AG), Missouri Barge Line Company, Inc., Missouri Chamber of Commerce, Missouri Corn Growers Association, Missouri Farm Bureau Federation, Missouri Levee & Drainage Dist. Assn., Missouri Oil Council, Missouri Port Authority Association, Missouri Soybean Association, Monsanto, National Corn Growers Association, National Council of Farmer Cooperatives, National Maintenance & Repair, Inc., New Bourbon Regional Port Authority, New Madrid County Port Authority, Norman Bros., Inc., Northstar Navigation, Inc. (Newco), NW Agri-Dealers Association, Olympic Marine Company, Ostrander Farmers Coop, Pattison Bros. MS River Terminal, Inc., Peoria Barge Terminal, Pinnacle Transportation, Inc., Plaquemine Towing Corporation, PML, Inc./Panzer Marine Transp. Inc., Port of New Orleans Board of Commissioners, Prairie Premium Agricultural Coalition, Quad City Development Group, Ray-Carroll County Grain Growers, Inc., River Cement Company, River Stone Group, Inc., Riverland Resources, Inc., Riverview Farm, Riverway Company, F.J. Robers Co., Inc., Sargeant Grain Company, Scott County Farm Bureau, SE Grain & Feed Dealers Assn., Seneca Transportation, Southern IL Construction Adv. Prog., Southern Illinois Transfer Company, Southern Towing Company, ST Services, St. Louis County Port Auth/Econ. Council, St. Louis RCGA, State Steel Supply Co., John W. Stone Oil Distributor Inc., Tennessee Valley Towing, Inc., Terminal Express, Tomen Grain Company, Tri-City Regional Port District, Trinity Marine Products, Inc., TriOak Foods, Inc., Twomey Company, United Soybean Board, Upper Mississippi Waterway Assn., Upper River Services, Ursa Farmers Cooperative, The Waterways Journal, West Central IL Bldg/Construction Trades Council, Western Kentucky Navigation, Inc., Whitewater Creek Grain & Feed, Inc., Winona River & Rail, Wisconsin Agri-Service Association, Wisconsin Corn Growers Association, and Wisconsin Soybean Association.

June 7, 2002

### **General Comments**

The Corps should be commended for working diligently through the collaborative process to achieve a workable draft document and is encouraged to release this report on time. However, this draft severely misses the mark in projecting a reasonable and qualitative indication of likely necessary large-scale navigation improvements to the Upper Mississippi and Illinois Rivers. Nor does it even recommend moving forward with proven small-scale navigation initiatives as it does for O&M efforts for the ecosystem. Overall, this report lacks appropriate balance and treatment of economic facts and implications consistent with the level of detail outlined for environmental issues.

While this draft attempts to underscore the future possible "breakpoint" for the environment of the river (page 109), it lacks similar appreciation for the likely economic "breakpoint" to our declining international competitiveness as a grain exporting nation and the Midwest economy. After 10 years of close work with the project team, countless public meetings with hundreds of affected stakeholders providing testimony, the inability of the team to reflect the expediency of making federal investments in a timely fashion is disappointing.

As population increases threaten the functional capacity of land, water and air, all of which are finite resources, transportation alternatives become critical in defining growth and quality of life options. Central to the choice of transportation is the fundamental understanding that when a commodity cannot move by barge on the river, it will move by truck or rail. Of those three modes of freight transportation, each in its own way impacts the environment, consumes natural resources and presents the hazards of social impact through injury, death and property damage. When the effects of waterway transportation are evaluated independently of these fundamentals, environmental hazard is too often the sole concern.

This draft report lacks a holistic approach to assessing the environmental benefits of enhancing and encouraging the use of waterway transportation, the environmental benefits associated with longer locks and the likely impacts and any qualitative risk assessment associated with concepts and proposals that add cost and disincentive to the use of the inland waterway system. We hope that the specific comments that follow will help clarify these general comments.

The potential increase in freight rates via rising fuel taxes based on inefficient operations of old facilities and rehab costs, the full cost impact on the shipping community during the periods of lock refurbishment, the measure of risk taken by the seafarer working on a tow that needs to be locked through twice versus one that does only once or not at all, and cost estimates associated with two small scale measures (more deck hands, helper boats) are four issues that should be addressed in the feasibility study, not currently identified in the interim report.

Navigation Industry Perspectives on  
Refocused UMR-IWW Navigation Study

*June 28, 2002*

Introduction

The waterways community, including the Midwest Area River Coalition 2000 (MARC 2000), The American Waterways Operators (AWO), the National Waterways Conference (NWC), and Waterways Work! are pleased to see the restart of the Navigation Study with an aggressive timeline to complete this long overdue report to Congress. The industry is firmly committed to working as an active and constructive partner with the five Upper Midwest states through the Upper Mississippi River Basin Association (UMRBA), the U.S. Army Corps of Engineers (Corps), and other federal, state, and non-governmental agencies to move this process forward in a timely fashion. This product must be in a form that will allow Congress to review authorization options during the WRDA 2002 and WRDA 2004 legislative process.

**Navigation Issues: Agriculture**

Agricultural exports are vital to farm income, job creation, and the tax base throughout the entire Midwest. State legislators from the five Basin states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin expressed concern about their states' economic future through the passage of resolutions urging Congress to begin construction of new, more efficient lock structures on the UMRS.

The navigation community endorses the inclusion of the U.S. Department of Transportation (USDOT) and U.S. Department of Agriculture (USDA) in the federal and regional discussions and the inclusion of the National Corn Growers Association (NCGA) in the Corps' advisory "oval team." The NCGA and the USDA represent the principal stakeholder in this policy discussion, the Midwestern farmer. The Midwest's agricultural community has the most to lose without immediate lock improvements and modernization. Studies that definitively show the impacts of no action -- including the loss of growth export markets, shrinking farm income, decreasing total regional income and job growth in the Basin, along with the erosion of the property and income tax base -- have previously been forwarded to the study team.

The economic worst-case scenarios are not acceptable options to the navigation industry, the agricultural community or to local and state governments.

## **Navigation Issues: Infrastructure**

The vision of an inland waterways infrastructure and its significance to the future wealth and prosperity of the United States was realized early in our nation's history. To allow and encourage the free flow of commerce and settling of the vast new republic, the Founding Fathers mandated that all navigable waterways would be federally managed. President Thomas Jefferson furthered that vision westward with the Lewis and Clark expedition. Congress in the 1930's saw the need to improve transportation routes from the very productive agricultural lands of the Midwest to coastal and export markets. As the draft interim report documented, the federal government has continually looked for ways to improve this vital infrastructure with improved structures and practices. Internal improvements on America's vast system of inland rivers created a "third coast." The time has come to exhibit the forethought and vision of our forefathers and move forward with lock modernization.

As the U.S. population has grown and become increasingly prosperous, other modes of transportation have continued to take advantage of new structures, new technologies, and/or new practices to increase the capacity and speed of transit. Besides the increase in automobile and truck traffic lanes, improved airport facilities and new high-speed freight railways, Congress has also seen fit to increase the capacity of critical waterways in other regions of the country with modern 1200-foot locks. It is clear that modernizing the transportation infrastructure across all modes is viewed as sound public policy by legislators from both political parties.

Failing to move forward with lock modernization on the UMRS will not only have a negative impact on waterways transportation, it will also have a negative impact on industries that bring products to and from the river, such as short-haul rail and truck feeder lines. Eventually, as the economy is impacted negatively, long-haul rail and truck lines will feel the impacts as well. The environment will also suffer with any modal shifts to more environmentally intrusive modes of transport.

## **Navigation Issues: Funding**

In 1986, a 20-cent per gallon Inland Waterways User Tax was implemented to fund 50% of the cost of construction and major rehabilitation of projects on the inland waterway system. Congress levied this tax because it saw the need for modernization throughout the inland waterway system. Although these improvements continue to benefit a wide base of society, only the commercial navigation industry directly contributes to this funding. The Inland Waterways Trust Fund, which now has a surplus of more than \$400 million, should be allocated to the UMR-IWW system in a timely manner, with matching funds from the general Treasury. User taxes were collected for the sole purpose of improving the infrastructure of the inland waterways. Diversion of this fund for other uses is not acceptable to the industry.

The Inland Waterways Users Board (IWUB), a federal advisory committee, has made extensive recommendations to the Congress and the President regarding prioritization of projects and allocation of funds. These technical and practical recommendations should be a primary source of information and direction as the UMRS project moves forward.

## **Navigation Issues: Operations & Management**

To eliminate emergency shutdowns of locks throughout the system before and during the construction of 1200-foot locks, both Congress and the Corps must address the extensive Operations & Management (O&M) backlog on aging locks. Continued deferred maintenance should not be tolerable to a world-class economy or to a Congress interested in improving the economic health of the nation. The Corps and the U.S. Department of Transportation should be active advocates for adequate maintenance of the existing inland waterways infrastructure.

## **Environmental Issues**

Increasing the capacity for waterborne commerce is good for the environmental sustainability of the Midwest region and the nation. First, compared to other forms of transportation, water transportation moves bulk products with the least amount of air pollution and fossil fuel usage, making it the most environmentally friendly form of commercial freight transportation. A modal shift from water to rail or truck would negatively impact areas struggling with EPA clean air standards, such as St. Louis. Second, river tows that can transit the system without waiting outside of the channel due to lock delays will do less damage to environmentally sensitive parts of the river. Third, keeping tows in the channel will decrease sediment resuspension. All of these environmental benefits should be considered and incorporated into the Corps' matrix.

The river industry has long been a supporter of the Environmental Management Plan (EMP), both in public meetings and in discussions with Congress. This program has a long history of state/federal/private partnerships that have consistently and thoughtfully improved the ecological environment of the Basin. The river industry continues to support this admirable program with full and reliable funding. Although other options should be discussed and considered, EMP has a proven track record of success and should be given extensive consideration as the vehicle for environmental projects. Increased funding of the EMP would finance a proven program while not increasing bureaucracy on the federal or state level.

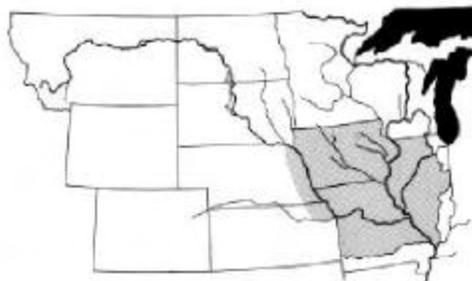
Appropriate funding mechanisms to support an enhanced ecosystem restoration effort and to redress cumulative impacts should be addressed during the feasibility phase of the study. Funding mechanisms should not be drawn from navigation funding sources, such as the Inland Waterways Trust Fund, which should only be used for the purpose for which it was created, namely, infrastructure construction and major rehabilitation.

## **Social Issues**

Quality of life throughout the Basin is increased with the movement of products on the river. Benefits include, but are not restricted to, less noise pollution, cleaner air, less traffic congestion, and fewer highway transportation-related injuries and loss of life. These quality of life issues should be evaluated monetarily and with consideration commensurate with their importance to the Midwest region and the nation. The quality-of-life benefits of navigation improvements must be incorporated into the various scenarios.

## **Summary**

The navigation community embraces a balanced approach to meeting the economic and ecological needs of the river basin. The region needs an improved navigation system to sustain our environment and economy. As its population grows, the nation needs to maintain the economic advantage afforded by a waterway transportation system that is the envy of the world. We look forward to a continuing cooperative effort with federal, state, and non-governmental agencies to create an improved waterway transportation system while enhancing flood control, investment opportunities, water quality, energy reliability, recreational benefits, and river health.



## Upper Mississippi, Illinois and Missouri Rivers Association

Comments on the Upper Mississippi River  
and Illinois Waterway Restructured System  
Navigation Feasibility Study,  
DRAFT 5-17-02.

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### **BACKGROUND:**

Although UMIMRA members and organizational representatives have participated in the public input opportunities leading up to the study's restructuring, our group's official representation on the joint Oval Group comprised of the Economic Coordinating Committee (ECC) and the Navigation Environmental Coordinating Committee (NECC) began in October 2001.

The invitation to participate came as a result of the restructured study's guidance to consider floodplain needs. Our input was encouraged because our membership represents diverse economic interests throughout the floodplain of the study area.

As latecomers to the inner circle of stakeholders, it seemed that the floodplain discussion had been framed in terms of ecosystem needs and tradeoffs long before we became involved, thereby limiting any substantial contribution from our group to determine the far more complex "needs" of floodplain interests.

### **GENERAL OBSERVATIONS and SUGGESTIONS:**

1. **OBSERVATION:** In general, it seems the entire purpose of the restructured Navigation Study has been either misidentified or misstated as one of "relieving lock congestion."  
**SUGGESTION:** Our board of directors and membership view **the overriding purpose of the study as to determine what is needed to maintain a globally competitive inland waterway system in the Upper Mississippi Valley.** Lock congestion is just one of many symptoms of the problem of an outdated infrastructure that does not allow for innovation in products or methods of transporting products on the rivers. (sidenote: the economics should account for goods transported throughout the entire study area, that reaches to the Mississippi-Ohio confluence. The significance of world grain prices being set from the Port of New Orleans, which is heavily dependent on the Upper Mississippi Valley grain shipments, should also be stressed in the economic analysis.)
2. **OBSERVATION:** Due to revised guidance, the objective to, "address ecosystem and floodplain management needs related to navigation" is referenced many times throughout the report.  
**SUGGESTION: Remove the word "management" from the phrase "floodplain management."** (ex. pp. 11, 80 Report, p. 16 Exec. Summ.) It is a term that takes on a number of different connotative meanings depending on who is speaking and the topic of conversation. From UMIMRA's perspective, the term "floodplain management" reeks of regulatory command and control measures that expedite public land acquisition by

removing incentives or placing multiple barriers to economic development in floodplains. The phrase implies management through executive branch (state or federal with county requirements) administration without recognition to tremendous public benefits provided by efforts of the number of private landowners and businesses who have funded the capture and removal of sediment prior to reaching mainstem tributaries and maintenance of interior water levels, in many cases for close to 100 years, using their own dollars and time – not public resources. Much of the floodplain area of the study is not protected by levees. However, those areas that are protected by levees provide stability for economic and ecosystem activities. In short, the phrase “floodplain management” is offensive as it understates the roles played by thousands of private interests – far more than agricultural production – and overstates the role of public administrators.

3. OBSERVATION: In an effort to keep the Study to an almost manageable scope, the “99 WRDA Comprehensive Floodplain Study” is referenced as an important piece to provide more thorough input on floodplain needs – outside of the Navigation Study’s primary purposes.

SUGGESTION: **Properly reference the 99 WRDA piece.** As authorized in Section 459 of the Water Resources Development Act of 1999, the above referenced study is titled, “Upper Mississippi River Comprehensive Plan.” (ex. pp. 5, 15 Exec. Summ., pp. 36, 41, 122 Report)

Also, **properly describe what the Plan will deliver** (p. 61-62 2.4.2.3 Report). There are three primary deliverables expected in a report due to Congress three years from the date of funding the planning process: 1. contain recommendations on management plans and actions to be carried out by the responsible Federal and non-Federal entities; 2. specifically address recommendations to authorize construction of a systemic flood control project for the Upper Mississippi River (and Illinois River as defined in geographic scope); and 3. include recommendations for Federal action where appropriate and recommendations for follow-on studies for problem areas for which data or current technology does not allow immediate solutions. Since the Project Management Plan for the Comprehensive Plan has yet to be developed and approved by Corps officials, it might be premature to outline the items as currently written on the top of Page 62.

4. OBSERVATION: A false dichotomy of navigation-environment permeates the document and the study effort (ex. p. 39 2.3.2, p. 97 2.5.1.2 Report; p. 13 Exec. Summ.). By communicating outside the study process, some non-governmental groups have achieved limited recognition that these two functions are not exclusive of each other. That recognition has yet to translate to implementable strategies – largely due to the limited resources of stakeholder interests to fully learn about all facets of all project purposes and the limited will to incorporate “equal project purposes” into their own mission statements and organizational action plans. (In other words, the debate has been incorrectly oversimplified to two issues. Groups are different because they form around different motives and philosophies. And there’s been a lot of talk and only actions that lead to more tradeoffs, not mutually beneficial solutions.)

SUGGESTION: **Any reference to considering a multi-purpose system authority with adequate funding or other references to multiple needs/uses/purposes/ or mandates,**

**should include flood control (Add to flow chart p. 13 Exec. Summ., p. 121 Report).**

This is a necessary building block to protect critical infrastructure that allows businesses and recreation access to the rivers for navigation and to protect much of the habitat (public and private) that is cited time and again as a national treasure (ex. p. 80 2.4.3.7 Report).

The **“Goals for the Floodplain” (p. 41 2.3.4 Report) completely overlook industry and commercial activity interests in the floodplain and link recreation to environmental projects without adequate credit to flood control.** The first is a glaring omission. Both statements reflect a bias that must be eliminated prior to pursuing the Comprehensive Plan. The segment on **“Social Goals” (p. 41 2.3.5 Report)** begins to recognize that people need to be employed before they can afford to play outside. However, it once again **overlooks the role that flood control plays to allow for intermodal access, interstate commerce, protection of critical infrastructure such as water supplies and power production-distribution and recreational access to the rivers.**

Another example of under rating or overlooking the role of flood control structures is found on p. 5 of the Executive Summary, “In the middle and southern portions of the basin the habitat provided by the mainstem rivers represents the most important and abundant habitat in the region for many species...Agriculture dominates the wide floodplain south of Rock Island, Illinois...” Despite agriculture “dominating” the floodplain, this area is admittedly the richest habitat in the study area.<sup>1</sup> We learn through the Report on p. 53 2.4.2.2 that “levees protect about three percent of the floodplain north of Clinton, Iowa, 50% of the floodplain between Clinton and Alton, Illinois, 83% of the floodplain south of St. Louis to the Ohio River, and 60% of the Illinois River south of Peoria, Illinois.” **These facts also contradict the notion that floodplain connectivity – which implies removing or notching levees – is necessary to provide rich habitat.**

**The survey design and methods used for both the Long Term Resource Monitoring Program and the Habitat Needs Assessment need to be closely reviewed before they are referenced as valid information on which to base system wide (multi-purpose) decisions,** including identification of goals (p. 41 Report).

Also suggest that the **economic benefits of waterborne recreation** be more accurately documented and figured into the cost-benefit economic analysis of the lock and dam system. (ex. p. 6 Exec. Summ; pp. 16, 41, 62 Report)

Recognize that **consensus, under time and funding constraints, leads to the lowest common denominator** instead of maximizing the resources for each function or facet of the rivers. **Staying focused on the primary purpose of the study (globally competitive inland waterway system), while being aware of and minimizing system impacts or maximizing synergies, will achieve better results** for the purpose of Navigation in the long run.

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<sup>1</sup> However, the Report p. 57 2.4.2.2.7 contradicts the Executive Summary citing habitat above Pool 14 as more diverse and higher quality. Yet, the specie numbers indicated to exist below Pool 14 seem larger. ?

(Specific comments available upon request)

American Rivers \* Environmental Defense \* Institute for Agriculture and Trade Policy \*  
Izaak Walton League of America \* Mississippi River Basin Alliance  
Audubon \* National Wildlife Federation \* Sierra Club  
Mississippi River Revival

July 11, 2002

U.S. Army Corps of Engineers,  
Rock Island  
ATTN: CEMVR-PM (Lundberg)  
Clock Tower Building  
P.O. Box 2004  
Rock Island, IL 61204-2004

Dear Mr. Lundberg:

Our organizations are deeply concerned that the Draft Interim Report for the Upper Mississippi River-Illinois Waterway Navigation Study exaggerates expected barge traffic growth, proposes to use faulty economic models to forecast traffic growth, abandons the principles of benefit-cost analysis in favor of qualitative “scenarios,” fails to consider small-scale opportunities to immediately relieve lock congestion, and ignores the Corps’ existing legal obligations.

Since August 2001, we have been participating in the Corps efforts to develop a new scope of work for the revised Upper Mississippi River-Illinois Waterway Navigation Study, including frequent meetings and conversations with the study team and cooperating agencies. Some important steps have been made to increase our understanding of what is needed (1) to stop the ongoing degradation of the Upper Mississippi River System natural resources, (2) to restore those resources to a desired level, and (3) to actively maintain and restore existing habitats to meet the future needs of society.

As the Upper Mississippi River Conservation Committee recently reported, the science is clear: the Upper Mississippi and Illinois rivers are slowly losing the ability to support many species of river wildlife, and dam and channel construction and operation are leading causes of this ecological decline. The U.S. Fish and Wildlife Service, in a draft Fish and Wildlife Coordination Act report, recently concluded that “current fish and wildlife populations are not self-sustainable under the current navigation management regime” and that “the proposed project to increase navigation traffic will further degrade the resources of the river ecosystem unless appropriate management actions are taken. “ The Upper Mississippi and Illinois rivers are far more than commercial waterways. These rivers supports hundreds of species, including 10 federally protected species, and attract millions of annual visitors who spend \$1.2 billion, supporting 18,000 jobs. Accordingly, we believe that Corps should use objective, peer-reviewed methods and models to assess navigation and natural resource needs.

## The Draft Interim Report Ignores the Findings of the National Research Council

The Draft Interim Report simply ignores the recommendations of the National Research Council (NRC) in its 2001 Inland Navigation System planning report. First, the NRC rejected the Tow Cost Model that the Corps now proposes to use in the Draft Interim Report and instead directed the Corps to use an updated version of the Spatial Equilibrium model, which explicitly recognizes and incorporates the elasticity of demand for barge transportation. Second, the NRC rejected the Corps' grossly optimistic traffic forecasts in the original feasibility study, but the Corps continues to rely on similar forecasts of traffic growth, now called "scenarios," in the Draft Interim Report. Third, the NRC urged the Corps to first investigate small-scale measures such as mooring buoys and traffic scheduling before assessing more costly future transportation needs, but the Corps does not propose to quickly investigate and implement justified small-scale measures.

The Corps' failure to follow the NRC recommendations is particularly troubling in light of the history of the Navigation Study planning process. We urge the Corps to comply with the NRC recommendations by rejecting the Tow Cost Model, deleting the grossly optimistic traffic projections prepared by the Sparks Companies, and immediately focusing the study on the investigation and implementation of small-scale measures. If the Corps had followed the NRC recommendations in 2001, a revised Spatial Equilibrium model would nearly be complete; instead, the Corps proposes to use models and methods that reflect a major step backward from the draft feasibility study. We also urge the Corps to abandon its "scenario-based" approach and instead employ a credible benefit-cost analysis that (1) explicitly recognizes the uncertainty and risks associated with attempting to forecast the future, and (2) recognizes adverse environmental impacts and reasonably accounts for environmental mitigation and restoration costs. As importantly, we urge the Corps to submit the model the agency proposes to use in the revised feasibility study for review and approval by the NRC panel.

## The Draft Interim Report Ignores the Corps' Existing Legal Obligations

Although we are encouraged that the Corps has recognized the need to reexamine and modify its operations and maintenance activities and to implement much needed restoration and mitigation, we strongly oppose the Draft Interim Report's efforts to tie such a reevaluation to any potential lock and dam expansion. The Corps is already required by law to prepare a supplemental environmental impact statement on its operations and maintenance of the 9-foot navigation channel.

A properly prepared supplemental environmental impact statement would examine a full range of alternatives to the Corps' current practices to identify less environmentally damaging methods of operating the system. This would include evaluating alternative water level management regimes, evaluating alternative channel maintenance and pool plans, and examining the removal and redesign of channel training structures and levees all to enhance aquatic and floodplain habitat, restore natural hydrologic and geomorphic processes, and increase connectivity between the main channel and backwaters and floodplains.

The Corps also is already authorized to change its operations and maintenance practices to cause less ecological harm, and to recommend and implement any needed mitigation for past, ongoing, and future impacts of the existing navigation system. As the Draft Report and other analyses recognize, less environmentally damaging operations and maintenance practices also can have significant restoration benefits. We urge the Corps to immediately prepare a comprehensive supplemental environmental impact statement, and where appropriate, to take immediate steps to improve the health of the Upper Mississippi River.

#### Mitigation Efforts Should Not Be Tied To Any Authorization Arising From The Feasibility Study

We are deeply concerned that the Corps intends to delay long overdue mitigation measures unless longer locks are recommended for authorization. As discussed above, the Corps does not need additional legal authority or new internal policies to examine mitigation or to take immediate steps to improve the health of the Upper Mississippi and Illinois rivers. In addition, we are concerned that by structuring mitigation as an element of the feasibility study, the Corps may propose that states share 35% of the cost of mitigation for the historic and ongoing impacts of the lock and dam system. We believe the federal government and the private beneficiaries of the lock and dam system should bear the cost of mitigating the historic and ongoing environmental impacts of waterway construction and operation.

#### Additional Restoration Efforts And Mitigation For The Impacts Of Any Potential System Expansion Should Be Fully Examined

Mitigation for the past and ongoing impacts of the existing navigation system should be augmented by a comprehensive restoration effort. We urge the Corps to revise the Draft Interim Report to recommend an evaluation of comprehensive ecosystem restoration efforts, and mechanisms for funding those efforts. We further urge the Corps to subject the proposed scope of work for environmental restoration to a panel of independent experts for review and approval. We urge the Corps to use as a foundation for restoration planning the preliminary report by the Upper Mississippi River Conservation Committee entitled “A Preliminary Description of Habitat Objectives (And Estimated Costs) Needed to Achieve a Desired Level of Ecosystem Integrity on the Upper Mississippi River System.”<sup>1</sup>

In particular, we urge the Corps to fully evaluate the removal and redesign of channel training structures to enhance aquatic and floodplain habitat, restore natural hydrologic and geomorphic processes, and increase connectivity between the main channel and backwaters and floodplains as part of a comprehensive restoration initiative (where mitigation-related efforts may not be sufficient). The Corps also should fully explore opportunities to acquire floodplain land and restore seasonal flooding by removing or repositioning levees.

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<sup>1</sup> Upper Mississippi River Coordinating Committee. A Preliminary Description of Habitat Objectives (And Estimated Costs) Needed to Achieve a Desired Level of Ecosystem Integrity on the Upper Mississippi River System. Rock Island, IL, June 2002.

The Corps also should examine measures to improve fish passage, as well as other measures that would prevent and reverse the spread of exotic species. In particular, we urge the Corps to consider severing the artificial link between Lake Michigan and the Illinois River to stop the introduction of new exotic species. In recent years, three new species have invaded the Inland Waterway system through this connection, devastating native mussels and the mussel industry. The introduction of exotics will likely lead to significant and expensive mussel recovery actions.

Mitigation for any potential expansion of the locks and dams also must be fully examined. A comprehensive and detailed mitigation plan that includes mitigation monitoring must be prepared before the selection of any recommended alternative in order to determine whether the environmental impacts of such an alternative can in fact be effectively mitigated.

#### Release of a Final Feasibility Study Should Not Be Tied To An Arbitrary Deadline

We are hopeful that meaningful traffic forecasts and restoration planning can be completed by 2004. However, we do not believe the Corps should rely on discredited economic models and insufficient environmental data to meet an artificial deadline. Under the most optimistic scenarios, locks on the Upper Mississippi and Illinois rivers are not likely to reach capacity and would not be eligible for trust fund cost sharing until at least 2015.

Given the very preliminary status of the Draft Interim Report and the significant concerns raised about the report, we urge the Corps to reiterate to Congress and the public that the Draft Interim Report does not in any way support authorization to construct any component of a navigation system expansion. This is particularly important given the ongoing consideration in Congress of a Water Resources Development Act (WRDA), and efforts by industry and agricultural interests to seek such authorization in this WRDA cycle.

In light of the Corps' efforts to manipulate the original feasibility study to justify construction of longer locks, we are disappointed that the Corps continues to rely on faulty economic models and traffic forecasts. Indeed, reliance on the Tow Cost Model and grossly optimistic traffic "scenarios" has further eroded undermined the credibility of the Corps planning process. We hope the Corps will instead develop credible traffic forecasts that will be subjected to National Academy of Science review and approval, abandon the use of qualitative "scenarios," fully examine comprehensive ecosystem restoration efforts, and immediately begin the process of preparing a supplemental environmental impact statement to reevaluate operations and maintenance practices, and take immediate steps to restore lost aquatic and floodplain habitat.

We look forward to working with the Corps to develop a revised feasibility study that addresses our concerns and deserves the trust of all stakeholders.

Sincerely,

Scott Faber  
Water Resources Specialist  
Environmental Defense

Tim Sullivan  
Executive Director  
Mississippi River Basin Alliance

Melissa Samet  
Senior Director, Water Resources  
American Rivers

David Conrad  
Water Resources Specialist  
National Wildlife Federation

Mark Muller  
Director, Environment and Agriculture Program  
Institute for Agriculture and Trade Policy

Bob Perciasepe  
Senior Vice President, Public Policy  
Audubon

Richard X. Moore  
Upper Mississippi River Regional Coordinator  
Izaak Walton League of America

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Sierra Club

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Executive Director  
Mississippi River Revival



**Public Employees for Environmental Responsibility**

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June 5, 2002

Denny Lundberg  
U.S. Army Corps of Engineers, Rock Island  
ATTN: CEMVR-PM (Lundberg)  
Clock Tower Building  
P.O. Box 2004  
Rock Island, IL 61204-2004

Dear Mr. Lundberg:

### INTRODUCTION

On May 10, 2002 the U.S. Army Corps of Engineers released "The Draft Interim Report for the Upper Mississippi River and Illinois Waterway Restructured System Navigation Feasibility Study." The Corps hailed this document as "a blueprint for moving forward with the feasibility study to ensure the UMRS [Upper Mississippi River System] continues to be a nationally treasured ecological resource as well as an effective transportation system." Draft Interim Report for the Upper Mississippi River and Illinois Waterway Restructured System Navigation Feasibility Study, 2 (May 10, 2002).

The stated purpose of this effort is "to reduce lock congestion" while achieving an environmentally sustainable system that addresses ecosystem and floodplain management needs related to navigation. § 1.1 Draft Interim Report, 11.

Significantly, the Draft Interim Report purports to establish the "existing and future without project conditions" for use in the final study. § 2.1, Draft Interim Report, 35. Because the Corps will not further review these conditions after the Interim Report is finalized, this Draft Interim Report is itself a decision document and not merely a preliminary "draft."

Public Employees for Environmental Responsibility (PEER) hereby submits the following comments to the Draft Interim Report for UMRS:

### SUMMARY OF COMMENTS

This Draft Interim Report:

- Violates the National Environmental Policy Act (NEPA), the Economic and Environmental Principles and Guidelines for Water and Related Land Resources

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Field Offices: California • Maine • Montana • New England • Refuge Keeper • Rocky Mountain • Southwest • Tennessee • Texas • Washington

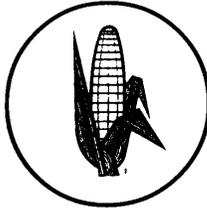


Implementation Studies (P&G), and the Corps' own Engineering Regulations (ER);

✘✘ Mischaracterizes, ignores, and contradicts the explicit recommendations of the National Research Council (NRC) of the National Academy of Sciences; and

✘✘ Constitutes a significant step backwards in Corps planning to the detriment of the true system stakeholders, the taxpayers.

(Detailed comment available at Nav. Study website: )



National  
**Corn Growers**  
Association  
www.ncga.com

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June 13, 2002

Brigadier General Edwin J. Arnold, Jr.  
U.S. Army Corps of Engineers  
Mississippi Valley Division  
P. O. Box 80  
Vicksburg, MS 39181-0080

Dear General Arnold:

On behalf of the 32,000 members of the National Corn Growers Association (NCGA), I would like to commend the U.S. Army Corps of Engineers on the thorough, and inclusive manner in which you have conducted the Upper Mississippi River-Illinois Waterway Navigation Study. The Corps has taken great strides to ensure that stakeholders are informed and involved in the study process.

Throughout the study process NCGA and other agricultural groups have emphasized the importance of modernizing locks on the Upper Mississippi and Illinois Rivers. This river system connects midwestern growers with world markets. However, investments in this crucial waterway have not kept pace with current or future demand.

While the Corps has methodically conducted the Navigation Study, the need for increased lock capacity has become dire. Congestion-related delays, lost agricultural sales, and slippage in U.S. competitive position have all occurred during this study's life. Without investment in new lock capacity soon, the economies of agriculture, the Midwest, and the entire Nation will erode.

Recently, NCGA released a study quantifying the macroeconomic impacts related to delaying lock modernization. If lock expansions are not made by 2020, the average cost of transporting corn and soybeans to export could increase by 17 cents per bushel. This seemingly modest cost increase will have a devastating impact on the agricultural economy. These impacts include reduced production, lost export sales, and a \$562 million drop in farm income. This precipitous drop in farm income would reduce agricultural employment by nearly 11,000 jobs resulting in \$185 million decline in state and local tax receipts. As this continues to ripple through the Midwestern and National economy, an additional 9,000 jobs would be lost due to reduced tax receipts, and higher food prices. Although the Corps has thoroughly studied the economic impacts of lock construction, they have completely ignored the secondary and tertiary impacts of lock expansion or inactivity.

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NCGA is committed to work with the Corps and the environmental community to develop practical, common sense solutions to improve the river's ecosystem. We have always advocated for a better environment. It is the contention of all of our members that we can make much needed improvements to the locks, and still provide for environmental enhancement. These are not mutually exclusive goals.

Finally, after an extensive review of this interim report, we believe that the Corps has provided sufficient documentation to justify authorization of new locks. Even though the Corps will not complete the final feasibility study until 2004, they have presented convincing evidence that current traffic levels justify new locks, and increases in future traffic will only further exacerbate lock delays to the detriment of the National economy. It is now time to make this National investment.

Sincerely,



Tim Hume, President  
National Corn Growers Association  
Walsh, Colorado

cc. Denny Lundberg  
U.S. Army Corps of Engineers  
Clock Tower Building  
P.O. Box 2004  
Rock Island, IL 61204



**Illinois  
Corn  
Growers  
Association**

**Comments on Navigation Study  
Draft Interim Report**

Submitted, June 7, 2002

Illinois Corn Growers Association (ICGA) respectfully submits the following comments regarding the Army Corps of Engineers Draft Interim Report on behalf of its membership. ICGA is a membership-trade organization representing the state's corn producers on a variety of issues including river management.

**General Comments**

Agriculture continues to be the state's largest industry and corn and soybeans are the foundation of agricultural commerce, so the ability to export and compete in world markets is fundamental to all Illinois citizens.

Ninety-six percent of our potential customer base lives outside the borders of the United States. So, Illinois Corn Growers Association believes an efficient river transportation system is critical to the economic health and future viability of the Illinois economy. We currently export half of our corn crop and more than half of our soybeans and soybean products.

Illinois industry utilizes the Mississippi River and Illinois River heavily, but for the purposes of these comments we will address the Illinois River primarily. ICGA is a signatory on the Midwest Area River Coalition 2000 comments, which are specific to the entire river complex.

Perhaps our number one concern is the very obvious tenor of the Draft Interim Report which seems very environmentally focused. ICGA appreciates and advocates the need for a balanced approach to managing our river system and meeting the needs of businesses, recreational users, and environmental constituencies. However, we would like to see more emphasis on the importance of navigation reflected in the final report to strike a more even balance.

**Export Outlook**

The trend toward increasing exports of corn and soybeans is well documented. What is equally clear is that the buying power of many nations is increasing as populations continue to grow. China offers a perfect example. However, many of these same nations do not have the land resources or the technical expertise to become self sufficient regardless of their internal policies or desire.

At the same time, exponential growth in yields are forecast in the U.S. as a result of the emerging science of biotechnology. Some are currently portraying biotechnology as an export limiting element, but it will be less of a factor in exports in the near future. Biotechnology has

been used as an artificial trade barrier but this strategy cannot be sustained. Biotechnology is gaining acceptance as science overrides speculation and fear.

Of the five scenarios under review, ICGA will dispute any which do not factor in export growth. Corn production numbers provided by ICGA previously document the fact that corn yields and production trends have moved to a new plateau. Biotechnology is making historic production trends irrelevant unless they are put in perspective with yield increases in recent growing seasons.

Ultimately, we can either maintain our river locks as a means of accessing these hungry customers or allow our competition to service these markets. ICGA believes it is short sighted to allow our productivity to become a detriment, rather than an asset.

It would also lack vision to assume these markets will be handed to us without competition. For all intent South America has caught the U.S. in terms of productivity and they are working tirelessly to close the transportation gap. ICGA believes lock upgrades will allow the U.S. to continue to be the preeminent exporter for years to come.

### **Proposed Options**

ICGA asserts the pivotal role of the Illinois River makes any plan which does not incorporate major improvements to this system unacceptable. Therefore, Alternative 1, & 4 should be excluded. Tonnage and seasonal demand on the Illinois River support this assertion.

Congestion Fees mentioned under Alternative 2 do not ultimately resolve the problem either because they too would make us less competitive, limit exports and depress the agriculture economy. Our goal should be to provide a multi-functional river resource that meets the diverse needs of society, not to put off the problem facing our society and delay it for future generations.

The concept of traffic scheduling mentioned in Alternative 3 should be discarded out of hand because it shows no appreciation for the realities of commodity sales and transportation needs. Many customers for U.S. goods do not have the luxury of buying ahead because of limited capital, nor do they have the storage infrastructure or means to operate in this type of environment. Our ability to produce a consistent supply, store commodities as needed, and ship efficiently are key to our holding the majority share of world grain demand.

ICGA has previously stated its belief that there is enough data to support five new locks on the Mississippi River and two locks on the Illinois River.

### **Locking Delays**

ICGA wants to make sure the report contains a detailed and accurate picture of lock delays which adequately reflects traffic patterns and transportation needs on our rivers. Specifically, it is not sufficient to look strictly at "average lock delays" on the Illinois River. Because of the

ability to “open pass” (at Peoria and LaGrange locks) by lowering wickets in time of high water, this makes average delay numbers nearly irrelevant.

To truly address the demand picture on the Illinois River you must assess data for periods with and without open pass. Considering locking is not necessary for many months of the year, the annual average locking numbers are seriously suspect.

Exporting is an on-demand enterprise so it’s not the average delay but the actual delay at the time the lock is needed that is relevant. A three-hour locking procedure (an typical locking time) during peak export season translates into poor customer service and endangers future business. The increased locking cost is also a burden to farmers who ultimately pay increased shipping costs. These elevated shipping costs increase the cost of our corn to customers worldwide, thus making us less competitive.

The more inefficient our transportation system becomes the larger share of world demand we lose.

### **Seasonal Demand**

Seasonal demand is another factor which requires a closer look. It is common knowledge that the river sees heavy agricultural traffic in the fall, but another factor that deserves consideration is the shift of tonnage from the Mississippi to the Illinois River during the winter months.

When the Mississippi River closes in the winter all of the traffic shifts to the Illinois within the Rock Island District. This is a common occurrence. The data indicates the actual tonnage on this critical portion of the Illinois River actually moves more tonnage during the winter months than the Mississippi River portion of the Rock Island District. Half the total tonnage passing St. Louis comes off the Illinois River because of increased traffic demand in the winter.

The restrictive size of the Peoria and LaGrange locks are amplified even more because of icing in the winter. Although the river remains passable, there is a constant need to lock vessels and cargo as well as ice flows through the locks. As a result, expanding to 1200-foot locks at Peoria and LaGrange would have the added benefit of speeding the locking of tows and ice flows.

### **Illinois Priority**

ICGA contends the arguments above show the need for giving upgrading of the Illinois locks a high priority. In previous versions of the draft navigation proposals it was projected that work on these Illinois locks might not begin until 2020. The condition of these facilities is such that they clearly will not withstand this kind of delay.

River carriers in previous hearings and commentary clearly stated these locks cannot wait another 18 years for major improvements because of the tonnage and the overall volume of traffic moving on the Illinois River.

Thank you for the opportunity to offer comment on the Draft Interim Navigation Study.

Gary Niemeyer, President  
Illinois Corn Growers Association



## MISSOURI CORN GROWERS ASSOCIATION

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WORKING TO INCREASE THE PROFITABILITY OF CORN PRODUCTION

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June 14, 2002

Brigadier General Edwin J. Arnold, Jr.  
U.S. Army Corps of Engineers  
Mississippi Valley Division  
P. O. Box 80  
Vicksburg, MS 39181-0080

Dear General Arnold:

On behalf of the Missouri Corn Growers Association (MCGA), I would like to commend the U.S. Army Corps of Engineers on the thorough, and inclusive manner in which you have conducted the Upper Mississippi River-Illinois Waterway Navigation Study. The Corps has taken great strides to ensure that stakeholders are informed and involved in the study process.

Throughout the study process MCGA has emphasized the importance of modernizing locks on the Upper Mississippi and Illinois Rivers. This river system connects midwestern growers with world markets. However, investments in this crucial waterway have not kept pace with current or future demand.

If lock expansions are not made by 2020, the average cost of transporting corn and soybeans to export could increase by 17 cents per bushel. This seemingly modest cost increase will have a devastating impact on the agricultural economy in Missouri. These impacts include reduced production, lost export sales, and a drop in farm income. This precipitous drop in farm income would reduce agricultural employment resulting a decline in state and local tax receipts.

MCGA is committed to develop practical, common sense solutions to improve the river's ecosystem. We have always advocated for a better environment. It is the contention of all of our members that we can make much needed improvements to the locks, and still provide for environmental enhancement. These are not mutually exclusive goals.

Finally, after an extensive review of this interim report, we believe that the Corps has provided sufficient documentation to justify authorization of new locks. Even

A grassroots organization directed by its members, dedicated to increasing the profitability of corn production by developing and expanding corn markets, collecting and distributing information, building coalitions with organizations and industries, and participation in the governmental and legislative process.



*Brigadier General Edwin J. Arnold, Jr.*

*June 14, 2002*

*Page Two*

though the Corps will not complete the final feasibility study until 2004, they have presented convincing evidence that current traffic levels justify new locks, and increases in future traffic will only further exacerbate lock delays to the detriment of the National economy. It is now time to make this National investment.

Sincerely,

Gary D. Marshall  
Chief Executive Officer

GDM:pp

cc. Denny Lundberg  
U.S. Army Corps of Engineers  
Clock Tower Building  
P.O. Box 2004  
Rock Island, IL 61204



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June 7, 2002

Brigadier General Edwin J. Arnold, Jr.  
U.S. Army Corps of Engineers  
Mississippi Valley Division  
P.O. Box 80  
Vicksburg, Mississippi 39181-0080

Dear General Arnold:

On behalf of the American Soybean Association (ASA), I would like to thank the U.S. Army Corps of Engineers for allowing us to comment on your Draft Interim Report for the Upper Mississippi River and Illinois Waterway Navigation Study. This is a critically important issue to soybean farmers, and we sincerely hope that our comments are reflected in your final study.

As few things are as important to soybean farmers as an efficient inland waterway system is, ASA believes that it is absolutely imperative that the Interim Report endorse the modernization of the locks and dams on the Upper Mississippi and Illinois Waterways. More specifically, we believe your study should recommend that locks 20 through 25 on the Upper Mississippi River and the Peoria and LaGrange locks on the Illinois River be lengthened from 600 feet to 1,200 feet. We also believe that your study should endorse guide wall extensions on Mississippi River locks and dams 14 through 18.

Nearly every other row of soybeans grown here in the U.S. is exported each year. And over 75 percent of these soybean exports move to world markets via the Upper Mississippi River and Illinois River systems. Though the locks and dams of the Upper Mississippi and Illinois Waterways have served us well, they are beginning to deteriorate at an alarming rate.

Grain transportation on these rivers relies upon a 60-year-old lock and dam system that was built to handle 600 foot barges. Most barges today, however, are 1,200 feet long, requiring the barge to be split and sent through one section at a time – a process known as “double locking”. The delays caused by the double locking process are costing American farmers millions of dollars a year in higher transportation costs.

These higher transportation costs equate to lower commodity prices or fewer international sales for U.S. farmers. In fact, according to a recently released study of the issue, failure to modernize our river infrastructure could lower soybean exports by 10 million bushels per year below 2020 projections. The study, authored by Mike Evans, an economics professor at Northwestern University's Kellogg Graduate School of Management, also claims that corn exports would decline by 68 million bushels per year below 2020 estimations.

Brigadier General Edwin J. Arnold, Jr.  
June 7, 2002  
Page 2

Meanwhile, our South American competitors are investing millions to improve their transportation infrastructure to make their grain more competitive in the global market. Argentina, for example, has invested over \$650 million to improve their transportation system. Likewise, Brazil is reviving its water transport network to reduce shipping costs for soybeans by at least 75 percent. As a result, Brazil and Argentina have captured 50 percent of the total growth in the world soybean market during the past three years. Further inaction with respect to the locks and dams of the Mississippi and Illinois Rivers will only allow this figure to grow.

Another important aspect of a modernized lock and dam system is the environmental benefits it would produce. According to the Environmental Protection Agency (EPA), towboats emit 35 to 60 percent fewer pollutants than trains or trucks. Likewise, a U.S. Department of Transportation (DoT) study reveals that a gallon of diesel fuel in a towboat can push a ton of freight two and a half times farther than rail and nine times farther than a truck. Also noteworthy is that fact that an average tow and barge replaces more than 800 semi-trucks on our nation's congested highway system.

Making the necessary upgrades to improve the Mississippi and Illinois Waterways would also protect jobs. Navigation on the Upper Mississippi and Illinois Rivers supports over 400,000 jobs. Roughly 90,000 of those happen to be high paying manufacturing jobs. However, the Evans study estimates that more than 20,000 jobs could be lost if nothing is done to improve the current system of locks and dams.

The bottom line is that U.S. soybean growers are no longer the lost-cost producers. What makes us competitive is our transportation infrastructure system. We have the ability to preserve this advantage, but we must be willing to act in a decisive manner. The time is now to modernize our transportation infrastructure on the Upper Mississippi and Illinois Waterways.

ASA thanks you for your consideration and looks forward to working with you in the future to improve the Mississippi and Illinois Waterways as a whole.

Sincerely,



Bart Ruth  
President



May 28, 2002

Colonel William Bayles  
Commander  
U.S. Army Corps of Engineers  
Clock Tower Building  
Arsenal Island  
Rock Island, Illinois 61204-2004

Dear Colonel Bayles:

The Quad City Riverfront Council (QCRFC) acknowledges the Army Corps of Engineers for its efforts toward a revised and comprehensive navigational study. The study recognizes the Mississippi River as a keystone; emphasizing a sustainable balance between commerce and environment. The QCRFC is cognizant of the commercial and economic value of the river, as well as the need to sustain a vibrant and lasting ecological and recreational system. The Corps' efforts in maintaining this balance are paramount to the success of the study.

The QCRFC supports the Corps' initiative to conduct an equitable and thorough evaluation of the Mississippi River navigation system. It embraces an expedient and amenable conclusion to the study. The results are demonstrative of a balanced approach, utilizing valid data and a viable analysis, impervious to contestation.

The QCRFC was created in the mid 1980's to promote coordination and communication of ideas among Quad Cities' representatives. For nearly two decades the QCRFC has worked to proliferate the free exchange of ideas and information regarding community planning and development within the Mississippi River corridor and along its shorelines.

Respectfully submitted,

Tim Huey  
President  
Quad City Riverfront Council

THOU:ah  
Environment/QCRFC/Ltr/Corps Nav Study Ltr

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**Navigation Industry Perspectives on**  
**Refocused UMR-IWW Navigation Study**

*July 11, 2002*

**Introduction**

The waterways community, including the Midwest Area River Coalition 2000 (MARC 2000), The American Waterways Operators (AWO), the National Waterways Conference (NWC), the River Resource Alliance (RRA) and Waterways Work! are pleased to see the restart of the Navigation Study with an aggressive timeline to complete this long overdue report to Congress. The industry is firmly committed to working as an active and constructive partner with the five Upper Midwest states through the Upper Mississippi River Basin Association (UMRBA), the U.S. Army Corps of Engineers (Corps), and other federal, state, and non-governmental agencies to move this process forward in a timely fashion. This product must be in a form that will allow Congress to review authorization options during the WRDA 2002 and WRDA 2004 legislative process.

**Navigation Issues: Agriculture**

Agricultural exports are vital to farm income, job creation, and the tax base throughout the entire Midwest. State legislators from the five Basin states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin expressed concern about their states' economic

future through the passage of resolutions urging Congress to begin construction of new, more efficient lock structures on the UMRS.

The navigation community endorses the inclusion of the U.S. Department of Transportation (USDOT) and U.S. Department of Agriculture (USDA) in the federal and regional discussions and the inclusion of the National Corn Growers Association (NCGA) in the Corps' advisory "oval team." The NCGA and the USDA represent the principal stakeholder in this policy discussion, the Midwestern farmer. The Midwest's agricultural community has the most to lose without immediate lock improvements and modernization. Studies that definitively show the impacts of no action -- including the loss of growth export markets, shrinking farm income, decreasing total regional income and job growth in the Basin, along with the erosion of the property and income tax base -- have previously been forwarded to the study team.

The economic worst-case scenarios are not acceptable options to the navigation industry, the agricultural community or to local and state governments.

### **Navigation Issues: Infrastructure**

The vision of an inland waterways infrastructure and its significance to the future wealth and prosperity of the United States was realized early in our nation's history. To allow and encourage the free flow of commerce and settling of the vast new republic, the Founding Fathers mandated that all navigable waterways would be federally managed.

President Thomas Jefferson furthered that vision westward with the Lewis and Clark expedition. Congress in the 1930s saw the need to improve transportation routes from the very productive agricultural lands of the Midwest to coastal and export markets. As the draft interim report documented, the federal government has continually looked for ways to improve this vital infrastructure with improved structures and practices. Internal improvements on America's vast system of inland rivers created a "third coast." The time has come to exhibit the forethought and vision of our forefathers and move forward with lock modernization.

As the U.S. population has grown and become increasingly prosperous, other modes of transportation have continued to take advantage of new structures, new technologies, and/or new practices to increase the capacity and speed of transit. Besides the increase in automobile and truck traffic lanes, improved airport facilities and new high-speed freight railways, Congress has also seen fit to increase the capacity of critical waterways in other regions of the country with modern 1200-foot locks. It is clear that modernizing the transportation infrastructure across all modes is viewed as sound public policy by legislators from both political parties.

Failing to move forward with lock modernization on the UMRS will not only have a negative impact on waterways transportation, it will also have a negative impact on industries that bring products to and from the river, such as short-haul rail and truck feeder lines. Eventually, as the economy is impacted negatively, long-haul rail and truck

lines will feel the impacts as well. The environment will also suffer with any modal shifts to more environmentally intrusive modes of transport.

### **Navigation Issues: Funding**

In 1986, a 20-cent per gallon Inland Waterways User Tax was implemented to fund 50% of the cost of construction and major rehabilitation of projects on the inland waterway system. Congress levied this tax because it saw the need for modernization throughout the inland waterway system. Although these improvements continue to benefit a wide base of society, only the commercial navigation industry directly contributes to this funding. The Inland Waterways Trust Fund, which now has a surplus of more than \$400 million, should be allocated to the UMR-IWW system in a timely manner, with matching funds from the general Treasury. User taxes were collected for the sole purpose of improving the infrastructure of the inland waterways. Diversion of this fund for other uses is not acceptable to the industry.

The Inland Waterways Users Board (IWUB), a federal advisory committee, has made extensive recommendations to the Congress and the President regarding prioritization of projects and allocation of funds. These technical and practical recommendations should be a primary source of information and direction as the UMRS project moves forward.

### **Navigation Issues: Operations & Management**

To eliminate emergency shutdowns of locks throughout the system before and during the construction of 1200-foot locks, both Congress and the Corps must address the extensive

Operations & Management (O&M) backlog on aging locks. Continued deferred maintenance should not be tolerable to a world-class economy or to a Congress interested in improving the economic health of the nation. The Corps and the U.S. Department of Transportation should be active advocates for adequate maintenance of the existing inland waterways infrastructure.

### **Environmental Issues**

Increasing the capacity for waterborne commerce is good for the environmental sustainability of the Midwest region and the nation. First, compared to other forms of transportation, water transportation moves bulk products with the least amount of air pollution and fossil fuel usage, making it the most environmentally friendly form of commercial freight transportation. A modal shift from water to rail or truck would negatively impact areas struggling with EPA clean air standards, such as St. Louis. Second, river tows that can transit the system without waiting outside of the channel due to lock delays will do less damage to environmentally sensitive parts of the river. Third, keeping tows in the channel will decrease sediment re-suspension. All of these environmental benefits should be considered and incorporated into the Corps' matrix.

The river industry has long been a supporter of the Environmental Management Plan (EMP), both in public meetings and in discussions with Congress. This program has a long history of state/federal/private partnerships that have consistently and thoughtfully improved the ecological environment of the Basin. The river industry continues to support this admirable program with full and reliable funding. Although other options

should be discussed and considered, EMP has a proven track record of success and should be given extensive consideration as the vehicle for environmental projects. Increased funding of the EMP would finance a proven program while not increasing bureaucracy on the federal or state level.

Appropriate funding mechanisms to support an enhanced ecosystem restoration effort and to redress cumulative impacts should be addressed during the feasibility phase of the study. Funding mechanisms should not be drawn from navigation funding sources, such as the Inland Waterways Trust Fund, which should only be used for the purpose for which it was created, namely, infrastructure construction and major rehabilitation.

### **Social Issues**

Quality of life throughout the Basin is increased with the movement of products on the river. Benefits include, but are not restricted to, less noise pollution, cleaner air, less traffic congestion, and fewer highway transportation-related injuries and loss of life. These quality of life issues should be evaluated monetarily and with consideration commensurate with their importance to the Midwest region and the nation. The quality-of-life benefits of navigation improvements must be incorporated into the various scenarios.

## **Summary**

The navigation community embraces a balanced approach to meeting the economic and ecological needs of the river basin. The region needs an improved navigation system to sustain our environment and economy. As its population grows, the nation needs to maintain the economic advantage afforded by a waterway transportation system that is the envy of the world. We look forward to a continuing cooperative effort with federal, state, and non-governmental agencies to create an improved waterway transportation system while enhancing flood control, investment opportunities, water quality, energy reliability, recreational benefits, and river health.

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## APPENDIX 1

### Acronyms

A&M	Avoid and Minimize
AMS	Agricultural Marketing Service
ANS	Aquatic Nuisance Species
AWO	American Waterway Operators
BO	Biological Opinion
CAP	Continuing Authorities Program
CCP	Comprehensive Conservation Plan
CEMVS	Corps of Engineers, St. Louis District
CEQ	Council on Environmental Quality
CMMP	Channel Maintenance Management Plan
CRP	Conservation Reserve Program
DEIS	Draft Environmental Impact Statement
DNR	Department of Natural Resources
DOC	Department of Conservation
DOT	Department of Transportation
ECC	Economics Coordinating Committee
EIS	Environmental Impact Statement
EMP	Environmental Management Program
EMPCC	Environmental Management Program Coordinating Committee
EnCC	Engineering Coordinating Committee
EPA	Environmental Protection Agency
EPM	Environmental Pool Management
EQIP	Environmental Quality Incentives Program
ER	Engineering Regulation
FAPRI	Food and Policy Research Institute
FPMA	Floodplain Management Assessment
FPP	Farmland Protection Program
FWCA	Fish and Wildlife Coordination Act
FWIC	Fish and Wildlife Interagency Committee
FWWG	Fish and Wildlife Work Group
GIS	Geographic Information Systems
GLC	Governors' Liaison Committee
GMO	Genetically Modified Organism
GREAT	Great River Environmental Action Team
HEP	Habitat Evaluation Procedures
HNA	Habitat Needs Assessment
HQUSACE	U.S. Army Corps of Engineers, Headquarters
HREP	Habitat Rehabilitation and Enhancement Project
IDNR	Illinois Department of Natural Resources
INSA	Inland Navigation Systems Analysis
IPMP	Initial Project Management Plan
ITR	Internal Technical Review

IRCA	Illinois River Carriers Association
IWUB	Inland Waterway Users Board
IWW	Illinois Waterway
JFA	Jack Faucett and Associates
L&D	Lock and Dam
LTRMP	Long Term Resource Monitoring Program
MARC	Midwest Area River Coalition
MIS	Mitigation Implementation Strategy
MMR	Middle Mississippi River
MR&T	Mississippi River & Tributaries
MVD	Mississippi Valley Division
MVP	St. Paul District
MVR	Rock Island District
MVS	St. Louis District
NAS	National Academy of Sciences
NECC	Navigation Environmental Coordinating Committee
NED	National Economic Development
NEPA	National Environmental Policy Act
NER	National Ecosystem Restoration
NGO	Non-Governmental Organization
NRC	National Research Council
NRCS	Natural Resources Conservation Service
NWR	National Wildlife Refuge
O&M	Operations and Maintenance
OSIT	On Site Inspection Team
P&G	Principles & Guidelines
PDT	Project Delivery Team
PED	Preliminary Engineering and Design
PEIS	Programmatic Environmental Impact Statement
PICC	Public Involvement Coordinating Committee
PMP	Project Management Plan
POS	Plan of Study
PSP	Project Study Plan
QCP	Quality Control Plan
RC&D	Resource Conservation and Development
RCP	Responsible Carrier Program
RED	Regional Economic Development
RIAC	River Industry Action Committee
ROD	Record of Decision
RPA	Reasonable and Prudent Alternatives
RPM	Reasonable and Prudent Measures
RRAT	River Resources Action Team
RRCT	River Resources Coordinating Team
RRF	River Resources Forum
T&E	Threatened and Endangered Species
TCM	Tow Cost Model

TIPR	Traffic Impact Prevention and Reduction
TMDL	Total Maximum Daily Load
TRB	Transportation Research Board
TVA	Tennessee Valley Authority
UMIMRA	Upper Mississippi - Illinois - Missouri Rivers Association
UMR	Upper Mississippi River
UMR-IWW	Upper Mississippi River-Illinois Waterway System
UMRBA	Upper Mississippi River Basin Association
UMRCC	Upper Mississippi River Conservation Committee
UMRS	Upper Mississippi River System
UMWA	Upper Mississippi Waterways Association
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USDA	U.S. Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WAM	Waterway Analysis Model
WCSC	Waterborne Commerce Statistics Center
WES	Waterways Experiment Station
WHIP	Wildlife Habitat Incentives Program
WRDA	Water Resources Development Act
WRP	Wetland Reserve Program
WSTB	Water Science and Technology Board
WTO	World Trade Organization

## APPENDIX 2

### Glossary

Avoid and minimize – Measures developed to avoid and minimize impacts to the river environment.

Avoidance zone – Voluntary avoidance areas established by the USFWS to protect native plants and animals.

Bathymetry – The measurement of water depth.

Bed load – Rock particles rolled or pushed along the bottom of a stream by moving water.

Benchmark – A point of reference by which something can be measured.

Channel Training Structure – A man-made flow obstruction (e.g., wing dam, closing dam or revetment) used to divert river flow to a desired location, usually toward the center of the main channel to increase flow and limit sedimentation or to protect the river bank from eroding.

Cofferdam – A temporary dam built to keep the riverbed dry to allow construction of a permanent dam or infrastructure.

Comprehensive Conservation Plan – A document that describes the desired future conditions of a USFWS refuge and provides long-range guidance and management direction for the refuge manager to accomplish the purposes of the refuge, contribute to the mission of the system, and to meet other relevant mandates.

Demand elasticity – In reference to the Navigation Study, a measure of the price responsiveness to waterway demand.

Disturbance regime – The spatial and temporal characteristics of disturbances affecting a particular landscape over a particular time.

Draft depth – Number of feet and inches below the waterline that the vessel is submerged.

Drawdown – Lowering the level of the water in a selected portion of an aquatic system.

Dredged material – The excavated material from dredging operations.

Dredging – The scooping, or suction, of underwater material (e.g., sediment) from a harbor or waterway.

Ecological integrity – The ability of an ecosystem to retain its complexity and capacity for sustainability (i.e., its health).

Ecological stressor – A substance or action that has the potential to cause an adverse effect on an ecosystem.

Ecosystem restoration – Management actions that attempt to accomplish a return of natural areas or ecosystems to a close approximation of their conditions prior to human disturbance, or to less degraded, more natural conditions.

Environmental impact statement – A document prepared to describe the effects for proposed activities on the environment.

Environmental restoration – See ecosystem restoration.

Environmental sustainability – The ability of aquatic, wetland, and terrestrial complexes to maintain themselves as self-regulating, functioning systems.

Fish entrainment – Process by which fish are wounded or killed after being swept in and through a boat's propellers.

Fish passage – Modification or removal of barriers that restrict or prevent movement or migration of fish.

Fleeting area – A permanent facility within defined boundaries used to provide barge mooring service and ancillary harbor towing under the care of the fleeting operator.

General Plan land – Lands that the USACE outgrants to the USFWS through a Cooperative Agreement for fish and wildlife management purposes.

Genetically Modified Organism – An organism that has been modified by gene technology.

Geomorphology – The science that deals with land and submarine relief features (landforms) of the earth's surface; the physical structure of the river floodplain environment.

Guidewall – The extension of the inner lockwall on the upper and lower side of the lock chamber to assist navigators in guiding vessels or tows into the lock chamber. It is usually 600 feet in length, although some are now 1,200 feet long.

Hydrology – A science dealing with the properties, distribution, and circulation of water on the surface of the land, in the soil and underlying rocks, and in the atmosphere.

Hypoxia – The condition in which dissolved oxygen concentrations are less than 2 parts per million of water.

Impoundment – In reference to rivers, the area of water that is captured and held back by a dam.

Levee – An embankment constructed to prevent flooding.

Levee district – Cooperative quasi-governmental organizations that protect areas from flood waters and serve as wildlife refuges.

Levee setback – The process of moving levees back a sufficient distance from the Ordinary High Water Mark to allow an escape valve for flood water, to replenish the floodplain and to allow restoration of the riparian corridor.

Management action – Measures used to modify or adjust the condition of the river system.

Moist soil unit – Areas where water levels are controlled to provide a desired mix of moist soil vegetation.

Mooring buoy – A buoy attached to the river bottom by permanent moorings with means for securing a vessel by use of its mooring lines.

Mooring cell – A riverfront structure generally comprised of steel piling or a cluster of wooden piles used for securing barges along the bank at loading facilities.

N-up/N-down – A lock operating policy in which up to N upbound vessels are serviced, followed by up to N downbound vessels, where N is positive integers.

Navigation improvement – Structural and nonstructural measures that can increase the efficiency or capacity of the navigation system.

Non-native species – Species of plants and animals that are not native to an area.

Non-point source pollution – Water pollution produced by diffuse land-use activities.

Open river condition – The condition when all dam gates are out of the water and the pool water level is no longer controlled by the dam.

Operation and Maintenance – Activities and costs associated with operating and maintaining the navigation system including funding for lock and dam personnel, maintenance crews, dredging, utilities, and minor repairs.

Point source pollution – Pollution into bodies of water from specific discharge points such as sewer outfalls or industrial-waste pipes.

Pool aging – A term used to broadly describe degradation in the quantity and quality of non-channel aquatic habitats since impoundment.

Pool Plans – Maps and descriptions of desired future conditions of the Mississippi River.

Pre-settlement – A condition or state prior to human intervention.

Project Management Plan – A plan that outlines the scope, cost, and schedule for executing a study.

Reach – A continuous stretch or expanse. In reference to rivers, it can be used to define portions of rivers at different scales (i.e., floodplain reach, pool reach, reach between two river bends).

Reference condition – The range of factors (e.g., hydrology, sediment movement, vegetation, and channel geometry) that are representative of a river's recent historical values prior to significant alteration of its environment.

Riparian – Areas that are contiguous to and affected by surface and subsurface hydrologic features of perennial or intermittent water bodies (e.g., rivers, streams, lakes, or drainage ways).

River stage – The elevation of the water surface, usually above an arbitrary datum.

Sediment resuspension – The movement of sediment from the river bed into the water column due to a disturbance (e.g., wave action).

Sediment transport – The movement of sediment (usually by water).

Sedimentation – The process of sediment being deposited in a given location.

Species diversity – The richness, abundance, and variability of plant and animal species and communities.

Total Maximum Daily Load – A calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources.

Trust Species – USFWS trust species include migratory birds, anadromous and interjurisdictional fish, and endangered species.

Turbidity – Measure of the “lack of clearness” of water. Degree to which light is blocked because water is muddy or cloudy.

Turnback lockage – A lockage in which no vessels are served; a reversal of the water level in a lock chamber with no vessels in the chamber. A turnback includes closing one set of gates, filling or emptying the chamber, and opening the other set of gates. Also called a “swingaround” or an “empty lockage.”

Wicket gate – A rectangular heavily constructed slab of wood and steel hinged in a counterbalanced way so as to be lying flat on the river bed when down, and when raised will be held upright by the pressure of the water. Wicket gates are placed in a parallel line across the river and when all are in raised position they form a wall or dam, thus backing up the water and raising it to the pool level.

**APPENDIX 3**

**Regional Interagency Work Group Issue Papers**

UMR-IWW SYSTEM NAVIGATION STUDY  
ISSUES PREPARED FOR  
REGIONAL INTERAGENCY GROUP MEETING  
24 MAY 2001

**ENVIRONMENTAL THEMES & ISSUES:**

**Theme 1a:** Equal consideration for fish and wildlife resources.

**Theme 1b:** Environmental effects of the existing Nine-Foot Channel Project.

**Issue 2:** Incorporate a cause and effects cumulative effects analysis in the System Study.

**Issue 3:** Should the scope of the tow traffic effects analysis be expanded to include quantification of the impacts of existing traffic (including Second Lock traffic) and traffic increases expected to occur without navigation expansion, or should existing traffic impacts remain identified as the baseline condition.

**Issue 4:** Include an assessment of ongoing project operation and maintenance (O&M) impacts as an element of the System Navigation Study.

**Issue 5:** Include a comprehensive mitigation plan that addresses the total array of navigation effects (O&M impacts, baseline traffic, Second Lock traffic, avoid and minimize, and incremental traffic) as part of the Navigation Study.

**Issue 6:** Assessment of traffic effects due to the Second Lock, Melvin Price Lock and Dam.

**Issue 7:** Upper Mississippi River cooperating federal and state agencies should develop and implement a comprehensive ecosystem management plan for the Upper Mississippi River system.

**Issue 8:** How will site-specific impacts be addressed and incorporated into the overall environmental impact assessment?

**Issue 9:** Inadequacy of incremental effects studies due to insufficient data.

**ECONOMIC ISSUES:**

**Issue 1a:** Calculation of Traffic Forecast. Relates to Issue 1, "Spatial Equilibrium Model and Data" of the National Research Council (NRC) review report.

**Issue 1b:** Demand Elasticities. Relates to Issue 1, "Spatial Equilibrium Model and Data" of the National Research Council (NRC) review report.

**Issue 1c:** Use of ESSENCE Model (Benefit Model). Relates to Issue 1, “Spatial Equilibrium Model and Data” of the National Research Council (NRC) review report.

**Issue 2:** Consider nonstructural options for improving traffic management as a baseline condition for the study. This relates to issue 2 of the National Academy of Sciences Review Report.

# ENVIRONMENTAL THEME #1a

(Equal Consideration for Fish and Wildlife Resources)

## UMR-IWW System Navigation Study

Draft 5/25/01

**1. Theme:** Planning for nationally significant fish and wildlife resources does not receive equal consideration in the UMR-IWW Systemic Navigation Study, in terms of alternatives development, impact assessment and mitigation, and environmental restoration.

Relates to matrix Issues 3, 4, and 6.

**2. Background:** The NAS report criticizes the Systemic Navigation Study for its focus solely on alternatives contributing to national economic development; “the feasibility study does not incorporate operational and environmental alternatives consistent with the project-specific directive from Congress, despite the fact that the Corps appears to have ample latitude to explore alternatives aimed at enhancing environmental resources...”. The NAS recommended that the Systemic Feasibility Study should develop alternatives that include natural resource objectives and not be restricted to those which focus solely on the national economic development objective. The National Academy of Sciences (NAS) review report states in its Executive Summary that:

A thorough analysis that supports informed decisions must address environmental impacts with the same comprehensiveness and sophistication that is now expected for the evaluation of the National Economic Development alternative. The Corps should aim toward a more comprehensive and integrated assessment of navigation system effects on the environment.

And finally, the NAS report Executive Summary states:

The Secretary of the Army should ensure that the environmental consequences of proposed construction and operating practices be analyzed along with the National Economic Development account. Furthermore, environmental improvements – not just the mitigation of incremental environmental damages – should be examined as part of the navigation study.

The Water Resources Development Act of 1986 declared the Upper Mississippi River to be both a nationally significant transportation system and ecosystem.

The Fish and Wildlife Coordination Act requires that fish and wildlife receive equal consideration in project planning.

The *Principles and Guidelines* allow for the consideration of alternatives that reduce NED benefits in favor of other objectives.

The Corps Planning Guidance Notebook (ER 1105-2-100) is not specific about the requirement of feasibility cost sharing for natural resources restoration as part of navigation planning. ER 1105-2-100 refers cost-sharing questions to COE Headquarters when they are proposed as part of a navigation study.

The 1970 Flood Control Act, authorizes the Secretary of the Army “...to review the operation of projects the construction of which has been completed and which were constructed by the Corps of Engineers...to report thereon to Congress with recommendations on the advisability of modifying structures, or their operation, and for improving the quality of the environment in the overall public interest.”

### **3. Potential Options:**

1. Expand the Navigation Study to address the concern for equal consideration of nationally significant fish and wildlife resources.
2. Do not implement such a plan.

### **4. Regional Interagency Group Discussion Points:**

U.S. Fish and Wildlife Service: When considered in the context of UMR navigation planning, fish and wildlife resources have always been viewed as a constraint rather than an equal project purpose. The Service believes that the Corps’ Planning Guidance and other Congressional authorities give it ample latitude to include restoration and enhancement planning for nationally significant fish wildlife resources at full federal expense. Virtually all of the Corps’ current and past navigation planning exercises have dealt with natural resources in the context of mitigation for navigation improvements, without including study alternatives that consider natural resource enhancement or restoration.

Environmental Protection Agency: EPA agrees that the maintenance/restoration of fish and wildlife resources needs to be considered as a co-equal project objective. To meet this goal, EPA agrees more direct involvement of federal and state resource agencies in study planning and execution is necessary.

Department of Transportation:

Department of Agriculture:

Corps of Engineers: The Corps of Engineers is required under federal law (e.g., 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, design, construction, operation, and maintenance 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 un-quantified environmental amenities and values be given appropriate consideration in decision-making along with economic and technical considerations. The environmental studies included in the Navigation Study were designed to satisfy these laws. The final report will evaluate a number of alternatives and make recommendations to Congress. These recommendations will have been made in consideration of the results of the environmental analysis, including individual impact assessment studies, existing literature, and best professional judgment. These results will constitute 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 will then be weighed along with engineering and economics results to formulate a recommended plan.

# **ENVIRONMENTAL THEME #1b**

**(Environmental Effects of the Existing 9-Foot Channel Project)**

## **UMR-IWW System Navigation Study**

**Draft 5/25/01**

**1. Theme:** Environmental Effects of the existing Nine-Foot Channel Project. Refers in part to matrix Issue 3.

**Major Sub-issues:**

- a. baseline traffic effects;
- b. 9-foot channel O&M effects;
- c. comprehensive mitigation planning for all 9-foot channel project effects;
- d. cause and effect cumulative effects analysis;
- e. mitigation funding (trust fund) and institutional arrangements.

**2. Background:** In coordination on the environmental studies, these issues have been longstanding. The Navigation Study was scoped to examine the environmental consequences of the incremental increase in traffic that would occur if improvements were to be made. The baseline condition for the study is considered the system environment as it exists today (i.e., base year 2000), including the physical and environmental changes resulting from construction of the locks and dams, ongoing O&M activities required to maintain commercial navigation, and traffic levels as they have existed and currently exist. Coordinating agencies maintain that these effects must be collectively considered as part of the Navigation Study impact assessment, and that the study is too narrowly scoped; likewise, the agencies believe that any mitigation plan must consider the consequences of all of these actions.

The Corps is considering the consequences of theirs and other's past actions as part of the cumulative effects assessment for the Navigation Study, but this is not a cause and effect analysis; the agencies also contend that the assessment does not look at possible multiplying or synergistic effects of traffic and other impacts.

**3. Potential Options:**

See Environmental Issues 2 - 6

**4. Regional Interagency Group Discussion Points:**

U.S. Fish and Wildlife Service: Significant, system-wide impacts to UMR natural resources result from the operation and maintenance of the existing navigation project as well as existing traffic. These impacts have never been fully assessed or mitigated and will continue to occur as long as the project is maintained. The Service believes these impacts should have already been addressed (in compliance with NEPA) and so lacking, should

now be considered under the Navigation Study. We disagree with the Corps' position that these effects are part of the baseline project condition and not subject to assessment. Baseline project impacts such as water level regulation, spread of exotic species, baseline tow traffic, habitat diversity degradation from channelization, and hindrance of fish passage through navigation dams have never been thoroughly analyzed in any systemic NEPA document for the navigation project. The Service believes that mitigation for impacts from the Second Lock at Melvin Price Lock and Dam must also be addressed within the current study. Failure to do so constitutes project fragmentation under NEPA.

The Service advocates that a comprehensive adaptive mitigation plan should be prepared and implemented to address the complete range of navigation project-related impacts (incremental traffic effects, baseline traffic effects, Second Lock traffic effects, and project O&M effects). An adaptive mitigation plan should be the result of a comprehensive analysis of all navigation project effects. The Service believes such a plan must be prepared as part of the UMR-IWW System Navigation Study. The Service believes that the principal roadblocks to addressing these effects in a collective fashion are Corps policy constraints and not project authority limitations. Continuing to address the various navigation project effects in different forums and independent of one another leads to fragmented and inefficient attempts to mitigate project-related impacts. In addition, the capability of the state and Federal natural resource managers is continually strained by the need to work in multiple planning arenas.

U.S. Environmental Protection Agency:

See EPA discussion points for environmental issues 2-6.

Department of Transportation:

Department of Agriculture:

Corps of Engineers: Actions to address the sub-issues above, beyond using the existing cumulative effects analysis based on best available information and professional judgment as will be included in the DEIS, do not represent legal requirements necessary to achieve project compliance with the National Environmental Policy Act (NEPA; Public Law 91-190). Rather, they would be potential actions to enhance the documentation of the Project impacts beyond the requirements of NEPA, as well as the base of scientific knowledge concerning the Upper Mississippi and Illinois Rivers. Absent a legal obligation to perform such actions, it must be recognized that the sub-issues above involve significant policy considerations and should be resolved on the basis of Administration policy on implementation of those programs and funds entrusted to the Corps. Significant policy decisions involve weighing the benefits of any proposed actions beyond using the existing cumulative effects analysis against competing demands and budget constraints. Such policy decisions weigh most heavily in consideration of the Corps' Operation and Maintenance budget, which has not kept up with inflation over the past decade.

The competition of authorized programs for funding by Congress is illustrated by the NAS proposals that are addressed as the sub-issues set forth above. USF&WS seeks Corps commitment to discretionary mitigation for on-going operation and maintenance of the Nine-Foot Channel Project. Mitigation for completed Corps projects is addressed under Section 906(b) of the Water Resources Development Act (WRDA) of 1986 (Public Law 99-662). Text of a previously prepared fact sheet on this topic is instructive:

- This section establishes a comprehensive mitigation policy for water resources projects; subsection 906(b) dealing with post-authorization mitigation, states in part “*After consultation with appropriate Federal and non-Federal agencies, the Secretary (of the Army) is authorized to mitigate damages to fish and wildlife resulting from any water resources project under his jurisdiction, whether completed, under construction, or to be constructed.*”
- ER 1105-2-100, revised version dated 22 April 2000, Appendix C, paragraph 15, Post-authorization Mitigation, states “ *Section 906(b) of the Water Resources Development Act of 1986 authorizes the Secretary of the Army to mitigate damages to fish and wildlife without further specific Congressional authorization within certain limits. **Current budgetary constraints do not provide for the implementation of Section 906(b).***” (Bold added)

A change in this policy, involving the provision of funding may be required to consider Corps action for mitigating effects of the Nine-Foot Channel Project.

In terms of baseline (existing) traffic effects, the study has accounted for these effects within the cumulative effects analysis as part of the baseline condition.

A plan focused on ongoing O&M effects would allow for consideration of environmental benefits under a General plan which could be prepared parallel to the Navigation Study and be available when any Navigation Study recommendations go forward for authorization. An adaptive mitigation strategy is supported to address any mitigation recommended as a result of reducing delays at the locks. The Navigation study adaptive mitigation strategy will complement any O&M plan or adaptive management initiative developed for ecosystem restoration.

# ENVIRONMENTAL ISSUE #2

## UMR-IWW System Navigation Study

Draft 5/25/01

**1. Issue:** Incorporate a cause and effects cumulative effects analysis in the System Study.

Relates to matrix Issues 3, 7(1), and 7(3).

### **2. Background:**

The NAS review report stated in part: “ To address this need for enhanced understanding of these cumulative effects throughout the UMR-IWW system, a good starting point would be a detailed assessment of how current operations and maintenance activities, when combined with environmental changes, are affecting the environment.” Operations and maintenance activities were not identified in a cause and effect analysis for this proposed project. The Cumulative Effects Study offered by the Corps projected a two-dimensional geomorphic analysis of future habitat changes. It did not specifically identify on-going impacts of operation and maintenance of the 9-ft Channel Project nor did it specifically identify impacts from existing baseline traffic. Possible synergistic relationships were not discussed in the report, but will be included in the EIS. The report did, however, acknowledge some of its shortcomings and did provide recommendations to conduct a more comprehensive analysis of operation and maintenance effects.

Properly addressing cumulative effects is a major thesis in the NAS report (**NOTE:** The NAS did not review the Cumulative Effects Study report). On p. 81, the NAS report states:

There is not a thorough understanding of how current operations (e.g., intra- and inter-annual changes in navigation system, as well as other factors such as changes in land use and water quality, are affecting river ecology. This understanding is essential to an assessment of how future changes in the navigation system might affect the environment.

### **3. Potential Options:**

1. Use existing Cumulative Effects Study as is.
2. Expand the Cumulative Effects Study.

### **4. Regional Interagency Group Discussion Points:**

U.S. Fish and Wildlife Service: The Fish and Wildlife Service supports Option 2, development of an expanded cumulative effects study conducted as part of this system-wide study, that would illustrate cause and effects and synergistic relationships among

basin-wide factors including identification of operation and maintenance and baseline traffic effects.

U.S. Environmental Protection Agency: EPA believes that a cumulative effects analysis is a critical component to the navigation study. The CEQ regulations require the analysis of direct, indirect and cumulative impacts. The CEQ guidelines identifies eight principle elements to be considered in cumulative effects analysis. The first being that aggregate of past, present, and reasonably foreseeable future actions are to be discussed. This means that similar actions that have similar effects, such as, agricultural activities that contribute to degrading of water quality and promotion of sedimentation are to be included in the analysis. To date, a cumulative effects analysis has not been conducted for the Mississippi river activities. All of the issues identified, such as baseline traffic, 9-foot channel O&M effects, comprehensive mitigation, incremental traffic, and scope of the study justify the need for this type of investigation. By failing to analyze these aggregate impacts, and failing to adequately discuss means to mitigate these impacts, the Corps' approach would not meet the fundamental requirements of NEPA.

Department of Transportation:

Department of Agriculture:

Corps of Engineers: The options listed presumably refer to the Cumulative Effects Study (WEST Consultants, June 2000) conducted as part of the Corps environmental impact analysis. This study compiled and reviewed all available historical and current geomorphic, plan form, and ecological data to evaluate historical, current, and projected future condition of the UMR-IWW. Although some data pre-dated the construction of the lock and dam system in the 1930's, the actual evaluation considered the time period immediately following lock and dam construction to the end of the Navigation Study planning horizon in 2050. This study is not a cause and effects analysis.

The Corps has been, and remains, clearly aware of the requirement to examine cumulative effects under NEPA. The WEST study was not intended to solely constitute the cumulative effects analysis required under NEPA for the Navigation Study. The WEST study, along with other existing reports and information, notably the USGS-LTRMP Status and Trends Report (USGS 1999), will be used to prepare the cumulative effects analysis that in turn becomes part of the study DEIS. The DEIS for the Navigation Study has not been completed. Per the CEQ guidelines, the cumulative effects analysis will consider the consequences all past, present and reasonably foreseeable future actions, in a synergistic and additive fashion to project effects. These actions will include past and current navigation project actions as well as other non-navigation actions that have affected the UMR-IWW. Thus the Corps of Engineers also supports Option 2, as the WEST Cumulative Effects Study will in effect be expanded as it is subsumed into the DEIS cumulative effects analysis.

# ENVIRONMENTAL ISSUE #3

## UMR-IWW System Navigation Study

Draft 5/25/01

**1. Issue:** Should the scope of the tow traffic effects analysis be expanded to include quantification of the impacts of existing traffic (including Second Lock traffic) and traffic increases expected to occur without navigation expansion, or should existing traffic impacts remain identified as the baseline condition.

Relates to matrix Issues 3 and 7(1).

**2. Background:** To assess the ecological effects of tow traffic associated with the proposed project, the Corps completed numerous impact assessments including hydraulic and biological modeling efforts, field and laboratory studies, and review of existing literature. Broad assumptions and data extrapolations were used in these assessments, which were primarily directed at identifying traffic effects on adult and larval fish, native mussels, submergent aquatic vegetation, backwater and side-channel sedimentation, and shoreline erosion.

The scope of the Corps' impacts assessments were limited to the effects of incremental traffic (with project traffic minus without-project traffic) associated with various construction alternatives. The effects of existing traffic (including Second Lock traffic) were not assessed. The Service and state resource agencies have advocated that the scope of the traffic effects analysis be expanded to assess all traffic associated with the existing 9-ft Channel Project and the proposed expansion.

### **3. Potential Options:**

1. Do not change the scope of the incremental traffic effects analysis.
2. Expand the scope of the traffic effects analysis.

### **4. Regional Interagency Group Discussion Points:**

U.S. Fish and Wildlife Service: The scope of the Corps' current traffic effects analysis was limited to incremental traffic without concurrence from the Service or states. The Service supports expanding the scope of the analysis to assess the effects of additive traffic levels (without-project traffic plus incremental traffic) using existing and new data and/or models. The Corps' analysis to date is unacceptable because it does not adequately reflect the true ecological effects of tow traffic associated with the existing 9-ft Channel Project. Further, since these effects have never been assessed (or mitigated), they must be evaluated within the scope of the current analysis in order to comply with NEPA.

NEPA requires an analysis of all alternatives, including the no action alternative. In this case, the no action alternative consists of the existing 9- ft Channel Project and its resultant traffic. In order to understand the significance of incremental traffic associated with navigation expansion, the effects of ongoing traffic (without project) must first be identified. Therefore, it is essential that the effects of existing traffic be clearly presented in the same quantitative manner as the incremental traffic effects. For example, the number of larval fish entrained by existing traffic should be presented along with the number of larval fish entrained by incremental traffic. Such effects must be quantified both for consideration during the decision making process for the proposed project and for mitigation of on-going impacts.

If the scope of the study is expanded in the future, coordinating agencies must be allowed full participation throughout the scoping process.

U.S. Environmental Protection Agency: EPA believes the Corps' intent to use the current, project-degraded environment as the baseline for analyzing environmental impacts (and to not consider the ongoing effects of current O/M activities) is not consistent with the requirements of NEPA. By failing to analyze the past and ongoing adverse environmental impacts associated with the tow traffic, and failing to adequately discuss means to mitigate the impacts of the project proposal (i.e., direct, indirect and cumulative impacts), the Corps' approach would not meet the fundamental requirements of NEPA to provide for a comprehensive evaluation of the environmental consequences of all reasonable alternatives. We are also concerned that under this approach of only examining the incremental effects over the current conditions, the Corps would need to characterize the no-action alternative as essentially having "no impact," which is clearly not an accurate assessment of the ongoing effects. The no-action alternative can be an effective benchmark to compare alternatives only if it incorporates the cumulative effects of the past activities and accurately depicts the existing condition of the environment.

Department of Transportation:

Department of Agriculture:

Corps of Engineers: Baseline (existing) traffic effects will be accounted for within the cumulative effects analysis as part of the baseline condition.

# ENVIRONMENTAL ISSUE #4

## UMR-IWW System Navigation Study

Draft 5/25/01

**1. Issue:** Include an assessment of ongoing project operation and maintenance (O&M) impacts as an element of the System Navigation Study.

Relates to matrix Issues 3 and 7(1).

**2. Background:** Operation and maintenance of the 9-ft Channel Project has altered the natural ecosystem of the Upper Mississippi River. The dams that were constructed to hold minimum water levels at low flows which prohibit the natural river processes, trap sediment above the dams, and reduce bedload delivery to the open river. The high water levels maintained by the dams reduce the diversity of the aquatic and terrestrial vegetation. Channel training structures isolate backwaters and side channels from the mainstem river, scour out beneficial sediments, and in accreted dike fields can change aquatic habitat to terrestrial habitat. Point bars that form in the main channel are removed by dredging and are disposed of along adjacent shorelines. These activities are examples of O&M practices of concern.

The System Navigation Study's stated objective is to investigate the feasibility of system-wide navigation improvements to address traffic delays at locks. The Corps' environmental plan focuses on the effects of incremental traffic that might result from those improvements. Early on in the study's scoping phase, the Service and State resource agencies recommended that a full assessment of the existing projects' ongoing O&M impacts should be conducted. The Corps disagreed on the basis that three EISs previously completed in the 1970's adequately met the NEPA requirement. The Service and state resource agencies have argued that these documents are out of date and deficient. An assessment of ongoing O&M effects has been recommended in order to provide a context against which to evaluate the significance of proposed system improvements. This issue has been elevated up through the Department of the Interior (letter of April 12, 1997 from Deputy Sec. of Fish, Wildlife and Parks Don Barry) and Assistant Secretary of the Army for Civil Works (letter of June 24, 1997 from H. Martin Lancaster) without resolution.

### **3. Potential Options:**

1. Complete assessment of O&M impacts in current study.
2. Do not complete O&M assessment within current study.

#### **4. Regional Interagency Group Discussion Points:**

U.S. Fish and Wildlife Service: The Service believes existing project O&M impacts must be assessed and on-going impacts mitigated within the current study as stated in Mr. Barry's letter of April 12, 1997, for the following reasons.

(1) NEPA regulations, specifically 40 CFR §1502.9(c), direct that agencies "Shall prepare supplements to either draft or final impact statements if "there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts." Relatively recent information documents ongoing fish and wildlife impacts which were never assessed (or mitigated) in the original EISs.

Information/data that supports this conclusion is provided in the USGS Status and Trends Report (USGS 1999). This report documents ongoing system-wide project impacts that were not addressed in the Corps 1970's documents.

(2) The Corps has implemented new actions under the authority of the 9-ft Channel Project that have never been assessed under NEPA and therefore should also be assessed in the current study. New channel maintenance techniques (e.g., off-bank revetment, bendway weirs, and chevrons) are now routinely constructed as part of the St. Louis District's O&M Program. However, these actions have never been evaluated in any NEPA document. The Service believes the Corps' 1970's EISs cannot be considered adequate to address these actions.

(3) A full accounting of existing project O&M impacts is needed as part of a cumulative effects assessment in order to determine the environmental significance of incremental traffic effects. 40 CFR §1508.25 of the NEPA regulations direct that the EIS evaluate 3 types of impacts: (1) direct, (2) indirect, and (3) cumulative. An assessment of O&M effects is need for two of the three impact categories; indirect and cumulative. Cumulative effects are defined in 40 CFR §1508.7 as

"The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time"

O&M impacts associated with past, present, and future project conditions apply to this definition.

(4) There has never been any system-wide mitigation plan implemented for the UMR The Service believes the systemic study should also include a 9-ft Channel Project mitigation plan (See Issue 5). Since O&M impacts will continue to occur in the future, and concurrently with incremental traffic effects, preparation of such a plan is justified as part of the study. Although the Corps annually expends upwards of \$130 million to maintain this project, a negligible amount is spent to offset negative O&M effects that are perpetuated by continued project maintenance. To facilitate funding for an O&M mitigation plan, the Service strongly recommends that the Corps implement Section 906(b)

of the Water Resources Development Act of 1986. Such a plan should allow for incorporation of the principles of adaptive management.

Environmental Protection Agency: EPA believes the Corps' intent to use the current, project-degraded environment as the baseline for analyzing environmental impacts (and to not consider the ongoing effects of current O/M activities) is not consistent with the requirements of NEPA. By failing to analyze the past and ongoing adverse environmental impacts associated with the O & M of the 9 foot channel project, and failing to adequately discuss means to mitigate the impacts of the project proposal (i.e., direct, indirect and cumulative impacts), the Corps' approach would not meet the fundamental requirements of NEPA to provide for a comprehensive evaluation of the environmental consequences of all reasonable alternatives. We are also concerned that under this approach of only examining the incremental effects over the current conditions, the Corps would need to characterize the no-action alternative as essentially having "no impact," which is clearly not an accurate assessment of the ongoing effects. The no-action alternative can be an effective benchmark to compare alternatives only if it incorporates the cumulative effects of the past activities and accurately depicts the existing condition of the environment.

Department of Transportation:

Department of Agriculture:

Corps of Engineers: NEPA does not require supplementation of the existing NEPA documentation for O&M of the Project, nor does it require that the Navigation Study be expanded by assessing ongoing O&M in the current study. The options raise a policy question, that of mitigation for the effects of Corps projects as addressed under Section 906(b) of the Water Resources Development Act of 1986 (Public Law 99-662). Text of a previously-prepared fact sheet on this topic is instructive:

- This section establishes a comprehensive mitigation policy for water resources projects; subsection 906(b) dealing with post-authorization mitigation, states in part *"After consultation with appropriate Federal and non-Federal agencies, the Secretary (of the Army) is authorized to mitigate damages to fish and wildlife resulting from any water resources project under his jurisdiction, whether completed, under construction, or to be constructed."*
- ER 1105-2-100, revised version dated 22 April 2000, Appendix C, paragraph 15, Post-authorization Mitigation, states *" Section 906(b) of the Water Resources Development Act of 1986 authorizes the Secretary of the Army to mitigate damages to fish and wildlife without further specific Congressional authorization within certain limits. **Current budgetary constraints do not provide for the implementation of Section 906(b).**"* (Bold added)

A change in this policy may be required to consider Corps action on mitigating the effects of the 9-Foot Channel Project.

A plan focused on ongoing O&M effects would allow for consideration of environmental benefits under a General plan which could be prepared parallel to the Navigation Study and be available when any Navigation Study recommendations go forward for authorization. An adaptive mitigation strategy is supported to address any mitigation recommended as a result of reducing delays at the locks. The Navigation study adaptive mitigation strategy will complement any O&M plan.

# ENVIRONMENTAL ISSUE #5

## UMR-IWW System Navigation Study

Draft 5/25/01

**1. Issue:** Include a comprehensive mitigation plan that addresses the total array of navigation effects (O&M impacts, baseline traffic, Second Lock traffic, avoid and minimize, and incremental traffic) as part of the Navigation Study.

This issue relates to matrix Issue 10.

**2. Background:** A system-wide plan to mitigate for the adverse effects of the UMR-IWW Nine-foot Channel Navigation Project has never been completed. Navigation impacts were first addressed in the 1970's, when the three UMR Corps of Engineer Districts each completed an Environmental Impact Statement (EIS) for the Nine-foot Channel Navigation Project section within their respective District. No mitigation was ever developed as part of those documents.

The next system-wide effort that addressed both navigation improvements and impacts was the Upper Mississippi River Master Plan completed in 1982. The Master Plan attempted to develop a comprehensive plan that addressed the future needs of both UMR natural resources and commercial navigation. Due to funding and time constraints, the plan was never completed. The plan did, however, recommend an (the?) Environmental Management Program and a second lock at Lock and Dam 26.

The St. Louis District prepared an EIS to consider the impacts resulting from the Second Lock at Lock and Dam 26 (Melvin Price L/D). Although the Record of Decision was signed in November 1988, and Second Lock construction completed in 1994, Second Lock traffic impacts have yet to be quantified, or mitigated (see Issue Paper #6). A system-wide Program designed to avoid and minimize the effects of commercial traffic was anticipated as a result of the Second Lock Record of Decision, but has been only partially fulfilled to date.

Section 906(b) of The Water Resource Development Act of 1986 authorized the Corps of Engineers to "...mitigate damages to fish and wildlife resulting from any water resources project under his jurisdiction, whether completed, under construction, or to be constructed..." This authorization has never been implemented by the Corps, due to budgetary constraints. The Service has advocated the implementation of 906(b) in order to provide more flexibility in addressing past, present, and future, navigation project impacts.

### **3. Regional Interagency Group Discussion Points:**

U.S. Fish & Wildlife Service: Despite the fact that the 9-ft Channel Project is a single authorized project, its impacts (and mitigation of those impacts) have never been holistically addressed; its assessment and remediation have consistently been conducted in

a fragmented fashion. Even the project's first impact assessment was completed in three separate, unrelated documents. The Corps' System Feasibility Study is the first project re-evaluation, since its (the Nine-Foot Channel Project) authorization, that examines the system as a whole. The Service believes it is appropriate, and required by NEPA, that the total array of project related impacts be addressed in the study. Despite repeated recommendations from the Service and State Natural Resource agencies, The Corps has narrowly defined the study objective to exclude such a comprehensive assessment. However, the Service believes such a narrow study scope does not excuse the Corps from NEPA regulations that mandate all related project impacts be assessed.

Given that all project related impacts should be assessed as part of the System Feasibility Study, the Service advocates that one comprehensive adaptive mitigation plan should be prepared to address the complete range of navigation project related impacts (incremental traffic effects, baseline traffic effects, Second Lock traffic effects, and project O&M effects). The Service believes that the principal roadblock to addressing these effects in a collective fashion is Corps policy constraints and not project authority limitations. For example Section 906(b) of the Water Resources Development Act of 1986 gives the Corps authority to complete such a plan. Yet, the Corps guidance has failed to implement such authority. Ideally, a single funding source such a trust fund should be established to implement this plan. A single funding source would promote efficiency, and avoid duplication of effort.

Each UMR Corps District follows different policies with respect to how they address O&M effects. For example, only the St. Paul District has supplemented their original EIS, albeit limited it to the effects of channel maintenance dredging. The Rock Island District has not supplemented their EIS, but instead prepares numerous environmental assessments for their O&M actions. The St. Louis District is the only District fulfilling their obligation to implement an avoid and minimize program for traffic effects. Yet, they also believe that all new (e.g., bendway weirs) and ongoing channel maintenance actions are covered under their historic EIS and believe there is no requirement to update their 1970's EIS or mitigate for new actions.

Implementing navigation effects mitigation in different forums (and independent of one another), leads to fragmented and inefficient attempts to mitigate project related impacts. The capability of the state and federal natural resource managers is already strained by Corps requests to provide assistance for multiple river management planning activities. An institutional arrangement that allows for system-wide coordination among the Corps, Service, US EPA, and the State natural resource agencies should be utilized to implement this plan. A coordination structure concerned with navigation project activities has existed on the UMR for more than two decades and could easily be adapted to address mitigation planning and implementation.

Environmental Protection Agency: EPA believes that all of these issues (baseline traffic, 9 foot O&M channel effects, second lock traffic, avoid and minimize, and incremental traffic) are strongly linked together and justify the development and implementation of a comprehensive mitigation plan. EPA also believes that the navigation study is the

platform to develop and implement such a plan that would address both local and system-wide impacts to river resources. Despite many years of Corps activities to address an array of navigational needs, none of these efforts have undertaken the effort to identify and assess mitigation requirements on the same planning level. As a result, there has been a tendency toward segmentation of mitigation needs.

Further, EPA believes that the budgetary limitations regarding the implementation of Section 906(b) of WRDA (allowing mitigation for past impacts) should not prevent the Corps from evaluating mitigation proposals. CEQ guidance is clear that alternatives that are outside the capability of an agency or beyond what Congress has authorized or funded need to be examined in an EIS if they are reasonable, as the EIS may serve as the basis for modifying the approval or funding. In addition, CEQ regulations require an examination of the means to mitigate impacts, and failing to do so would due to perceived budget limitations would not be consistent with the intent of NEPA.

Department of Transportation:

Department of Agriculture:

Corps of Engineers: The adaptive mitigation strategy that will be completed as part of the DEIS will consider mitigation for incremental effects, considering also cumulative impacts. The cumulative effects analysis will consider O&M and baseline traffic effects as part of the existing condition and future without.

# ENVIRONMENTAL ISSUE #6

## UMR-IWW System Navigation Study

Draft 5/25/01

**1. Issue:** Assessment of traffic effects due to the Second Lock, Melvin Price Lock and Dam.

Relates to matrix Issue 7(2).

**2. Background:** The Corps is considering additional navigation improvements before the effects of Second Lock improvements have been identified and quantified. The EIS and Record of Decision (ROD) for the 2<sup>nd</sup> Lock acknowledged that data gaps existed in regard to determining system effects of increased navigation traffic due to the 2<sup>nd</sup> Lock. To address these data gaps, a Plan of Study (POS) was prepared and recommended by interagency teams at the District level, which contained plans for 15 environmental studies at an estimated cost of \$26M. The POS was submitted to higher authority within the Corps for approval. The POS was incorporated into and subsumed by the Navigation Study, where most of the studies recommended by the interagency teams have been or are being conducted. However, some of the 15 studies were reduced in scope or modified without full interagency concurrence. The ROD also recommended a program to avoid and minimize ongoing impacts of operations and maintenance of the 9-foot channel. Such a program was formally implemented in the St. Louis District, but not in the Rock Island or St. Paul Districts, due to budgetary constraints.

It was determined by the Corps of Engineers, that effects due to the increment of traffic from the 2<sup>nd</sup> Lock would be addressed by the St. Louis District once sufficient economic and environmental models and data were available to complete the assessment. This was documented in the November 1995 document 'Responses to Issues Raised at the Public and NEPA Scoping Meetings of November 1994', page 23, as follows:

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 (now 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 if project 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.

### **3. Potential Options:**

1. Address 2<sup>nd</sup> lock impacts within the Navigation Study.
2. Address 2<sup>nd</sup> lock impacts in a separate effort, relying on information obtained from the Navigation Study.

### **4. Regional Interagency Group Discussion Points:**

U.S. Fish and Wildlife Service: The Service supports Option 1. In order to quantify the impact of the incremental traffic increases associated with the proposed project, impacts attributable to the Second Lock increment of traffic must be identified and mitigated for as part of the current System Study and as required under NEPA. The Service has been waiting for such information since the late 1980's in order to prepare a final FWCA report for the Second Lock Project. The Service has documented (most recently in their August 31, 2000 letter to the Rock Island District commander and an August 1999 statement read at the Navigation Study public workshops) the need for a system-wide avoid and minimize program as discussed in the Second Lock ROD. The Service also believes that any mitigation identified for Second Lock traffic effects should be included in this study (See issue 5).

Environmental Protection Agency: EPA believes that in order to ensure that the Navigation Study provides a comprehensive review of the proposed improvements (including an analysis of ongoing impacts), the Navigation Study needs to consider the impacts from the 2<sup>nd</sup> Lock. We are also concerned that the proposal to address 2<sup>nd</sup> Lock impacts in a separate effort will only be a segmentation of the issues, and would be an inappropriate limit on the scope of analysis for the Navigation Study.

Department of Transportation:

Department of Agriculture:

Corps of Engineers: Has maintained that Option 2 is reasonable, given that economic and environmental data from the Navigation Study make it possible to separate out the incremental impacts of the increase in system-wide traffic attributable to the 2<sup>nd</sup> Lock. CEMVS is prepared to commence analysis of impacts and potential mitigation once revisions are completed to the economic forecast model. The UMR-IWWS Navigation Study will consider any future traffic which may result from the 2<sup>nd</sup> Lock at L/D 26 in the without-project condition.

Corps of Engineers headquarters also issued a Legal Opinion on L/D 26 Second Lock ROD Commitments and Linkages to Navigation Study, dated 24 July 1995. The opinion was provided, via the then North Central Division, to the Governor's Liaison Committee (GLC) and Navigation Environmental Coordinating Committee (NECC) in August 1995.

The opinion concluded that Corps commitments had been met, and that the ROD did not require the Corps to implement the Plan of Study (POS) as an independent study effort or to implement each and every study identified by the interagency team.

# ENVIRONMENTAL ISSUE #7

## UMR-IWW System Navigation Study

Draft 5/25/01

**1. Issue:** Development and implementation of a comprehensive ecosystem management plan for the Upper Mississippi River system, by Upper Mississippi River cooperating federal and state agencies.

Relates to matrix Issues 6 and 9.

**2. Background:** In a recently completed review of the Corps' UMR System Navigation Study, the National Research Council (NRC) repeatedly pointed out that the system navigation study is only assessing some project impacts and that environmental improvements should also be considered. The NRC also interpreted the 1970 Flood Control Act and the *Principles and Guidelines* to provide policy latitude for the Corps to explore comprehensive improvements in environmental quality, in addition to identifying impacts for mitigation. Several similar recommendations have been made in recent years.

In 1993, the Fish and Wildlife Service and the state natural resource agencies from Illinois, Iowa, Missouri, Minnesota and Wisconsin identified the need for federally funded study that would not only address mitigation of all impacts of the nine-foot channel project but also address protection and restoration of the nationally significant Upper Mississippi River ecosystem. The natural resource management agencies asked for this study at full federal expense because: WRDA 1986 declared the UMR a nationally significant ecosystem; numerous federally endangered species inhabit the ecosystem; wetlands support significant numbers of North American migratory birds; there are 12 National Wildlife Refuges in the ecosystem; and, perhaps most significantly, the Corps' nine foot channel navigation project infrastructure is a principal influence on the ecosystem. The Corps replied that such a study of project enhancement features would be cost shared.

Following the Upper Mississippi River flood of 1993, the White House sponsored Interagency Floodplain management Review Committee in 1994 recommended an integrated approach to floodplain management for flood damage reduction, ecosystem management and navigation on the Mississippi and Missouri Rivers. Action 7.6 of that report recommends that federal agencies be required to fund UMR ecosystem management with their operating funds. Action 10.7 recommends that the Corps provide a report early in the Navigation Study on enhancement opportunities as they relate to operation and maintenance of the existing project.

The Water Resources Development Act of 1999 (PL 106-53) authorized in section 459 a comprehensive plan to "...develop a plan to address water resource and related land resource problems and opportunities in the upper Mississippi and Illinois basins...in the interest of systemic flood reduction..." According to the Corps the expected outcome would be recommendations for: 1) construction of a systemic multi-purpose water

resources and flood management reduction project, 2) floodplain management alternatives, and 3) follow-on construction and design alternatives. Congress has not yet appropriated any funds for this plan.

The Upper Mississippi River System Environmental Management Program was re-authorized by the 2000 Water Resources Development Act. Since re-authorization, additional planning for future Habitat Rehabilitation and Enhancement Projects (HREP) has begun with a focus on pool scale or larger planning objectives. An initial Habitat Needs Assessment has been completed to assist with HREP planning, and is being updated as new data become available.

### **3. Potential Options:**

1. Re-scope Navigation Study to include ecosystem planning.
2. Parallel comprehensive ecosystem plan (cost shared).
3. Parallel comprehensive plan (fed funded).
4. Develop a plan for such a study within the Navigation Report that is forwarded to Congress for consideration

### **4. Regional Interagency Group Discussion Points:**

U.S. Fish and Wildlife Service: We agree with the NRC and related recommendations and support Option 1. When the Service and the state DNRs first brought this issue to the Corps in 1992, their concept was that a comprehensive ecosystem or fish and wildlife plan would be developed at a feasibility level of detail at 100% federal cost by the Corps, with the assistance of the other agencies. This plan would describe an umbrella program of all the various things the Corps was already doing in its three Districts related to fish and wildlife impacts of the navigation project (dredging planning, avoid and minimize program, side channel restoration planning, etc.). In addition, the plan would include other non-navigation related restoration or management concepts and plans of the fish and wildlife agencies and other stakeholders. The Service does not believe that comprehensive ecosystem planning should be a separate effort from the system navigation study, but rather it should be integrated with the system study so that restoration opportunities can be captured as navigation improvements are implemented. Implementation of identified ecosystem restoration goals would not necessarily be at 100% federal cost.

Environmental Protection Agency: The EPA concurs with the Fish and Wildlife Service

Department of Transportation:

Department of Agriculture:

Corps of Engineers: Agency guidance on cost sharing is relevant. The Ohio River Ecosystem restoration plan could provide a model. This is an opportunity to integrate and leverage numerous Corps and non-Corps programs. An umbrella program would facilitate synergies with and between these programs.

# ENVIRONMENTAL ISSUE #8

## UMR-IWW System Navigation Study

Draft 5/25/01

**1. Issue:** How will site-specific impacts be addressed and incorporated into the overall environmental impact assessment?

Relates to matrix issue 7(4).

**2. Background:** The Navigation Study includes two aspects of site-specific impact assessment. The first aspect was a component of the initial screening process of potential large and small-scale engineering measures. These were the so-called Site-Specific Habitat Assessments, begun in 1995 and concluded with a report in 1998. The objective of this effort was to use habitat-based assessment tools to determine the impact of various lock construction and related measures, for the purposes of assisting in screening out those measures that, based on several criteria, would not be carried forward for more detailed consideration. The assessments were conducted at the lower five lock and dam sites on the Mississippi, and the lower two sites on the Illinois. Habitat replacement costs were estimated for potentially-impacted areas, and these costs were included in the overall screening process.

The second task dealt with more detailed site-specific assessments that would be conducted if and when a recommended plan was approved for implementation. An approved plan would be sequenced in its implementation, and it was determined that once the first site for construction was chosen, a detailed environmental assessment would be conducted and its results carried forward with further feasibility phase reporting. Subsequent sites, as they entered the pre-construction engineering and design phase, would also be assessed in a detailed manner. Each of these assessments would be 'tiered' off of, or based on, the system Programmatic Environmental Impact Statement (PEIS). This would allow for an efficient analysis as the system EIS would provide much of the background material on the project, cumulative effects of any proposed construction and environmental setting, while the site-specific document would be more focused on the individual site activity including detailed mitigation design.

### **3. Potential Options:**

1. Prepare complete NEPA documentation, including overall Navigation Study project description and plan formulation information, for each potentially recommended navigation system improvement project.

2. Address site-specific construction impacts in a tiered fashion, per Council on Environmental Quality (CEQ) Guidelines (40 CFR parts 1502.20, 1508.28), to avoid repetition and consider only those issues ripe for decision, utilizing appropriate follow-up NEPA documents prepared for each location where improvement measures are to be

constructed. Issues of cumulative effects related to the construction site impacts would be fully addressed in the system EIS.

#### **4. Regional Interagency Group Discussion Points:**

U.S. Fish and Wildlife Service: The Service concurs that a tiered approach is appropriate to assess site-specific impacts. Although preliminary assessments have been completed, impacts to resources will need to be investigated in much greater detail when Environmental Assessments are conducted for each site prior to construction. Additional Habitat Evaluation Procedure analyses, hydraulic modeling, endangered and threatened species evaluations, mussel surveys, fishery impact assessments, recreation impact assessments and contaminant risk assessments will be needed to fill data gaps. Site-specific effects must also be considered within the context of a comprehensive, cumulative effects analysis.

Inter-agency coordination and cooperation will be of critical importance during completion of each assessment so that impacts of concern can be properly recognized and evaluated and appropriate mitigation measures can be identified and implemented. For example, the Service and state agencies must be allowed full participation in the development of any scopes of work for future studies prior to their finalization or implementation. No further analyses or detailed mitigation planning should be completed without participation and concurrence from coordinating agencies.

Environmental Protection Agency: EPA agrees that the tiered approach to assessing the proposed navigation changes is acceptable and preferred in this case. However, the Navigation Study needs to clearly articulate how the tiered approach would be structured and the types of issues that would be addressed.

Department of Transportation:

Department of Agriculture:

Corps of Engineers: As included in the PSP, and in coordination with state and other Federal agencies, the Corps has chosen Option 2 for addressing site-specific impacts for the Navigation Study. The draft EIS text on site-specific habitat assessments will be strengthened to fully incorporate cumulative impacts.

Site-specific habitat assessments completed thus far were conducted with the full coordination and participation of cooperating Federal and state agencies. This included development of the assessment approach, identification of resources of concern, field data collection, and prediction of future conditions with and without project. Future studies will be to a greater level of detail, as discussed in initial project planning documents. These efforts will be conducted in full coordination with cooperating agencies.

# ENVIRONMENTAL ISSUE #9

## UMR-IWW System Navigation Study

Draft 5/25/01

**1. Issue:** Inadequacy of incremental effects studies due to insufficient data.

Relates to matrix Issues 3 and 7(3).

**2. Background:** Ongoing criticisms of the environmental studies have centered on the sometimes limited data used in making impact assessments. These criticisms have been especially prevalent in regard to the fish and plant impact assessments, where coordinating agencies have pointed out that in some instances, one year of data was used as a basis for certain components of the impact assessments. The agencies also assert that some critical biological and physical information is lacking. To address in part these data limitations, the environmental studies were designed in a risk and uncertainty framework, which seeks to characterize error bounds in the results.

The NAS report opined in its Executive Summary that,

“...despite numerous environmental assessments conducted as part of the feasibility study, characterization of the current environmental system is insufficient...Gaps in current scientific understanding make it very difficult to accurately understand how additional changes will affect the river.”

### **3. Potential Options:**

1. Large-scale additional data collection that could take, at minimum, 2-3 years, and cost additional \$10-15M (estimated minimum).
2. Modest data collection effort, maximum time and cost of 2 years and \$5M, respectively.
3. Address agency concerns, e.g., adult fish entrainment, larval fish density data, model verification studies, additional sediment or bathymetry data, plant presence and/or abundance, with near-term targeted data collection efforts, to be completed for inclusion in DEIS. Recommend an adaptive mitigation implementation strategy that can take advantage of new information and changed conditions through time while implementing experimental, systemic measures and monitoring the success of the measures.

### **4. Regional Interagency Group Discussion Points:**

U.S. Fish and Wildlife Service: Since study initiation, the Service has provided technical assistance to the Corps primarily through the Navigation Environmental Coordinating Committee (NECC). During the scoping phase, the Service was generally supportive of

the intended modeling approach to incremental traffic impacts. However, the Service was dissatisfied that the level of effort did not meet that agreed to in the Plan of Study for Second Lock impacts. Due to the abbreviated investigations, and the lack of critical biological and physical data, the modeling results are too uncertain to formulate a mitigation plan that adequately assures the replacement of lost fish and wildlife resources. The Service supports additional studies (including baseline traffic impact quantification) necessary to reduce the uncertainty of the impact modeling results. To assure that additional studies will achieve this goal (to the extent possible), the Service and state natural resource agencies must be partners in the scoping, and implementation of any additional work. With regard to this additional work, the Service has had little to no involvement thus far. This same concern also applies to a draft mitigation plan that was prepared by the Corps without consultation with the Service or states. Although the Service supports additional studies to identify incremental traffic impacts with more certainty, it believes such studies are of significantly less value unless other impact issues (O&M impacts, Second Lock traffic effects, and baseline traffic effects) are addressed as well.

Environmental Protection Agency: EPA believes there is a need for additional data collection and studies. These studies are key to establishing a baseline for present environmental conditions. Further, the data will also be important to support the Corps ecological risk analysis and cumulative impact analysis.

Department of Transportation:

Department of Agriculture:

Corps of Engineers: Previous agency guidance and decision-making has maintained that the data collected thus far, though in some cases limited, is sufficient to make a reasoned choice between alternatives under NEPA. Distinction has been made between general river research and the level of effort necessary to meet NEPA requirements. When the draft Mitigation Implementation Strategy, and estimated mitigation costs, were developed in January 2000, tasks and associated costs were developed to collect additional data and perform verification studies in the follow-on Preliminary Engineering and Design (PED) phase of the study. Given the current direction of the Navigation Study, it is foreseen that some of these studies can be accomplished during the time remaining in the feasibility phase, and the results included in the environmental impact assessment and DEIS. However, detailed site impact data would still be deferred to the Design phase of any mitigation implementation, which is appropriate under an adaptive implementation strategy.

# ECONOMIC ISSUE PAPER #1a

## UMR-IWW System Navigation Study

Draft 5/25/01

- 1. Issue:** Calculation of Traffic Forecast. Relates to issue 1, “Spatial Equilibrium Model and Data” of the National Research Council (NRC) review report.
- 2. Background:** The NRC review commented that the traffic forecast model should explicitly incorporate detailed world supply and demand functions for individual countries. The NRC was highly critical of the revised Faucett forecasts.

Jack Faucett and Associates completed the original traffic forecast in 1997. The assumption for grain was Exports = Production – Domestic Consumption. It considered acres in production, yields, domestic demand, U.S. port shares, and foreign demand in a general sense. The Corps requested Faucett revise the forecast in 2000 as a result of HQUSACE policy review. The revised forecasts dealt only with grain and are based on USDA 10-year export estimates for corn and soybeans. This comment was similar to comments received during review of the original Faucett forecast and again during the ITR for the revised forecast.

A world model does not currently exist. Such a model would require specification of supply and demand conditions in each foreign country that is a significant participant in the world grain market, in addition to specification of supply and demand conditions in the US. Separate models would be required for corn and soybeans. Existing US Department of Agricultural (USDA) and the Food and Policy Research Institute (FAPRI) models could be starting points for development of a world model.

- 3. Potential Options:** Three potential options have been discussed.
  1. Retain latest traffic forecast by Faucett, which includes revised grain and original non-grain forecast.
  2. Obtain new traffic forecast from another source.
  3. Obtain new traffic forecast from a newly created world model that addresses individual country supply and demand for grain, while using original Faucett for non-grain.

#### **4. Regional Interagency Group Discussion Points:**

U.S. Fish and Wildlife Service:

Environmental Protection Agency:

Department of Agriculture: While the 50-year forecast is important to the justification of the project, the significance of the U.S. share of world exports is often overlooked. The U.S. is the world's largest exporter of corn and soybeans, with a projected world market share of 63% for corn and 55% for soybeans. About half of all U.S. corn exports and a third of the soybean exports originate on the Upper Mississippi River-Illinois Waterway.

Department of Transportation:

Corps of Engineers:

# ECONOMIC ISSUE PAPER #1b

## UMR-IWW System Navigation Study

Draft 5/25/01

**1. Issue:** Demand Elasticities. Relates to issue 1, “Spatial Equilibrium Model and Data” of the National Research Council (NRC) review report.

**2. Background:** The NRC review commented that price responsiveness of waterway demand should be based on empirical data.

This issue was identified during the 1998 internal technical review (ITR) completed by the Corps. Subsequent to the ITR, an attempt to further investigate waterway demand elasticities was conducted. This investigation was limited in terms of its duration. For non-grain commodities, the result of this investigation was elasticities that reflect empirically based estimates of short run generic transportation demand elasticities. These elasticities were incorporated into the preliminary draft feasibility study, however, the investigation was not successful in developing empirically based elasticities for grain. The waterway demand elasticities for grain ultimately used in the preliminary draft feasibility study are based on subjective assessment incorporating very limited empirical data. The waterway demand elasticities are critical inputs to economic modeling efforts.

**3. Potential Options:** Two potential options have been discussed.

1. Refinement of the demand elasticities by limiting investigations to grain.
2. Refinement of the demand elasticities by including all commodity groups.

**4. Regional Interagency Group Discussion Points:**

U.S. Fish and Wildlife Service:

Environmental Protection Agency:

Department of Agriculture: Agency needs more time to provide discussion input.

Department of Transportation:

Corps of Engineers:

# ECONOMIC ISSUE PAPER #1c

## UMR-IWW System Navigation Study

Draft 5/25/01

**1. Issue:** Use of ESSENCE Model (Benefit Model). Relates to issue 1, “Spatial Equilibrium Model and Data” of the National Research Council (NRC) review report.

**2. Background:** The NRC review commented that the benefit model should explicitly consider all relevant alternative supply and demand regions, connected by product prices, alternative modes, and transportation rates. The NRC comment calls for a much more fully developed spatial model to be used in NED benefit computation.

The ESSENCE Model does not model the alternative regions. Similar to other Corps inland waterway models, only the water transportation mode is explicitly modeled by ESSENCE. However, unlike other Corps models, ESSENCE does incorporate a downward sloping function to represent the demand for water transportation. In this manner the influence that other markets (served by non water modes) have on the volume of waterway traffic and ultimately the magnitude of NED impacts is incorporated by ESSENCE. Conceptually, the model suggested by the NRC would be superior and more precise than the ESSENCE Model. However, with careful specification of barge demand and elasticity, the ESSENCE Model may capture the majority of NED.

**3. Potential Options:** Three potential options have been discussed.

1. Continue use of ESSENCE Model, supported by a detailed investigation of barge demand elasticity.
2. Change from ESSENCE Model to an existing Corps Model.
3. Build a new model with more fully developed spatial considerations.

#### **4. Regional Interagency Group Discussion Points:**

U.S. Fish and Wildlife Service:

Environmental Protection Agency:

Department of Agriculture: Agency needs more time to provide discussion input.

Department of Transportation:

Corps of Engineers:

# ECONOMIC ISSUE PAPER #2

## UMR-IWW System Navigation Study

Draft 5/25/01

**1. Issue:** Consider nonstructural options for improving traffic management as a baseline condition for the study. This relates to issue 2 of the National Academy of Sciences Review Report. The NAS indicated that Congress should instruct the Corps to explore fully these nonstructural options for improving traffic management as the baseline condition for the National Economic Development alternative and environmental evaluation of any proposal for lock extensions. A comprehensive review and assessment of the benefits and costs on nonstructural options for improving traffic management should be conducted. The benefits and costs of lock extensions should not be calculated until nonstructural measures for waterway traffic management have been carefully assessed.

**2. Background:** In the “Summary and Recommendations” section of the NAS review, it is stated that: a full range of nonstructural measures should be evaluated before lock extensions are considered; a comprehensive assessment of the benefits and costs of these nonstructural options for improving waterway traffic management should be conducted; and, congestion management could improve waterway traffic management almost immediately, while reducing congestion by extending locks on the UMR-IWW would take a decade or more. Tradable lockage permits and congestion fees are most prominently mentioned in the NRC review.

The Navigation Study is addressing the need for navigation improvements over a 50-year planning horizon. The principal problem being addressed is the potential for significant commercial traffic delays on the system within the 50-year planning horizon, delays that will result in economic losses to the Nation. As part of the formulation process, alternative plans are developed which involve implementation of specific improvement measures at appropriate locations and timing to increase the net economic benefits to the Nation consistent with protecting the Nation’s environment over the 50-year planning horizon.

Early in the study process, over 100 potential improvement measures were brought to the table for consideration through public interaction. Measures were categorized as large-scale measures requiring greater capital investments, and small-scale measures that are less capital intensive and either nonstructural or structural in nature. Several screening processes were performed to focus the study efforts on those measures that could be best packaged in various combinations to form alternative plans for the system to reduce congestion in light of growing traffic over the 50-year planning horizon. This screening would also allow for a more manageable number of measures to model for a system that covers 1200 miles of navigable waterway and 37 lock and dam sites. Nonstructural and structural small-scale measures that remained after the first screening process were:

Towboat Power: helper boats; switchboat with guidewall extension; switchboat with remote remake; industry self-help without facilities; industry self-help with guidewall extensions; industry self-help with remote remake

Tolls and Reports: congestion tolls; excess lockage time charges; lockage time charges; publish lockage times

Recreational Vessels: scheduling of recreational vessel usage; recreational craft landings above and below lock

Optimizing Decisions: scheduling program

Extended Guidewalls: with powered kevels; with unpowered kevels

Mooring Facilities: cell or buoy

Crew Elements: crew training; permanent deck winches; additional personnel; powered ratchets on tows; powered ratchets at locks

These measures were considered in further detail. A secondary screening was performed in consideration of the following criteria: completeness; effectiveness; efficiency; acceptability; and, covered as part of a potential without-project condition. The small-scale measures remaining subsequent to this screening were: congestion tolls/lockage time charges; guidewall extensions with powered kevels; guidewall extensions with switchboats; mooring facilities (cells or buoys); and, approach channel improvements. Selected runs of the system economic model demonstrated that approach channel improvements, guidewall extensions with switchboats, and some mooring cell locations were not viable based on system efficiencies and, therefore, were screened from further consideration. In addition, congestion tolls also was subsequently screened based on the fact that it does not adequately address the study objective of meeting future transportation needs and could actually reduce transportation options, and implementability issues. This final screening process resulted in carrying guidewall extensions with powered kevels and select mooring facilities forward in the development of alternative plans for system analysis.

The NAS review contained some discussion on scheduling programs. Under existing operation practices on the UMR and IWW, lock staff employ at their discretion a traffic management method known as N-up/N-down servicing. This method is when multiple upstream lockages are followed by multiple downstream lockages, or visa-versa. As a result, a higher number of turnback lockages (next tow traveling in the same direction) occur, which take less time than exchange lockages (next tow traveling in the opposite direction). The primary benefit arises from minimizing approach times. The time savings for replacing an exchange lockage with a turnback lockage is on average approximately 17 minutes for a double lockage. However, the additional time associated with turning back the lock chamber averages 11 minutes, therefore reducing the time savings. As a result, the net savings is roughly 6 minutes for double lockage tows. This existing N-up/N-down servicing has been successfully employed for years, and will continue as part of the without-project condition, and appears to accommodate much of the benefits that can be achieved by scheduling program concepts.

**3. Potential Options:** Four potential options have been discussed.

1. Accept the screening of improvement measures accomplished to date in the Navigation Study, and continue formulation with the remaining measures: mooring facilities; guidewall extensions with powered keels; and 1,200-foot lock chambers.
2. Further evaluate congestion tolls as a potential with-project condition measure.
3. Explore and consider the tradable permit concept.
4. Further evaluate congestion tolls, and explore and consider the tradable permit concept.

#### **4. Regional Interagency Group Discussion Points:**

U.S. Fish and Wildlife Service:

Environmental Protection Agency:

Department of Agriculture: Agency needs more time to provide discussion input.

Department of Transportation:

Corps of Engineers: The Corps has agreed to fully evaluate tradable lockage permits and congestion fees.

## **APPENDIX 4**

### **Guidance from Corps Headquarters and Federal Principals Group Concept Paper**



DEPARTMENT OF THE ARMY  
U.S. Army Corps of Engineers  
WASHINGTON, D.C. 20314-1000

REPLY TO  
ATTENTION OF:

02 AUG 2001

CECW-PM

MEMORANDUM FOR Commander, Mississippi Valley Division

SUBJECT: Upper Mississippi River and Illinois Waterway System Navigation Study - Project Guidance Memorandum

1. References:

- a. Memorandum, CECW-PE, 16 March 2000, subject: Upper Mississippi River Navigation System Study.
- b. Memorandum, CECW-PE, 12 May 2000, subject: Upper Mississippi River Navigation System Study.
- c. Report, National Research Council (NRC), released 28 February 2001, title: Inland Navigation System Planning, The Upper Mississippi River - Illinois Waterway.
- d. Memorandum, Acting Secretary of the Army, 02 March 2001, subject: Program and Policy Reviews of Corps of Engineers Civil Works Studies and Related Processes - Action Memorandum (see Encl 1).
- e. Memorandum, CECW-PM, 25 June 2001, subject: Completion of the Upper Mississippi River and Illinois Waterway System Navigation Study (see Encl 2).

2. Purpose. To provide the Mississippi Valley Division (CEMVD) guidance on the resumption of the subject navigation study. The Chief of Engineers has approved restart of the subject study, generally in accordance with the agreement contained in the enclosed Principals Group's Concept Paper and in accordance with guidance contained in this memorandum. The Principals Group consists of Washington-level representatives from the Department of Agriculture (USDA), Environmental Protection Agency (EPA), Fish and Wildlife Service (FWS), Maritime Administration (MARAD), and HQUSACE, formed to consider the NRC recommendations and advise the Chief of Engineers on potential study changes.

CECW-PM

SUBJECT: Upper Mississippi River and Illinois Waterway System Navigation Study - Project Guidance Memorandum

3. Objective. The upper Mississippi River system is nationally recognized as a significant navigation and environmental resource. The navigation infrastructure on the Mississippi River and Illinois Waterway System is aged and inefficient. As a result, significant costs to the national economy are occurring due to barge congestion at the locks. The ecosystem on both waterways has been in decline and there is considerable concern that the growing barge traffic may accelerate the decline, perhaps precipitously. In recognition of these conditions and concerns, the refocused study will seek to improve the effectiveness of the navigation system in a manner that will achieve environmental sustainability for the navigation system and the resources that it directly impacts. Further, the study will be comprehensive and holistic as it considers the multiple purpose uses of this system and seeks a robust strategy that will work well under a variety of future scenarios.

4. Products. The subject study will be restructured to include the following:

a. The first product will define navigation system and environmental sustainability goals, and present a conceptual plan for modifying the existing navigation system to relieve lock congestion and achieve environmental sustainability. The first product will address additional authorization that may be needed to investigate navigation, ecosystem, and related needs in a comprehensive, holistic manner. It will also address any procedural, sponsorship, and cost-sharing issues that might arise related to the study and implementation of measures that can not be appropriately allocated to inland navigation. The first product may also present recommendations for measures that would help meet these needs on an interim basis while permanent solutions are evaluated.

b. The second product will provide a detailed, comprehensive implementation plan to serve as a framework for modifying the Federal navigation system to relieve lock congestion and achieve environmental sustainability. This final report will consider all alternatives. For recommended measures that should not be implemented immediately, the plan will present thresholds and the process for re-evaluating such measures in the future. The product will display an assessment of the alternatives under various future scenarios in order to facilitate informed decision making.

5. Schedule. The first product cited above will be completed as an interim report by July 2002. Efforts to develop the second product may be initiated concurrently. Within 30 days, the Division Commander shall provide a proposed schedule for the comprehensive plan for HQUSACE approval.

6. Management. The study will continue to be managed by the Division Commander.

CECW-PM

SUBJECT: Upper Mississippi River and Illinois Waterway System Navigation Study - Project Guidance Memorandum

7. Collaborative Process. A new Project Management Plan (PMP) will be prepared in collaboration with the Interagency Regional Work Group and other interested agencies and groups to reflect the content of this memorandum. Further coordination and resolution of the regional issue papers developed by the Interagency Regional Work Group in support of the Principals Group this past spring is highly recommended to help achieve a collaborative PMP. Any future changes to the PMP will also be made through similar collaboration. CECW-P will continue to facilitate Washington-level collaboration with the Principals Group, particularly on issues that can not be resolved at the regional level. The study will continue to be a collaborative effort through its completion.

8. Scope of Study Adjustments. The PMP will reflect the prior guidance presented in references 1.a and 1.b, and incorporate the recommendations of the NRC and Principals Group in references 1.c and 1.c to the extent possible, and except where superseded by the guidance presented herein. Document the actions to be taken to address each recommendation incorporated and the rationale and alternative actions to be taken for any recommendations not incorporated. Other issues identified in the Principals Group meetings should also be addressed in the PMP. These include international competitiveness and the application of risk and uncertainty techniques to navigation analyses.

9. Navigation Improvements.

a. In accordance with Paragraph 2.6.3(a) of the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&G), the without-project condition will include reasonably expected nonstructural measures.

b. A variety of potential alternatives will be evaluated to relieve lock congestion and otherwise improve the effectiveness of the navigation system, including modifications of the existing projects and their operation and maintenance procedures. The study should consider alternatives that can be implemented within existing authorities as well as those that will require additional authority from Congress. Small measures, such as mooring cells, and nonstructural measures, such as congestion management, that could potentially provide some level of immediate relief to the lock congestion should be given full and serious consideration from the outset of this study. Any measures that warrant immediate implementation may be recommended in the first product.

c. Congestion management alternatives will be addressed fully in the interim and final products.

d. Alternatives that may be implemented by others, such as vessel operation changes, should be addressed in the study.

CECW-PM

SUBJECT: Upper Mississippi River and Illinois Waterway System Navigation Study - Project Guidance Memorandum

e. Any recommended alternatives that would shift barge traffic to alternative modes, such as truck or railroad, must include thorough evaluations of the capacity, environmental, and social impacts on the alternative modes, including their related resources and any necessary mitigation.

10. Environmental and Ecosystem Considerations.

a. Alternatives identified through regional or other collaboration that would modify the navigation system to restore or improve the environment will be evaluated in the study. All recommended plans will be formulated to improve the ecosystem, to the extent reasonable opportunities are present. The study may identify additional opportunities to restore the ecosystem and we may recommend that any such opportunities be planned and implemented independently under the normal budget and study processes. The report should address the advisability of modifying the Upper Mississippi River Environmental Management Program, authorized by Section 1103(e) of the Water Resources Development Act of 1986, as amended, to plan and implement ecosystem restoration measures that might be identified in this study.

b. All recommended plans, regardless of outputs, will seek to achieve environmental sustainability. The historical and projected conditions of the system's ecology, including the cumulative effects from all sources, will be evaluated to identify trends in the state and health of the ecosystem, and to identify opportunities to improve the ecosystem.

c. Modifications to operations and maintenance procedures to improve the environment will be identified and considered.

11. Floodplain Management Considerations. Given the complex relationships between floodplains, the navigation system, and their shared ecosystem, the study will consider the impacts of improvements on floodplain management considerations. The study may identify opportunities to improve floodplain conditions; i.e., reduce flood damages and restore the ecosystem; and recommend that planning and implementing related projects be pursued independently from the navigation study under the normal budget and study processes.

12. Economic Analysis Considerations.

a. The presentation of economic benefits and costs for plan selection will be accompanied by displays of the beneficial and adverse impacts on the ecosystem, and a display summarizing the resulting environmental sustainability of each plan.

CECW-PM

SUBJECT: Upper Mississippi River and Illinois Waterway System Navigation Study - Project Guidance Memorandum

b. A specific set of projections of future commodity and barge traffic levels for fifty years is unlikely to be acceptable under the highly complex conditions affecting the Mississippi and Illinois Waterway System. In lieu of such forecasts, various scenarios for future conditions will be developed collaboratively with the Regional Working Group and the Principals Group. Each scenario will include an assessment of the likelihood that the scenario could occur and the likely time necessary for the scenario to evolve, if it were to occur. The final report will present results of the evaluations using these scenarios in a manner that will allow the decision-makers to consider the relative impacts and risks of selecting a particular plan for implementation.

c. Further development of the ESSENCE and spatial equilibrium models should continue as an independent effort until the models have been appropriately corrected, independently validated, and accepted as defensible tools. That effort should be addressed in the report. Until these models are accepted, economic models that have been previously used and accepted should be adapted and applied in this study.

d. The application and results of the economic analyses will be compatible with the application and results of environmental/ecosystem evaluation procedures.

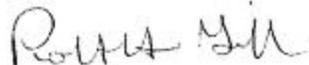
### 13. Review and Approval.

a. An in-progress review (IPR) will be scheduled with CECW prior to completion of the PMP. The read-ahead material for HQUSACE will include a memorandum that lists the various instructions and recommendations contained in each of the references, except reference I.d, and identifies the corresponding implementing task(s) in the PMP. For any instructions and recommendations that are not incorporated into the PMP, the document will present the supporting rationale.

b. An AFB will be scheduled for the interim product.

FOR THE COMMANDER

2 Encls



ROBERT H. GRIFFIN  
Brigadier General, USA  
Director of Civil Works



DEPARTMENT OF THE ARMY  
WASHINGTON DC 20310

*Mr. Johnson*  
*CECW - PAM*  
*PAM R. 3/3*



March 2, 2001

MEMORANDUM FOR THE ACTING ASSISTANT SECRETARY OF THE ARMY  
(FINANCIAL MANAGEMENT AND  
COMPTROLLER)  
ACTING GENERAL COUNSEL  
CHIEF OF ENGINEERS  
THE AUDITOR GENERAL  
OFFICE OF THE DEPUTY ASSISTANT  
SECRETARY OF THE ARMY  
(MANAGEMENT AND BUDGET)  
(CIVIL WORKS) :

SGS \_\_\_\_\_  
DCS-S \_\_\_\_\_  
DCS-G \_\_\_\_\_  
CS \_\_\_\_\_  
DCG \_\_\_\_\_  
CG \_\_\_\_\_

CF: CLW  
CC  
CS-C

SUBJECT: Program and Policy Reviews of Corps of Engineers Civil Works  
Studies and Related Processes – ACTION MEMORANDUM

Throughout my tenure as the Under Secretary and Acting Secretary of the Army, I have remained impressed with the professionalism and dedication of the employees and leaders of the U.S. Army Corps of Engineers. For 225 years, the Corps has honorably served the Army and our Nation in peace and in war. There is little doubt that the Corps will continue to excel as the preeminent public engineering organization well into the 21<sup>st</sup> Century.

An important part of the Corps' ability to maintain its well-earned bond of trust with the American people is to periodically review its policies, processes, and procedures to ensure that they properly and fully consider modern needs and concerns. Potential projects such as improving the Upper Mississippi River navigation system have highly complex and interdependent economic, social, and environmental effects that are far-reaching and difficult to forecast and assess in quantitative terms. The Corps will be continually challenged to develop, improve, and employ state-of-the-art methods and techniques to analyze these complex and sensitive civil works projects. This will require increasing levels of collaboration with experts from other parts of the Army, other Federal agencies, academia, and other interested parties.

As part of the on-going process to improve the Corps' project planning process, the former Secretary of the Army directed specific reviews and reports by selected Army offices (see memoranda dated November 29, 2000 and December 21, 2000) of the Army Inspector General Report related to the Corps' Upper Mississippi River and Illinois Waterway navigation study and the findings and recommendations of the National Research Council report, *Inland Navigation*

*System Planning: The Upper Mississippi River-Illinois Waterway.* This memorandum addresses how the Army will proceed with these matters.

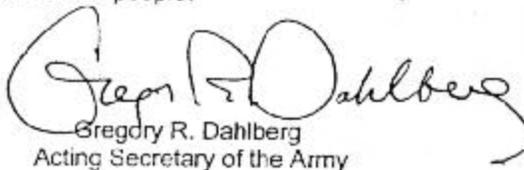
With the release of the National Research Council report later than anticipated and with the change in Administrations, I have determined that it is necessary to adjust the Army's evaluation timelines to ensure that relevant analyses can be fully considered by the new Army leadership. There are two separate but related actions that need to take place as we move forward.

First, I have approved a prior request by the Chief of Engineers to temporarily pause the feasibility study for the Upper Mississippi River-Illinois Waterway in order to invite a wide array of Federal agencies that have jurisdictional interest in this matter to participate more actively in the study. The Corps should consult with these agencies over proposed adjustments to the feasibility study in the March/April timeframe with the goal of implementing any necessary adjustments and restarting the study in a timely manner. I support the Chief of Engineers assessment that by leveraging the experience and perspectives of these agencies on matters within their area of expertise, the Army can complete the study in a more integrated and collaborative manner. In addition, the pause will be used to evaluate and incorporate the findings and suggestions from the National Research Council report into plans for completing the Upper Mississippi River-Illinois Waterway feasibility study. The Chief of Engineers is to report, through the Assistant Secretary of the Army (Civil Works), to the Secretary of the Army on April 30, 2001, the results of this collaborative process and provide an estimated schedule for completion of the study.

Second, the Chief of Engineers, the Office of the Assistant Secretary of the Army (Financial Management & Comptroller), the Office of General Counsel, and the Army Audit Agency are to continue their reviews directed by the former Secretary of the Army on November 29 and December 21, 2000. These reviews and reports, which are to be provided to the Assistant Secretary of the Army for Civil Works, will assess a broad range of program and policy options to improve the conduct of the Corps of Engineers project planning process. I have withdrawn the previous 60-day requirement for interim reports on these efforts. However, each reviewing office is directed to complete this work promptly with the goal to brief the new Secretary of the Army upon taking office. Final reports will be submitted in accordance with the 180-day suspense originally directed in the memoranda, dated November 29 and December 21, 2000.

The water resources infrastructure provided through the Corps' civil works program has improved the quality of our citizens' lives and provided a foundation for economic growth and development of this country. The actions that I have directed will provide the opportunity to make appropriate assessments of proposals to improve the Upper Mississippi River-Illinois Waterway navigation

study and the Corps' overall planning processes, identify potential adjustments, and implement them as appropriate in consultation with Army leadership, other Federal agencies, and the Congress. This will allow the Corps of Engineers to continue to move forward, maintaining its superb reputation as a quality, responsive, public organization, and continue to provide its important contributions to the Army and the American people.



Gregory R. Dahlberg  
Acting Secretary of the Army

cc:  
Chief of Staff, Army  
The Inspector General

SUBJECT: Completion of the Upper Mississippi River and Illinois Waterway System Navigation Study

1. This paper documents the recommendations of Washington-level representatives from the Department of Agriculture, Environmental Protection Agency, Fish and Wildlife Service, Maritime Administration, and Army Corps of Engineers regarding re-scoping of the Upper Mississippi River and Illinois Waterway System Navigation Study to address the recent National Research Council (NRC) review. The NRC identified several key issues, including economic analyses, traffic projections, cumulative impact analysis, and mitigation. The Federal agencies' recommendations to address these findings are presented in the following paragraphs.
2. In light of the Congressional declaration that the upper Mississippi River is both a nationally significant ecosystem and navigation resource, environmental and navigation concerns shall be fully addressed in the study, and all recommended measures should be environmentally sustainable. An evaluation of cumulative environmental effects of navigation, as well as the environmental restoration needs that can be addressed through mitigation of unavoidable effects, should be carried out as an integral part of the study. The cumulative effects analysis should be used as a basis for developing an environmentally sustainable navigation system.
3. Completion of a rigorous, model-based systems analysis is not achievable with the available tools. The study should be recast as a framework analysis that presents a more general analysis of the system and its critical elements, incorporating the suggestions below. The study should examine phased implementation of structural and nonstructural measures in a manner that is responsive to the changing conditions. Evaluations of nonstructural navigation improvements should proceed immediately, inasmuch as nonstructural measures could potentially postpone or eliminate the need for some structural measures. The study should also present findings and recommendations on those measures that warrant consideration for potential immediate implementation. For other measures, the study should define procedures for future phase(s) of analysis and decisions, including suggested thresholds for initiating or terminating the efforts.
4. The ESSENCE model is unlikely to be successfully refined to fully respond to the NRC recommendations within the desired time frame. Similarly, development of an adequate, defensible spatial equilibrium model is unlikely to be achieved in the desired time frame. Efforts to develop a spatial equilibrium model should occur separately from the navigation study and should not be applied to any study until the model has been independently validated and accepted as a reasonable tool.
5. Defensible 50-year forecasts of commodity and barge traffic levels are unlikely to be achieved within a time consistent with Congressional expectations for addressing

system navigation needs. In lieu of such forecasts, the Corps is encouraged to develop an approach that would utilize scenarios that cover the range of reasonable future barge traffic conditions. These scenarios, including threshold conditions (traffic) and the likelihood of their occurrence, should be defined collaboratively by the Principals Group with appropriate input from the Regional Working Group. Alternative projections within those scenarios should also be developed. The resulting report would present evaluations of the various alternatives within each scenario together with assessments of the likelihood of the scenarios occurring in order to inform decision-makers of the relative advisability of implementing each alternative. This approach should consider the lead-time necessary for reevaluation of trends and alternatives to confirm whether to proceed with project implementation. Under this approach, the Corps would collect and analyze environmental, economic, and barge traffic data on an on-going basis.

6. Alternative operation and maintenance procedures shall be formulated and evaluated to ensure or improve the efficiency of navigation, minimize the adverse effects of the navigation system on the environment, and promote an environmentally sustainable system. Any proposed modifications to the operation and maintenance plan should incorporate compensatory mitigation measures needed to offset unavoidable impacts of these alternatives.

7. A report is proposed to present recommendations to the Congress for consideration in the Water Resources Development Act of 2002. It may constitute an interim report if follow-on reports are deemed necessary. This report may include a proposal for such special additional authorities as are necessary to implement an environmentally sustainable navigation system. The report should address nonstructural measures such as congestion management and/or other measures with sufficient supporting analyses. The report should also describe the anticipated major activities regarding potential project recommendations expected after 2002.

8. A comprehensive mitigation plan should be developed to address the effects of the operation and maintenance of the navigation system on the environment, as identified and quantified in the cumulative effects analysis. That plan should be developed in coordination with the Principals Group with input from the Regional Working Group.

9. Upon resuming the study, the Corps of Engineers will work collaboratively with the Principals Group, the Regional Working Group, interested agencies and other parties to revise the project management plan that will be used to achieve these recommendations. This plan should address such items as products, key actions, roles, coordination, and schedules. The plan should also describe the purpose of each included action.

## **APPENDIX 5**

### **River Management Actions**

## Authorities for Management of the UMRS

Note: Refer by number to "Existing Authority" column in River Management Actions table. Most of the authorities listed are annotated more completely in the Corps of Engineers Policy Digest, Appendix B <http://www.usace.army.mil/inf/infactions/corpspolicydigest20appb.doc>

Ref.	Authority	Authorization
<b>Navigation System Operations and Maintenance</b>		
1	River and Harbor Act of July 3, 1920, as amended	Construction, operation, maintenance of UMR 9-Post Channel Navigation Project
<b>River Regulation</b>		
2	33 U.S.C. 1 P.L. 80-483, 33 U.S.C. 562a	Regulation of water levels for navigation and bottom nation-wide
3	33 C.F.R. 222.7 (ER 1193-2-240)	Corps water control management
4	EM 1110-2-3600, 30 Nov 87 Management of Water Control Systems	Corps water control management
5	Anti-Chokedam Law 1936, amended by PL 732 1946 and PL 607 1948	Full consideration for UMR fish and wildlife in water control management
6	Act of August 11, 1956, ch 860, 25 Stat. 419, 33 U.S.C. 602	Regulation of Mississippi Headwaters reservoirs in Minnesota
7	Flood Control Act of 1944, 33 U.S.C. 708	Regulation of Corps reservoirs for flood control
<b>Navigation Management</b>		
8	River and Harbor Act 1920	Authorized Mississippi River Commission construct levees along Mississippi River for navigation
9	Commercial Statistics 1901	Requires vessel operators to report information for bridge records
10	Transportation Act 1920, PL 162	Authorizes Corps to compile and publish waterway traffic statistics
11	Flood Control Act 1970, PL 91-611 Section 216	Authorizes Corps to complete and publish waterway traffic statistics Authorizes Corps to initiate operations of completed projects
<b>Environmental Protection</b>		
12	National Environmental Policy Act, E.O. 9119, 42 U.S.C. 4301 et seq	Established broad Federal policy on environmental management
<b>Water Quality Management</b>		
13	Federal Water Pollution Control Act Amendments 1972, PL 92-500	National goals for pollutant discharge, eliminate water quality
14	Sections 402, 403	Authorized EPA to regulate water discharges to water
15	Section 424	Authorized Corps to regulate 81 navigable of United States
16	Clean Water Act 1977 P.L. 95-217	Amended FWPCA 1972, requires Federal compliance
17	E.O. 12088 1978 Executive Order 12088	Requires Federal compliance with pollution control standards
18	33 U.S.C. 540	Management of Federal projects with "due regard for conservation of wildlife"
19	Oil Pollution Control Act 1924	Authorized Corps and Coast Guard to prohibit discharge of oil, enforce regulations
20	33 U.S. Code, Chapter 36, Section 2316	Authorizes water quality management at Corps projects
21	River and Harbor Act 1920	Authorized Corps to regulate, issue permits for work in navigable waters. Prohibits discharge of solid waste into rivers
22	Watershed Protection and Flood Prevention Act 1954	Authorizes Dept. Agriculture to work with states on watershed projects
<b>Fish and Wildlife Management</b>		
23	Endangered Species Conservation Act 1973	Directs Federal agencies to protect/conserv endangered species in consultation with Dept. Interior
24	Fish and Wildlife Conservation Act 1950	Provides funds to states for nonpoint management
25	River and Harbor Act 1920	Authorized Sec. Army to construct and operate levees at dams that obstruct fish passage
26	26 Stat. 426, 33 U.S.C. 609	Authorized Sec. Army to construct and operate levees at dams that obstruct fish passage
27	Fish and Wildlife Coordination Act 1946 (amended in 1959)	Provides for coordination with USFWS, states, "equal consideration" of fish and wildlife conservation with other project purposes
28	Federal Water Project Recreation Act 1965	Requires consideration of recreation opportunities, fish and wildlife attachment, provides for non-federal management
<b>Recreation Management</b>		
29	Federal Water Project Recreation Act of 1965, P.L. 89-72	Provides for recreation development at Federal projects
30	Fletcher Act 1932, PL 16-720	Broadened scope of Federal interest in wilderness to include recreational boating
31	Flood Control Act of 1944	Authorized recreation projects at Corps reservoirs, conservation of fish and wildlife
<b>Habitat Protection and Restoration</b>		
32	Fossil Conservation 1960	Provides for protection and management of fossil areas at Corps reservoir projects
33	Flood Control Act 1970, PL 91-611	Authorizes Corps to complete and publish waterway traffic statistics
34	Section 216	Authorizes Corps to complete and publish waterway traffic statistics
35	WRDA 1980	Requires non-Federal cost sharing
36	Section 704(b)	Authorizes Federal fish and wildlife habitat projects
37	Section 706	Requires mitigation consistent with Federal project construction
38	Section 210	Fish and wildlife enhancement projects, 100% Federal cost when benefits of national character
39	Section 1103	Other fish and wildlife enhancement projects, 75% Federal cost when benefits of national character
40	Section 1135	Authorized UMRS RFP, ITBMS, HRRC contracts
41	WRDA 1980	Provides for review of completed projects, projects modifications for environmental enhancement
42	Section 307	Makes environmental protection a primary Corps mission
43	Section 312	Established a national "no net loss of wetlands" policy
44	WRDA 1980	Authorized Corps to do "environmental trading" in coordinated management with non-Federal sponsors
45	Section 204	Established a program for beneficial use of dredged material
46	WRDA 1980	Authorized Corps aquatic ecosystem restoration projects
<b>Floodplain Management</b>		
47	Flood Control Act of 1928	Authorized Corps to develop comprehensive plan for flood control for Mississippi River and tributaries
48	Flood Control Act 1936	Broadened scope of Federal flood control activities, requirements of non-Federal sponsors
<b>Hydropower</b>		
49	Federal Power Act 1992, ch 860, 41 Stat. 1007, 16 U.S.C. 791a	Requires hydro development of Federal projects to be approved by Sec. Army









