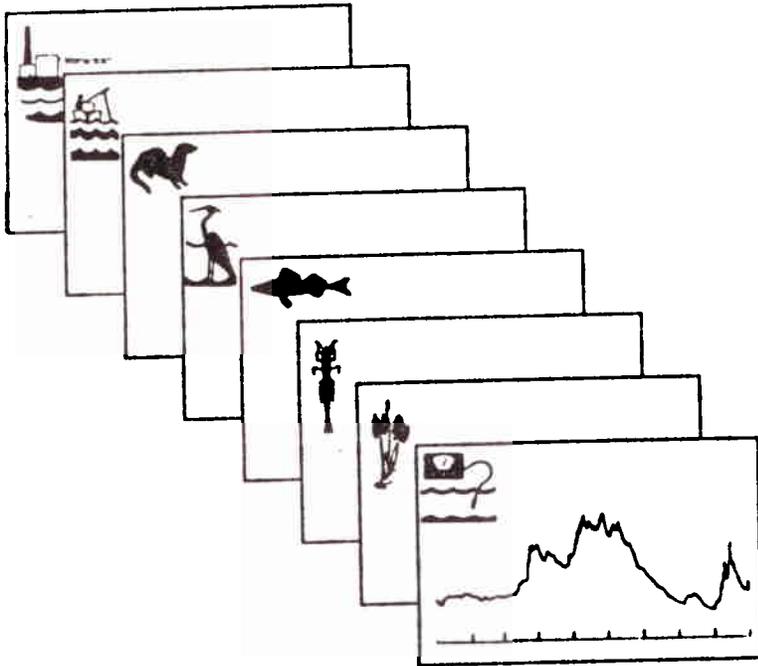


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# ENVIRONMENTAL MANAGEMENT PROGRAM LONG TERM RESOURCE MONITORING PROGRAM UPPER MISSISSIPPI RIVER SYSTEM



## BACKGROUND STUDY ON THE ENVIRONMENTAL IMPACTS OF BARGE FLEETING

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ABSTRACT  Background materials were compiled to determine what is currently known about barge fleeting on the Upper Mississippi River System. Background materials included available literature, contacts with professionals, permit information, regulatory statutes and a review of current aerial photography. Field investigations were conducted in an attempt to examine most of the fleeting areas on the Upper Mississippi and the Illinois rivers. Method of anchoring barges, distance to shore, water depths, substrate and shoreline composition, erosion, and any tree damage were noted. Fleeting areas were all located close to terminals. Barges were moored as close to the shore as water depths permitted. Trees were most often used for moorage in the Rock Island Corps of Engineers District and deadmen were most often used in the St. Paul and St. Louis Districts. Trees were most often used for moorage on the Illinois River.		
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BACKGROUND STUDY ON THE ENVIRONMENTAL IMPACTS  
OF BARGE FLEETING

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North Central Division, Planning Division

## PREFACE

The Long Term Resource Monitoring Program for the Upper Mississippi River System was authorized as part of the Environmental Management Program in the Water Resources Development Act of 1986 (Public Law 99-662). The Upper Mississippi River System is composed of the navigable reaches of the Upper Mississippi, Illinois, Kaskaskia, Black, St. Croix and Minnesota rivers. Program objectives are: 1) analyze significant resource problems such as sedimentation, water level management and navigation impacts; 2) monitor selected habitats and species; and 3) develop data management systems and techniques which will assist resource personnel to better manage the rivers' ecosystems.

A problem identification and analysis process was identified as one of the four major program components of the Long Term Resource Monitoring Program. One component was to "Evaluate impacts of barge fleetings on riparian and aquatic habitat on the Upper Mississippi River System", Task PA(NE)12 (Rasmussen and Wlosinski, 1988).

The following report provides general background information on barge fleetings and describes general fleetings characteristics in relation to potential impacts on fish and wildlife resources.

This report was prepared by Mary S. Mahaffy and Jody G. Millar of the Rock Island Field Office under the direct supervision of Rick Nelson. Cooperation and assistance was greatly appreciated of the many people who helped with this study. Gerald Bade and Gail Carmody of the Rock Island Field Office, Butch Atwood of the Illinois Department of Conservation, and Mike Anduss of Mark Twain National Wildlife Refuge assisted in the field work. Hokan Miller, Port of St. Paul harbor pilot, provided us with his knowledge of fleetings sites. Bruce Stebbings, Marion Field Office and Nick Rowse, St. Paul Field Office, assisted with review of aerial photographs. Jerry Rasmussen, Long Term Resource Monitoring Program, provided guidance throughout the study effort. Mary Mackrill, Long Term Resource Monitoring Program, performed editorial and administrative tasks. People associated with the river, biologists, lockmen, and switchboat operators, were there to provide information or help whenever we needed it.

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Millar, J.G., and M.S. Mahaffy. 1989. Background Study on the Environmental Impacts of Barge Fleetings. EMTc 89/04. U. S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin.

## SUMMARY

A barge fleeting background study for the Upper Mississippi River System was conducted in conjunction with the Long Term Resource Monitoring Program. The study was conducted in three parts.

First, background materials were compiled to determine what is currently known about barge fleeting on the Upper Mississippi River System. Background materials included available literature, contacts with professionals, permit information, regulatory statutes and a review of current aerial photography.

Secondly, a field investigation was conducted in an attempt to examine most of the fleeting areas on the Upper Mississippi and the Illinois rivers. Method of anchoring barges, distance to shore, water depths, substrate and shoreline composition, erosion, and any tree damage were noted. Fleeting areas were all located close to terminals. Barges were moored as close to the shore as water depths permitted. Trees were most often used for moorage in the Rock Island Corps of Engineers District and deadmen were most often used in the St. Paul and St. Louis Districts. Trees were most often used for moorage on the Illinois River.

In the third portion of this report the authors recommended that all fleeting sites should be operated under a permit which requires some environmental accountability. The least damaging method of fleet moorage appears to be an offshore location, in deep water, and cabled to pilings in an area which is not environmentally sensitive. Future study needs include examining the effect of barge fleeting on the riparian ecosystem, with special emphasis on impacts of tree loss to wildlife; a more thorough background fleeting study; quantification of impacts; evaluation of the relationship between barge fleeting and bank erosion; and examining the opportunities for aquatic habitat enhancement.

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## INTRODUCTION

Barge fleetings on the Upper Mississippi River System (UMRS) has been a concern of resource managers and industry. Attempts to resolve these concerns have been hampered by arbitrary regulations, lack of data identifying and quantifying impacts, and lack of alternatives for impact avoidance.

Several major studies have been conducted which attempted to describe barge fleetings problems and impacts, and to provide recommendations. The Great River Study, authorized by Congress in the Water Resources Development Act of 1976 (Public Law 94-587), included investigation of the effects of barge fleetings on the UMRS. The Great River Environmental Action Teams' (GREAT) reports provide valuable information related to the subject of barge fleetings. Other reports have summarized fleetings effects on fish and wildlife resources. A partial list of major publications include:

1. Great River Environmental Action Team Reports: GREAT I (1980a and 1980b), GREAT II (1980a, 1980b, and 1980c), and GREAT III (1982).
2. Comprehensive Master Plan for the Management of the Upper Mississippi River System (UMRBC, 1981).
3. A biological sensitivity analysis of fleetings for the port of metropolitan St. Louis (Versar, Inc., 1981.)
4. Barge fleetings report (MEQB, 1983).
5. Effects of fleetings on mussels (Sparks and Blodgett, 1988).
6. Port of LaCrosse Harbor Inventory and Plan (MRRPC, 1988).

The Problem Identification and Analysis Work Group set forth the task to "Evaluate impacts of barge fleetings areas on riparian and aquatic habitat on the UMRS". Within the broad scope of this task, the efforts of this study were centered on bringing together background information on impacts and describing the scope of fleetings. It was meant to be a preliminary survey of barge fleetings site information and to guide more comprehensive studies of fleetings impacts on natural resources.

The U. S. Army Corps of Engineers' St. Louis District, study on mooring facilities of the Mississippi River (USACE, 1982) provides the following definitions:

"Mooring Facilities - All structures, ground tackle, and equipment to hold barges and vessels to the bank or out of the main channel, such as cells, dolphins, anchor vessels, anchors, and piers."

"Emergency/Temporary (Safety) Mooring Facilities - Facilities for the temporary tie-up of a tow while still in transit, with the towboat normally staying with the tow due to an onboard emergency, traffic delays, heavy traffic, or adverse weather conditions."

These facilities are neither an origin nor a destination and no economic activity is taking place."

"Terminal Mooring Facilities - Facilities where the barges are dropped off for loading, unloading, or awaiting other vessels, including barge warehousing whether a temporary or permanent barge location. This type of facility is an origin or destination and economic activity is taking place."

"Fleeting Areas - These are areas where barges are dropped off or picked up, and facilities are provided to hold the barges against the current. These sites are origins or destinations for the barges and economic activity is taking place. The boat normally leaves the tow. The fleeting areas operate basically as a railroad switch yard. Normally work boats are present at the site in order to reconfigure the tows."

The scope of the present study effort includes fleeting areas and their associated mooring facilities on the Mississippi and Illinois rivers. It does not include emergency/temporary or terminal mooring facilities as defined above. The objectives of this study were to:

- (1) Summarize existing background information regarding barge fleeting.
- (2) Describe physical characteristics of barge fleeting sites on the Upper Mississippi River System (UMRS).
- (3) Provide recommendations for future study needs.

Objective (1) included review of pertinent literature, contact with experts involved with barge fleeting studies, retrieval of relevant permit information and review of existing regulatory authorities.

Objective (2) was accomplished by identifying fleeting site locations, mapping locations, field inspection of fleeting sites, and identification of on-site and adjacent habitats.

Objective (3) incorporates information from objectives (1) and (2) into recommendations for future study needs.

## BACKGROUND INFORMATION

### REGULATIONS

#### Federal

The U. S. Army Corps of Engineers (Corps) is the principal agency regulating fleeting on the UMRS due to its responsibility to maintain the navigability of the waterway. The Corps primarily regulates fleeting under Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403). It reads as follows:

"(Section 10)...prohibits the unauthorized obstruction or alteration of any navigable water of the United States. The construction of any structure in or over navigable water of the United States, the excavating from or depositing of material in such waters, or the accomplishment of any other work affecting the course, location, condition, or capacity of such waters is unlawful unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of the Army. The instrument of authorization is designated a permit. (51 Fed. Reg. 320.2b)."

In general, a permit is required for any structure placed in a navigable water of the United States below the ordinary high water mark. Structures include pile clusters, mooring cells and submerged anchorages. A Section 10 permit is not required for anchored barges, structures in place prior to 1968, or barges considered temporarily tied to existing structures in the water or to trees.

In a letter dated December 31, 1980, Acting Director Robert Cook of the U. S. Fish and Wildlife Service (Service) requested of Lt. General Joseph Bratton, Chief of Engineers, "that Corps barge fleeting policy be reconsidered and changed to require Section 10 permits of all barge fleeting operations". Deputy Director of Civil Works, Colonel George Robertson, responded in a February 5, 1981 letter as follows:

"The Corps exercises jurisdiction over structures associated with fleeting areas under Section 10 of the Rivers and Harbor Act of 1899. The district engineer may also require a Section 10 permit where an engineering determination is made on what effect the mooring of barges to deadmen, trees or other structures above the ordinary high water mark has on the navigable capacity of a waterway. Of course a complete public interest review is conducted on all of these cases before a decision is made to either issue or deny the permit. We do not require a Section 10 permit for anchored barges or barges temporarily tied to existing structures in the water as we consider this normal vessel traffic."

"We recognize that certain barge mooring areas outside of our jurisdiction are not presently regulated by the Federal Government. With this in mind, we contacted the U. S. Coast Guard Headquarters with a request that we meet to discuss our agencies' jurisdiction over the fleeting areas. We have not yet received a response from the Coast Guard on this matter."

We are not aware of any subsequent correspondence pertaining to the referenced Coast Guard and Corps meeting. The Coast Guard does not regulate fleeting, but enforces navigation regulation, safety and signal standards, and water pollution control.

Where installation of navigation structures involves discharge of dredged or fill materials, permits under sections 401, 402, and 404 of the Clean Water Act of 1977 (33 U.S.C. 1251 et. seq.) are required. For activities that may

pollute the waters of the United States, Section 401 requires State certification that the activity will not violate State water quality standards. Section 402 establishes a permit system for regulating all point source pollutant discharges into waters of the United States. Section 404 provides for the Corps to issue permits for the discharge of dredged or fill materials into waters of the United States. The Environmental Protection Agency has the primary responsibility for enforcement of the Act against unauthorized discharges.

Under environmental laws such as the National Environmental Policy Act (42 U.S.C. 4341), the Fish and Wildlife Coordination Act (16 U.S.C. 661-666c) and the Endangered Species Act (16 U.S.C. 1531, et. seq.), the Service and State agencies must be consulted regarding impacts to the environment or fish and wildlife resources. These laws are thoroughly discussed in many references (e.g. MEQB, 1983).

Much of the floodplain on the UMRS is owned by the United States Government and is under the jurisdiction of the States, the Corps or the Service. If the fleet is not moored to any structure, but instead is using trees on Federal property for anchorage, trespass laws may be enforced. These laws include general trespass covered under common law, trespass on public lands (43 CFR, Part 9230), the Refuge Trespass Act (18 U.S.C. 410) and the National Wildlife Refuge System Administration Act (16 U.S.C. 668dd). The level of regulation of barge fleeting under these statutes by the Corps and the Service has been variable.

The U. S. Department of Agriculture (USDA) was recently involved in barge fleeting via the Emergency Barge Storage Program. This program enabled the USDA in 1986 and 1987 to "...utilize excess barge capacity on the inland waterway system for emergency grain storage" (USDA, 1987). The USDA discontinued the storage of grain on barges in the spring of 1987 once the grain was sold.

#### State

Minnesota, Wisconsin and Iowa regulate barge fleeting activities independently from the Corps. Illinois and Missouri influence these activities solely through the review of Corps permits. The Illinois General Assembly repealed the Illinois Department of Transportation's barge fleeting regulations in 1981. The Assembly concluded that the regulations were duplicative of the Corps permits.

Barge fleeting activities in Minnesota are indirectly affected by regulating activities associated with the construction of barge fleeting facilities, including the filling or excavation of the beds of protected waters and the placement of structures in protected waters (Minnesota Statute Chapter 105). The Minnesota Environmental Policy Act (Minn. Stat. 116D, et seq.) and the Critical Areas Act (Minn. Stat. 116G, et seq.) may also affect barge fleeting permitting in Minnesota.

Barge fleeting activities in Wisconsin are regulated through legislation passed on December 1, 1982. Chapter NR 327 of the Wisconsin Administrative

Code "regulates the use of those waters for barge fleetling, including the installation of structures, physical site modification such as dredging and operation of fleetling equipment and maneuvering of barges within the fleet".

The State of Iowa passed barge fleetling rules on February 25, 1982. Chapter 54, "Barge Fleetling", of the Iowa Administrative Code, prohibits barge fleetling except in areas designated by the Department of Natural Resources. "Barges shall not be moored to trees or other natural features of an area except with the approval of the riparian property owner or during an emergency (290-54.3(7))." Prohibited areas include: areas adjacent to dams, locks, breakwaters, wingdams, bridges; areas within navigation channels; areas that would have substantial adverse effects on fish or wildlife due to dredging, propeller wash or other fleetling related activities; areas receiving high use for recreation, sport fishing, and commercial fishing, unless fleetling is compatible; areas adjacent to industries presenting serious safety hazards; areas where fleetling activities would interfere with public enjoyment of government owned parks, game refuges, forests, docks, marinas, ramps, or unique biological or physical features of the river valley (Iowa Reg. Ch. 54, 209-54.5(1-4) and 290-54.6(1-5)).

#### Private

Private leasing or purchase agreements are routinely carried out between fleetlers and adjacent private landowners on the Illinois River. This is also true for private land holdings on the Mississippi River, but to a lesser degree. Barges also may be moored on sites adjacent to and owned by terminals.

#### ENVIRONMENTAL IMPACTS TO FISH AND WILDLIFE

Miller, et. al. (In Press) concluded that very few laboratory or field studies have been conducted which clearly document biological effects of navigation traffic. They stated that the majority of the documents describing effects were "judgmental and did not adequately test the hypothesis that commercial traffic significantly affects aquatic resources". Similarly, indirect effects of barge fleetling on fish and wildlife have not been well documented. Direct impacts such as crushing of mussels and loss of fish and wildlife habitat through erosion have been more clearly observed. The following discussion provides information present in the literature. Although many biological effects have not been adequately documented, they present possible impacts that should be considered.

The UMRS provides areas of diverse habitat for fish and wildlife (UMRBC, 1981). The impacts of barge fleetling on fish and wildlife species vary, depending on species and habitat sensitivity (MEQB, 1983; MRRPC, 1988). Noise and activities associated with barge fleetling operations can lead to degradation and loss of fish and wildlife habitat. Interference with nesting, spawning, feeding and resting activities may occur (MEQB, 1983).

## Erosion, Turbidity and Sedimentation

Impacts associated with water quality are extremely pervasive and have a great effect on fish and wildlife (MEQB, 1983). Chronic long term effects on fish and wildlife result from turbidity, sedimentation and tow-induced waves (USACE, 1982; Versar, Inc., 1981). Impacts vary depending on type and level of fleeting activity, the habitat's susceptibility to physical disturbance, and sensitivity of the individual fish and wildlife species (MEQB, 1983).

Wave and propeller action may be a primary erosion factor, particularly in areas with steep banks or unprotected shorelines (Versar, Inc., 1981; MEQB, 1983). Banks of the Mississippi River are less cohesive than those of the Illinois River, and have experienced greater rates of erosion (Karaki and vanHofen, 1974). When barges are held in position with tows, propwash scour holes may result, displacing and/or burying organisms and resuspending solids. Concern has been expressed regarding the impacts of tow traffic under ice conditions; however, the extent of usage of fleeting areas under these conditions is unknown.

Sedimentation, due to suspended solids, results in habitat destruction (Sorensen, et al., 1977). Increased sedimentation and turbidity could cause a reduction in productivity (Versar, Inc., 1981). Accumulation of silt can smother eggs and impair plant photosynthesis (USACE, 1988; Mollenbrock, 1983). This may occur in either backwater areas or the main channel border during reduced current periods.

Bank erosion contributes to increased sediment and turbidity levels, and leads to loss of terrestrial and aquatic habitat quality. Indirectly, bank erosion can cause fish respiratory problems and feeding pattern disruptions (MRRPC, 1988).

## Exposure to Toxic and Hazardous Materials

Spills of toxic or hazardous materials into the river could occur in fleeting areas. Impacts depend on the type and volume of substances spilled (MRRPC, 1988). Besides direct impacts to fish and wildlife, spills could reduce the benthic component of the food chain (UMRBC, 1981). Barge cleaning in fleeting areas also may add pollutants if wastewater or waste materials are discharged to the river (MRRPC, 1988). Barge activities causing turbidity can affect plant and animal life by resuspending organic toxicants through the resuspension of river bottom sediments (Versar, Inc., 1981).

## Dredging

Dredging may be required for establishment or maintenance of fleeting areas (GREAT I, 1980a). Impacts from dredging may include changes in water quality, loss of shallow aquatic habitat, loss of benthos, loss of important structures for fish habitat and loss of habitat at the disposal site (Allen and Hardy, 1980). Changes in the habitat, through dredging, may allow colonization of opportunistic plant and animal species that were not originally present (USACE, 1982).

## Specific Impacts to Fish and Wildlife

Mussels. A study by Sparks and Blodgett (1988) confirmed that mussels are directly impacted by barge fleeing activities. Mortality occurs when mussels are cracked or smothered. Sparks and Blodgett (1988), found that growth rates of most mussel species were greater in non-fleeted areas than in fleeted areas. Increases in turbidity and sediment deposition from prop wash could cause dislodgement, feeding and respiration disturbances. The federally listed endangered Higgins' eye pearly mussel (Lampsilis higginsii) and fat pocketbook pearly mussel (Potamilus capax) are of particular concern in some areas. A comprehensive literature search on the effects of barge traffic on freshwater mussels at the Zimmer Power Plant, Ohio River, was recently prepared by Miller et. al. (In Press).

Fish. The UMRS provides important spawning, nursery, and wintering habitat for 66 fish species considered common and another 33 species considered occasional (Van Vooren, 1983). Species of primary importance to anglers include walleye, bluegill, crappie, catfish, sauger, sunfish, northern pike, white bass, and largemouth and smallmouth bass. Catfish, carp, buffalo and freshwater drum are of primary interest to commercial fisheries (GREAT I, 1980b). Impacts of fleeing to fish could include direct mortality (especially larval stages), displacement, disorientation, loss of feeding visibility from turbidity and disruption of wintering fish. Shorelines are subjected to prop wash, thereby reducing benthic colonization and food availability. Fish experience respiration problems due to suspended sediments (USACE, 1985).

Birds. The UMRS corridor is the migration route for more than 20% of all ducks in North America and more than 50% of the canvasbacks. Birds potentially impacted by fleeing include wintering and nesting bald eagles (Haliaeetus leucocephalus), an endangered species; migrating ducks, geese, swans and shore birds; and nesting herons and egrets (MEQB, 1983). Nesting and feeding bald eagles are known to be disturbed by human activities (Versar, 1981; Fraser et al., 1985). Noise and activity on the river can harass resting waterfowl during migration, significantly increasing their energy expenditure (MEQB, 1983). Barge activities may also affect fingernail clams, a major food source for diving ducks (Versar, Inc., 1981). Noise and disturbance associated with barge activities may cause nest desertion, or the birds may experience reduced reproductive success (McConnell, 1982). Certain birds may be attracted to these areas where they feed on dead and injured fish left in the towboat's wake (Mike Davis, pers. comm., Minnesota DNR).

Mammals. The UMRS corridor provides valuable habitat for a number of mammals. Mammals with the greatest potential for impact are aquatic furbearers such as mink, weasel, otter and muskrat, since their survival is dependent on availability of bank denning areas (MEQB, 1983). Impacts by wave and propeller wash may adversely affect the young in bank dens (Versar, Inc., 1981). Changes in plant communities, due to sedimentation, indirectly affect aquatic furbearers by reducing macrophytes used for food (MEQB, 1983).

## HISTORIC RECOMMENDATIONS

The need for a study to document the direct impacts of barge fleeting on fish and wildlife has been expressed (GREAT III, 1982; MEQB, 1983). The GREAT III team recommended that a barge fleeting study should attempt to answer the following elements:

1. "Is there any significant difference between fleeting areas and control sites with regards to fish, wildlife, invertebrates and plant production, distribution and species composition?"
2. "Is there any significant difference between fleeting areas and control sites with regards to water quality, water chemistry, and the physical and hydrologic conditions?"
3. "Is there any significant difference between onshore and offshore habitats which may be affected by barge fleeting?"
4. "Is there any significant difference between the pooled and open river with regards to effects of barge fleeting?"
5. "Is there any apparent affect on avian and mammalian behavior which may be related to barge fleeting?"
6. "What, if any, is the cumulative effect of barge fleeting?"
7. "What are the effects of barge washing, spills and other discharges on fish and wildlife resources?"

The GREAT II and III teams recommended that barge tie-offs in fleeting areas should be accomplished through the use of permanently installed shore or in-water mooring facilities, in accordance with appropriate permits. The GREAT II team recommended that as an inducement for voluntary compliance; mooring cleats, deadmen, cells, etc., used only for mooring purposes, should be permitted to be constructed at sites that have historically been used for fleeting without being subject to Corps permit requirements. As a way to avoid and minimize impacts from barge fleeting, the USFWS (1987b) also recommended that:

1. "Fleeting regulations should be developed for environmental protection and should include the requirements that all fleeting take place at mooring cells or deadmen and that certain areas are designated no fleeting zones."

Biological Rationale - "Where fleeting is unregulated, instances have occurred where barges have been tied to trees above the high water line, girdling and killing the trees. In other instances, barges have been moored too close to the shoreline resulting in their hitting bottom, disturbing substrates and killing mussels and other benthos. Fleeting in biologically sensitive areas such as near mussel beds and spawning sites also disrupts or kills biota through prop wash, scour and turbulence."

Navigational Constraints - "In some areas, there is not adequate fleeting capacity at the present time. Identifying no fleeting zones may further decrease that capacity."

2. "Complete waterfront development plans in urban areas."

Biological Rationale - "Urban areas are centers of impact with respect to barge terminal development and fleeting. Many municipalities have or are in the process of completing waterfront development plans. Those plans should be completed so as to preclude haphazard and poorly planned development and thereby avoid and minimize environmental impacts in important resource areas."

## INVESTIGATION OF FLEETING AREAS

### STUDY AREA

Data were collected at barge fleeting sites on portions of the UMRS in the fall of 1988 (Figure 1). The study area on the Mississippi River extended from its confluence with the Minnesota River in Pool 2 downstream to its confluence with the Ohio River. The greater Port of Metropolitan St. Louis from River mile 194.0 to 138.8 was excluded since barge fleeting on this portion of the river has been studied in detail (Versar, Inc., 1981). The area above St. Louis and below Lock and Dam 26 is referred to as "B-26". The area of the Mississippi River below St. Louis is called the "open river". The study area on the Illinois River extended from the tailwaters of Brandon Road Lock and Dam, in Rockdale, Illinois, downstream to its confluence with the Mississippi River.

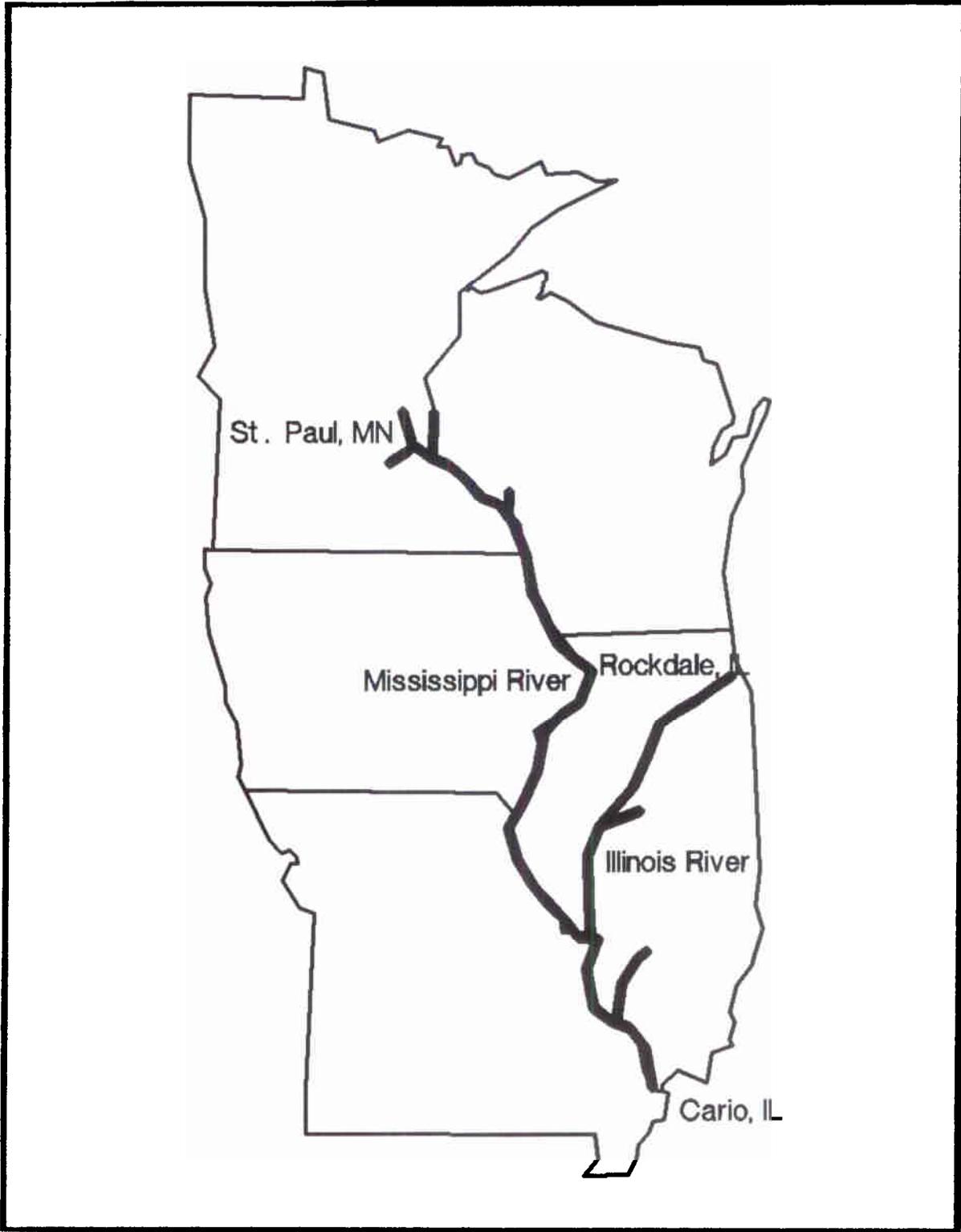
### METHODS

Barge fleeting sites were initially identified by compiling information from several sources. Aerial photographs from 1984 and 1987, with a scale of 1:24000, were used for the Mississippi and Illinois rivers, respectively. Permit information was obtained from the Corps and the States of Iowa and Wisconsin. Personal contacts also were made when appropriate. Barge location information was delineated on navigation charts. Terminals where actual commodity loading and unloading took place were distinguished from fleeting areas. Moorings directly adjacent to terminals were excluded from the study (see page 2).

In the field, it was necessary to distinguish between different barge fleeting sites. Permitted areas were considered one site even when barges were not moored contiguously. In areas where no permit information was available, a barge fleeting site generally consisted of contiguous moorings.

When barges were present data were collected on the following physical characteristics: 1) method of anchoring the barges, 2) distance of the inside barges to the shore, 3) depth of water on the shoreward and channelward sides,

Figure 1. Map of the Background Fleeting Study Project Area



4) substrates near the shoreward and channelward ends of the barges, 5) shoreline composition, 6) shoreline erosion, and 7) tree damage. Barge cleaning and river morphology were also noted. Data were collected only on the upstream end of the barges if the site was four or fewer barges long. It was collected both upstream and downstream for sites five or more barges long, or if there were obvious physical differences between the two ends.

Methods of anchoring barges were divided into 8 categories: mooring cell, deadman, piling, tree, sunken barge, grounded barge, anchor barge and other. A sunken barge was a barge filled with concrete or other material so it was permanently in place. A grounded barge was one placed on shore above the waterline. An anchor barge was anchored in place and other barges were tied to it. The other category included anchoring to a sea wall and anchoring in the water.

Trees used for anchoring were examined from the boat or on shore when appropriate. Tree damage was recorded as none, girdled, or dead.

The distance of the barges' inside edge to the shore was classified by visually estimating the following distances: on shore, 0.5-5m, 6-10m, 11-15m, and greater than 15m. Water depths under barges were estimated using an Apelco depth finder attached to the bottom stern of the boat. Depths were taken at the barges' shoreward and channelward corners.

Substrate samples were collected using a Petite Ponar (6 x 6 inches) dredge. Substrate types were divided as follows: silt, silt/sand, sand, gravel, cobble, rock and mollusks. The silt/sand substrate type was approximately 50% sand and 50% silt. If 25% or more of the sample was comprised of a particular substrate type, excluding mollusks, it was recorded. The presence of all mollusks, live or dead, were recorded.

Composition of bank substrates were visually inspected from the boat and categorized as follows: silt, silt/sand, sand, gravel, cobble, rock, riprap, bulkhead/wall, vegetation and shell. Shoreline erosion was categorized by estimating the height of the eroded bank from the waterline to the upper limit of the erosion. Categories were as follows: none (no evidence of erosion), light (<15cm), moderate (15cm - 45cm), and heavy (>45cm).

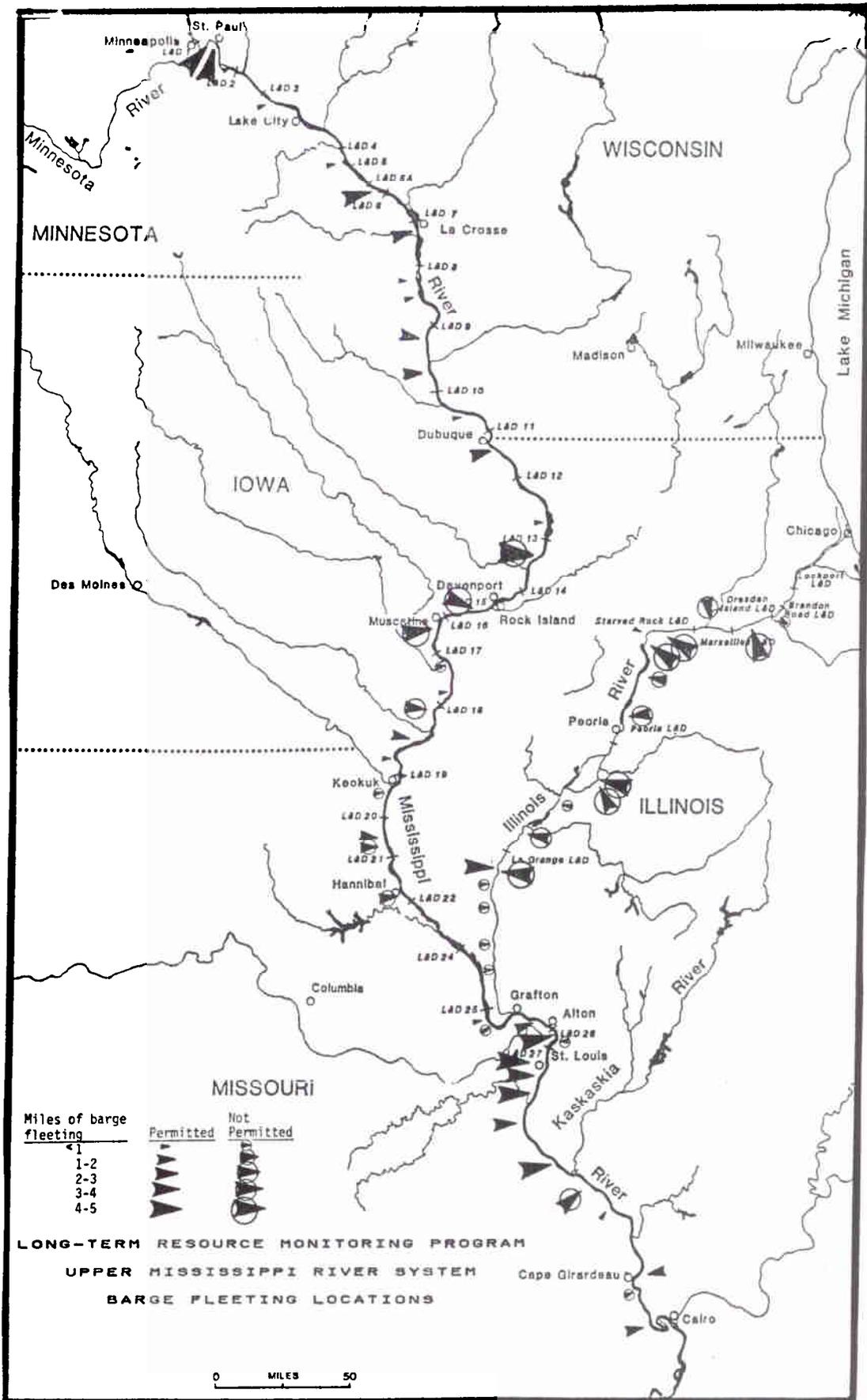
General fleet location was noted relative to its position in river morphology. Locations relative to main or side channel; mainland or island adjacency; and inside bend, outside bend or straight portion of the river were noted.

## RESULTS

### Mississippi River

A total of 188 barge fleeting sites were identified on the Mississippi River (Figure 2 and Appendix A). Due to an absence of barges at some fleeting sites at the time of field inspection, it was not possible to collect data at all the sites. Data were collected at 78 sites. Data were gathered at both upstream and downstream ends at 24 sites where the fleet was greater than 4 barges long. Physical data for the 11 fleeting sites observed in Figure 2

Figure 2. Barge Fleeting Locations



the open river, below Lock and Dam 27, were considered atypical and were not included in calculations. It was not possible to take substrate samples in the open river with the available equipment because of the velocity of the current. Water levels were extremely low in 1988, leaving many of the anchor barges grounded far above the water line. However, the method of barge mooring and presence of riprap were included in calculations for these sites.

Method of mooring and tree damage. Mooring to deadmen was the most common method of attachment, used at 42% of the sites (Table 1). Trees were used for mooring at 41% of the sites. The "other" category included 1 site with barges anchored to a flood wall and 2 sites with barges anchored in the water. Of the barges anchored in the water, the site near Keithsburg, Illinois was located in the main channel border near the center of the river.

Fleets were moored to trees with a rope or steel cable. Ninety-one percent of the observed anchor trees were girdled. The sites where trees were used for moorage also had dead and/or downed trees which appeared to have been formerly used as moorage trees.

Moorage to trees was evaluated and compared among the three Corps Districts (Table 2). Within the Rock Island District (Pools 11-22), trees were used for moorage at 75% of the fleeting sites. This is almost three times the number of sites with barges moored to trees than observed in the St. Louis District and six and one-half times more than in the St. Paul District.

Proximity to shore and water depth. The majority of fleets, 75%, were located between 0.5m and 5m from the shore (Table 3). This appeared to be as close to shore as possible, while maintaining adequate water depths. Loaded barges required 2.4m or more of water depth while empties required less. Average shoreward and channelward depths were 2.4m and 4.5m, respectively.

Substrate, shoreline composition and erosion. Silt was the most frequently observed sediment type along the shoreward side of the fleets, occurring at 52% of the sites (Table 4). Silt/sand and sand were also common along the shoreward side, occurring at 37 and 31%, respectively. Sand was the most frequently observed sediment type along the channelward side of the fleets, occurring at 50% of the sites (Table 5). Silt was present in 34% and gravel in 26% of the channelward sites. Oil was released from the substrate while sampling at 6 sites in Pool 2 and 1 site each in Pools 14, 26, and B26. Live mussels were present in substrate samples in Pools 10, 16, 19 and 26. Mussels shells were present in Pools 2, 9, 14, 18, 22 and B26. Shell material was a major component in a substrate sample taken in Pool 10 near Clayton, Iowa. Although live specimens were not observed at all the sites, it is assumed that live mussels are present if shell material was collected.

The shoreline was riprapped on 42% of the sites and the shoreline was composed of sand at 34% of the sites (Table 6). Twenty-one percent of the sites consisted of silt/sand. Dense vegetation prevented visual determination of the bank soils at 14% of the sites. Bank erosion was observed at 38% of the

Table 1. Mooring methods used for 78 barge fleeting sites on the Mississippi River. (Note: More than one method of mooring was used at some sites causing total moorage sites in the body of the table to exceed the number of fleeting sites by 24)

<u>Pool</u>	<u>#Sites</u>	<u>Mooring Cell</u>	<u>Deadman</u>	<u>Piling</u>	<u>Tree</u>	<u>Sunken Barge</u>	<u>Grounded Barge</u>	<u>Anchored Barge</u>	<u>Other</u>
2	11		6	4	1			2	1
4	2			1			1		
5	1		1						
6	5		2	1			1	1	1
8	2		1	1					
9	2	1			1				
10	4		4	1	1				
11	1		1					1	
12	3		3					2	
14	5				5				
16	6				5	1			
17	3				3				
18	4		1		2			1	1
19	4	1	1	1	3			2	
20	2				2			1	
21	2				2				
22	2				2				
26	3		2		1	1	1		
B26	5		3	1	2		3		
Open River	11	—	8	—	2	2	—	2	—
Total	78	2	33	10	32	4	6	12	3
% of sites		3	42	13	41	5	8	15	4

Table 2. Comparison of Corps Districts of the Mississippi River of the number of fleeting sites where barges were moored to trees

<u>Corps District</u>	<u>Total No. of sites</u>	<u>No. with tree attachment</u>	<u>% with tree attachment</u>
St. Paul (Pools 1-10)	27	3	11
Rock Island (Pools 11-22)	32	24	75
St. Louis (Below Pool 22)	19	5	26

Table 3. Distance of barges from shore, in 67 fleets on the Mississippi River, as measured from the shoreward side. (Note: Some fleeting sites include more than one attachment and mooring location)

<u>Pool No.</u>	<u>#Sites</u>	<u>On Shore</u>	<u>0.5-5m</u>	<u>6-10m</u>	<u>11-15m</u>	<u>&gt;15m</u>
2	11	1	9	6		1
4	2		2			
5	1		1			1
6	5	1	4	1		
8	2		2			
9	2		1	1		
10	4	1	2	1		
11	1		1		1	
12	3	1	3			
14	5	4	2			
16	6	3	1			
17	3	1	1		1	
18	4		3			1
19	4		4		1	1
20	2		2	1		
21	2		2			
22	2		2			
26	3		3			
B26	<u>5</u>	<u>—</u>	<u>5</u>	<u>—</u>	<u>—</u>	<u>—</u>
Total	67	12	50	10	4	4
% of Sites		18	75	15	6	6

Table 4. Substrate type as sampled from the shoreward fleet boundaries, Mississippi River

<u>Pool</u>	<u>#Sites</u>	<u>Silt</u>	<u>Silt/Sand</u>	<u>Sand</u>	<u>Gravel</u>	<u>Cobble</u>	<u>Shell Material</u>	<u>Rock</u>
2	11	7	6	3	5	1	1	1
4	2	2						
5	1		1					
6	5	2		2	1			
8	2		1	1				
9	2							
10	4	3	1		2		3	
11	1	2						
12	3	2		2				
14	5		5	1	1		1	
16	2	1	1	1			1	
17	3		1	3				
18	4	2			2			
19	4	3	2	3	1		1	2
20	2	1	1					
21	2	2		1				1
22	2	2					1	
26	3	2		1			2	1
B26	<u>4</u>	<u>1</u>	<u>2</u>	<u>1</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>
Total	62	32	23	19	12	1	10	5
% of sites		52	37	31	19	2	16	8

Table 5. Substrate type as sampled from the channelward fleet boundaries, Mississippi River

<u>Pool</u>	<u>#Site</u>	<u>Silt</u>	<u>Silt/Sand</u>	<u>Sand</u>	<u>Gravel</u>	<u>Cobble</u>	<u>Shell Material</u>	<u>Rock</u>
2	11	2	1	4	3	1	1	1
4	2	1	1					
5	1			1				
6	5	3		2	2			
8	2		1	1				
9	2		1	2	1		2	
10	4	2	1	1	1		4	
11	1	1		3				
12	3	2		4	1			1
14	5		5	1	1	1	1	
16	2		1		1			1
17	3			2	1			
18	4	1		1	2		1	
19	4	1	2	3	1		1	2
20	2	1		1				
21	2	1		2				
22	2	1	1					
26	3	2		1				
B26	4	3		3	2		1	
Total	62	21	14	32	16	2	13	5
% of sites		34	23	50	26	3	21	8

Table 6. Composition of shorelines adjacent to barge fleeting sites, Mississippi River

<u>Pool</u>	<u>#Sites</u>	<u>Silt</u>	<u>Silt/Sand</u>	<u>Sand</u>	<u>Gravel</u>	<u>Cobble</u>	<u>Rock</u>	<u>Riprap</u>	<u>Bulkhead/Wall</u>	<u>Vegetation</u>	<u>Shell Material</u>
2	11		2	4			1	5	1	6	
4	2			1				1	1		
5	1			1				1			
6	4	1	1	1			1			2	
8	2			1				2			
9	2			2							
10	4	1	1					3			
11	1	1						1			
12	3			3			1	1			
14	5			4				1			
16	6		4	1				1			
17	3	1	1	2							
18	3	1		1				1			
19	4		1	1			2	2		1	
20	2		2								
21	2		1	1			1			1	
22	2	1	1								
26	3						1	2			
B26	5		2	2				1			
Open River	11			1				10		1	
Total	76	6	16	26	0	0	7	32	2	11	0
% of Sites		8	21	34	0	0	9	42	3	14	0

sites (Table 7). Light erosion was observed at 21% of the sites, moderate at 13% and heavy erosion was observed at 17% of the sites.

### Illinois River

A total of 59 barge fleeting sites were identified on the Illinois River (Figure 2 and Appendix B). Data were collected on 27 of these sites. No data were collected at the remaining sites due to the absence of barges. Barge numbers were reduced or absent since the sampling period coincided with the active fall shipping season. Samples were taken both upstream and downstream at 13 sites.

Method of mooring and tree damage. Trees the most frequently observed moorage for fleets, were used at 52% of the sites (Table 8). Deadmen were used at 41% and anchor barges at 26% of the sites. All of the trees used for barge attachment appeared to be girdled. A number of the sites had dead trees that appeared to have formerly been used to anchor barges and were girdled. No fleeting was observed in backwater lakes or mid-channel on the Illinois River. Comparisons between Corps Districts were not made since 5 of the 6 pools were located in the Rock Island District.

Proximity to shore and water depth. Eighty-two percent of the fleeting sites were located 0.5-5m from the shore (Table 9). Thirty-six percent were located between 6m and 10m from the shore. The narrower width of the Illinois River, compared to the Mississippi River, did not permit fleets to be located at distances of greater than 15m from the shore. Shoreward water depths average 1.8m while mean channelward depth averaged 3.3m.

Substrate, shoreline composition and erosion. Substrates sampled were very similar for both the shoreward and channelward sides. Sand and silt were present in 56 and 41%, respectively, of the shoreward and channelward substrate samples (Tables 10 and 11). Silt/sand occurred in 26% of the shoreward samples and in 22% of the channelward samples. Evidence of mussel beds were found in Alton, LaGrange and Peoria pools. A number of snail shells were found in Dresden Island Pool. Mollusk shells were observed on 7% of the shorelines sampled and in 11 percent of the substrate samples.

Shorelines at 52% of the sites were primarily composed of sand (Table 12). Nineteen percent of the sites had a natural rock shore or rock outcropping and another 22% were primarily composed of silt/sand. Bank erosion was observed at only 2 of the 27 sites. One site was composed of silt/sand and had a moderate level of erosion and the other was sand with a heavy erosion level.

Table 7. Observed erosion of banks adjacent to barge fleeting sites, Mississippi River (Note: More than one degree of erosion could have taken place per site)

<u>Pool</u>	<u># Sites</u>	<u>No erosion</u>	<u>Light</u>	<u>Moderate</u>	<u>Heavy</u>
2	11	9	2		
4	2	2			
5	1	1			1
6	4	2	1	1	
8	2	2			
9	2	2		1	
10	4	3	1		
11	1	1	1	1	1
12	3	3			
14	5	2	2	1	1
16	2		1		1
17	3	1			2
18	4	2		1	1
19	4	3		1	
20	2		2		1
21	2	1	1		1
22	2				2
26	3	3			
B26	4		2	3	
Open River	<u>10</u>	<u>7</u>	<u>2</u>	<u>—</u>	<u>1</u>
Total	71	44	15	9	12
% of Sites		62	21	13	17

Table 8. Mooring methods used for barge fleeting sites on the Illinois River. (Note: More than one method of mooring was used at some sites causing total moorage sites in the body of the table to exceed the number of fleeting sites by 24)

<u>Pool</u>	<u># Sites</u>	<u>Mooring Cell</u>	<u>Deadman</u>	<u>Piling</u>	<u>Tree</u>	<u>Sunken Barge</u>	<u>Grounded Barge</u>	<u>Anchored Barge</u>	<u>Other</u>
Alton	2		1	1	1				
LaGrange	4		1		4		2		
Peoria	10		6		4	1	1	2	3
Starved									
Rock	4		1		3			1	1
Marseilles	4		1		1			2	
Dresden									
Island	<u>3</u>		<u>1</u>		<u>1</u>	<u>1</u>		<u>2</u>	
Total	27	<u>0</u>	11	<u>1</u>	14	2	3	7	3
% of sites		0	41	4	52	7	11	26	11

Table 9. Distance of fleets from shore, on the Illinois River, as measured from the shoreward side. (Note: Some fleeting sites include more than one attachment and mooring location)

<u>Pool No.</u>	<u># Sites</u>	<u>On Shore</u>	<u>0.5-5m</u>	<u>6-10m</u>	<u>11-15m</u>	<u>&gt;15m</u>
Alton	2		2			
LaGrange	4		4	2		
Peoria	11		7	5	1	
Starved Rock	4	1	5			
Marseilles	4	2	2	2		
Dresden						
Island	<u>3</u>	<u>1</u>	<u>3</u>	<u>1</u>	—	—
Total	28	4	23	10	1	0
% of Sites		14	82	36	4	0

Table 10. Substrate type as sampled from the shoreward fleet boundaries, Illinois River

<u>Pool</u>	<u># Sites</u>	<u>Silt</u>	<u>Silt/Sand</u>	<u>Sand</u>	<u>Gravel</u>	<u>Cobble</u>	<u>Shell Material</u>	<u>Rock</u>
Alton	2	1	1				1	
LaGrange	4	1	2	2			2	
Peoria	10	5	3	3				
Starved Rock	4		1	5		1		
Marseilles	4	1		3	2	1		
Dresden								
Island	<u>3</u>	<u>3</u>	—	<u>2</u>	—	—	—	—
Total	27	11	7	15	2	2	3	0
% of Sites		41	26	56	7	7	11	0

Table 11. Substrate type as sampled from the channelward fleet boundaries, Illinois River

<u>Pool</u>	<u># Sites</u>	<u>Silt</u>	<u>Silt/Sand</u>	<u>Sand</u>	<u>Gravel</u>	<u>Cobble</u>	<u>Shell Material</u>	<u>Rock</u>
Alton	2	1	1				1	
LaGrange	4	3	1	2			2	1
Peoria	10	5	3	4				
Starved								
Rock	4		1	5		1		
Marseilles	4			3	2	1		
Dresden								
Island	<u>3</u>	<u>2</u>	—	<u>1</u>	—	—	—	—
Total	27	11	6	15	2	2	3	1
% of Sites		41	22	56	7	7	11	4

Table 12. Composition of shorelines adjacent to barge fleeting sites, Illinois River

<u>Pool</u>	<u>#Sites</u>	<u>Silt</u>	<u>Silt/Sand</u>	<u>Sand</u>	<u>Gravel</u>	<u>Cobble</u>	<u>Rock</u>	<u>Riprap</u>	<u>Bulkhead/Wall</u>	<u>Vegetation</u>	<u>Shell Material</u>
Alton	2		1	1							
LaGrange	4	1	2	2							2
Peoria	10			8	1	1		2			
Starved											
Rock	4		1	1	1		3				
Marseilles	4			2	2	1	1				
Dresden											
Island	<u>3</u>	—	<u>2</u>	—	—	—	<u>1</u>	—	—	<u>1</u>	—
Total	27	1	6	14	4	2	5	2	0	1	2
% of Sites		4	22	52	15	7	19	7	0	4	7

## DISCUSSION

### Mississippi River

Pools 2-10. Though most natural resources remain unaffected by fleeting in this reach, site specific impacts may be significant. Fleeting in Pools 2-10 is generally performed under a Corps permit with moorage to pilings or deadmen. Fleets were cabled to trees at Genoa, Wisconsin (Iowa bank); Clayton, Iowa and Alma, Wisconsin.

The major hub of barge fleeting activity in the upper pools is at St. Paul. The Port of St. Paul is a concentrated fleeting area on both banks from the lower end of Pig's Eye Island upstream to within a mile of the confluence with the Minnesota River. All Port of St. Paul fleeting sites observed were permitted. One site appeared to be moored upstream of its permitted area, at 841.2 instead of 840.6.

Most of the shoreline adjacent to the sites is urban developed with low wildlife value. The Pig's Eye Island area is the exception. Fleets are moored in backwater areas adjacent to Pig's Eye Island (river mile 834.0L). A concern in this area has been the potential for barge fleeting impacts on the heron rookeries of Pig's Eye Island. Impact concerns include general disturbance during breeding periods and decreased feeding efficiency of the herons due to increased turbidity from towboat movement.

Fleeting activity decreases downstream of St. Paul. Two relatively small fleeting operations are located in Pool 4 at Red Wing, Minnesota. In Pool 5 at Alma, Wisconsin, a fleet of coal barges is located near the coal-fired power plant.

Winona, Minnesota, in Pool 6 is the next most significant fleeting area below St. Paul. Five permitted sites were observed there, one of which was in a backwater lake. Submerged aquatic vegetation was observed near the fleet in the backwater lake, indicating a potential for productive fishery habitat. Switchboat activity likely degrades the lake habitat for both fish spawning and feeding. Prop wash may dislodge eggs and fry from breeding areas and also increase turbidity, reducing primary production of the lake.

LaCrosse, Wisconsin, is the site of two major fleeting areas, both located along and across from Isle La Plume, river mile 696. The Wisconsin Department of Natural Resources included the Brennan Marine, Inc. site along Isle La Plume in its environmental assessment for multiple application for barge fleeting and dock development (WDNR, 1987).

Trees were used as anchorage for two fleeting sites in this reach (both in Iowa). One site is across and downstream of the Genoa, Wisconsin power plant and the other at Clayton, Iowa. Trees used for anchorage are generally killed by barge cables due to either toppling or girdling. The loss of shoreline trees may reduce prime perching areas for bald eagles and may increase bank erosion.

The fleet at Clayton, Iowa, river mile 623.4 - 624.1R was found to be located over a significant mussel bed. Live juvenile mussels were picked up in the sampling dredge and appeared to be abundant. Thiel (1981) also collected good numbers and diversity of mussels with a brail. Although mussels are abundant, the potential exists that they are being impacted by the barges. The fleet is located adjacent to the shoreline and may be crushing juvenile and adult mussels. This impact could become accentuated with changing water levels, where the barges may be afloat at one time and grounded at another.

Besides the potential for crushing mussels, the grounded or near grounded fleet may alter hydraulics of the main channel border habitat. Changes in river hydraulics have the potential of adversely impacting mussels by lowering water velocities and increasing sedimentation.

Pools 11-22. Fleeting in this reach of river is generally unpermitted and trees are the primary method of anchorage. A lack of permits does not indicate violations since permits may not be required, as in the case of structures built above the high water mark or those covered under a grandfather clause since they were constructed prior to 1968. Barge attachment to trees is not regulated by the Corps. This area of the river includes the States of Iowa, Illinois and Missouri. Iowa has a fleeting permit program, whereas the other two states do not.

Major fleets are located near Cassville, Wisconsin and Dubuque, Iowa. These sites have been or are currently undergoing a special use permitting process. The permitted site at 536.9L, in Pool 13, was adjacent to park land owned by the City of Savanna, Illinois. This site was abandoned because of problems with its location over a gas line. The fleet was moved adjacent to the grain terminal in Savanna, Illinois.

The Beaver Island area, lying between Clinton, Iowa and Fulton, Illinois is one of the largest fleeting areas outside of St. Paul and St. Louis on the Upper Mississippi River. One site at the upstream end of Beaver Slough is permitted. Otherwise, all the barges attached to Beaver Island are cabled to trees and are not permitted. At one fleeting site along Beaver Island on Beaver Slough, 33 barges were moored to bank trees. The trees were girdled and toppled. Killing the shoreline trees may increase erosion and reduce wooded riparian habitat available for bird perching and nesting. Moorage to trees may also increase the possibility of barge breakaway and polluting spills as the trees topple and the barges lose anchorage.

Pool 16 is used as the fleeting area for many terminals in the Quad-Cities (Illinois and Iowa). All fleets in Pool 16 were moored to trees. One sunken barge was observed, but no barges were attached to it. One fleeting company has received a permit to place mooring cells in one of its locations but has not constructed them and continues to use trees. Consultants for an intermodal terminal proposed for the Quad-Cities, were planning to use existing fleeting services provided in Pool 16. Construction of a separate permitted fleeting site with deadmen at mooring cells is not proposed (Louis Berger Assoc, pers. comm.). Thus, it appears that existing sites may be expanded and trees will continue to be used as the primary anchorage in Pool 16.

Fleeting in the Muscatine, Iowa area was also generally unpermitted, with barges cabled to trees along the Illinois bank. Downstream in Pool 18, one fleeting site near Keithsburg, Illinois was unique from all others. This site was anchored in the midst of the river, main channel border, below a bridge pier. The mid-channel fleet in Pool 18 appears to avoid the environmental damage of shoreline fleets: no increased erosion, no grounded barges and assumed minimal effects from prop wash due to greater water depths.

Another major fleeting area in this reach is at Quincy, Illinois. Most of the terminals are located along the Illinois shore, but fleeting is predominately along the Missouri bank. This may be due to the lack of available space adjacent to the terminals. None of the sites are permitted. On September 21, 1988, 52 barges were observed moored along the Missouri bank, with trees as anchorage.

Pools 24-B26. No data were collected from Pools 24 and 25. Two small fleeting sites in Pool 24 were adjacent to terminals and were excluded. Fleeting in Pool 26 was at the extremes of the pool. The upstream site lay just below Lock and Dam 25 on the Illinois bank, adjacent to the Cap Au Gris Natural Area, and a focal point for wintering bald eagles. The two downstream sites are a few miles above Lock and Dam 26. The substrate at both of these sites contained fingernail clams, snails and mussels.

Biologists with the Missouri Department of Conservation (MDOC) report that mooring to trees above Lock and Dam 25 has injured bald eagle perching trees. MDOC biologists have also reported mooring along the shoreline of Cuivre Island (river mile 236) in wait for lockage. A habitat enhancement project using submerged cedar trees has been constructed by MDOC along the Cuivre Island shoreline. Tows are disturbing the habitat structures through prop wash. Mooring was not observed at Cuivre Island or above Lock and Dam 25 at the time of this site visit.

The entire Illinois shore is generally developed terminals with limited wildlife value in the B26 area. Fleeting is primarily conducted along the Missouri bank which contains riparian vegetation. One site along the Illinois bank, river mile 200, was reported by commercial clammers to be over a mussel bed. Sampling at this site in August 1988 by Leroy Koch, MDOC, produced 16 mussel species, two species of snails and one brackish water mussel. The clammers also reported that "oil filters" were strewn all over the mussel bed below the fleeting site.

Mooring of fleets in the B26 area was generally permitted and used structures other than trees for anchorage. The fleeting site at river mile 200L, discussed above, and one at river mile 198.5 on the Missouri shore were not permitted. Trees were used for anchorage at the site at 198.5R and a grounded barge and deadmen were used at 200L.

Open River (miles 138.8 to mouth of the Ohio River). The atypical conditions of extreme low water levels made observations of barge fleeting sites difficult in the lower river. Although physical data collected at the 11 sites were not used in calculations, it was interesting to note that the shoreline was reinforced with riprap at all but one location. The site with a

natural shoreline was composed of sand, and erosion appeared to not be a problem. Most fleets in this stretch of river were permitted and were moored by some structure other than trees. One site at Thebes and one at Cape Girardeau were cabled to trees. The Cape Girardeau site lay in front of an outfall and may contribute to delayed mixing of the discharge.

### Illinois River

Like the Mississippi River, fleeting areas and their respective terminals are concentrated in urban areas. One major fleeting site near Morris, Illinois was not evaluated since it is located in an active quarry adjacent to permitted terminals. Most of the fleeting sites on the Illinois River were not permitted. However, private landowner permission may have been obtained. Trees were used for moorage at more than one-half of the fleeting sites. As on the Mississippi River, moorage to trees destroys riparian habitat and may induce erosion.

Shell material was found at several sites, but most notably at Pekin. Although no live mussels were found in our sample, much shell material was observed, indicating a significant bed at one time. It is interesting to note that a switchboat operator at this site in Pekin was not aware of "clams" in the Illinois River and thought "nothing much" lived there. This highlights the need for informational meetings and materials on the value of the river resources.

### CONCLUSIONS

A major concern with fleeting on the UMRS is the inconsistent application of regulations. This concern has been recognized by virtually every study conducted on the subject. The Corps requires a permit for fleeting only if a structure is placed below the ordinary high water mark or on Corps-owned lands. Iowa and Wisconsin have barge fleeting permit programs. Minnesota requires permits for excavation or placement of fill or structures associated with fleeting. Illinois and Missouri require no permits for barge fleeting. Private land owners, notably along the Illinois River, may require a fee/lease agreement.

Environmental impacts as a result of fleeting have also been a major concern. From information gathered in this study, fleeters currently use deadmen and trees, about equally, for anchorage on the Upper Mississippi River. Trees are used for anchorage three times more frequently on the Mississippi River in the Rock Island District than in the St. Paul or St. Louis Districts. On the Illinois River, trees are used as the primary means of anchorage. Most fleets are parked between one-half to five meters from shore. Thirty-eight percent of the sites exhibited bank erosion along the adjacent shore.

Moorage of fleets offshore, in deep water and cabled to pilings appears to be the least environmentally damaging arrangement. The offshore distance is related to water depth and may only be a short distance from shore. Keeping the barges offshore avoids the direct crushing impacts to benthos from

grounded barges or those parked in shallow waters. Barges moored in shallow waters may become grounded due to fluctuating water levels, particularly in the open river. Moorage of fleets offshore also may reduce the potential for resuspending bottom sediments. However, fleets located along shore may be more protected and less likely to break away.

Environmental impacts from shoreline moorage can be reduced by using permanent structures in deep water rather than tying to trees. Moorage to permanent structures such as pilings or deadmen would reduce damage to trees and may reduce associated bank erosion. Moorage to permanent structures may also reduce the potential for barges breaking loose due to trees dislodging. Fleeting in deep water would minimize destruction of benthos associated with grounding barges. In narrow channel conditions, however, moorage offshore may not be feasible in that navigation traffic could be blocked. This is the case for much of the Illinois River.

Fleets should avoid areas identified as environmentally sensitive, such as fish spawning areas, submergent aquatic vegetation or mussel beds. The federal and state conservation agencies should provide assistance to identify potential environmental impacts. This coordination should be done as part of the early planning process, preceding application for permit. The adverse direct impacts of grounded fleets on mussel beds have been well documented showing high mortality and crushed shells (Sparks and Blodgett, 1988; USFWS, 1987c). Little further research is needed in this area.

Some studies are underway that will provide additional information on fleeting and potential impacts to freshwater mussels. A long-term study evaluating the effects of barge fleeting on mussel resources of the Illinois River at Naples has been conducted by Sparks and Blodgett of the Illinois Natural History Survey. On the Ohio River, the Zimmer Power Plant Trust Fund is beginning a long-term study on the effects of a barge terminal on a mussel bed. Impacts determined from barge movement in and out of the terminal should be relevant to fleeting activity. Basic information on mussel population dynamics may still be required to completely understand navigation effects on mussel resources.

Indirect impacts associated with navigation need to be defined and documented. Studies on the effects of tow traffic are proposed to be undertaken by the Corps, St. Louis District for the Lock and Dam 26 Second Lock Plan of Study. The Long-Term Resource Monitoring program, Onalaska, Wisconsin may also address some of these data gaps (Rasmussen and Wlosinski, 1988). However, it is likely that studies specifically addressing fleeting will be needed due to different uses of river locations (main channel border) and differing operation and horsepower needs to switch the barges.

The girdling and toppling of trees as a result of barge attachment has been well documented. The relationship of the lost trees to riparian ecology has not been evaluated. If this practice persists, additional studies in this area may be needed to properly assess barge fleeting impacts resulting from use of trees for anchorage.

In general, very few studies have been conducted which clearly document direct or indirect effects of fleeting on fish and wildlife. Parameters measured in the field portion of this study need to be defined in terms of environmental consequences.

## RECOMMENDATIONS

Many of the recommendations listed below have been previously stated in other documents (see Background Historic Recommendations, pp. 10-11). For the most part, however, they have yet to be implemented. The objective of the recommendations is to protect fish and wildlife from adverse effects of barge fleeting.

### FLEETING DESIGN

Fleeting design recommendations are outlined below. In all cases, fleets should not be moored in environmentally sensitive areas (mussel beds, spawning areas, backwaters), should not be moored adjacent to environmentally sensitive areas where prop wash could increase sedimentation (i.e. side channels, backwaters) or be anchored to trees. The recommendations are based on information contained in this report.

1. The fleeting design which appears to be least damaging is one moored offshore, cabled to pilings and in water deep enough to avoid direct impacts to the benthos. This distance is related to water depth and may only be a short distance from shore.
2. If the fleet must be located along shorelines, the best design appears to be a fleet moored to a permanent structure (i.e. pilings or deadmen), in water deep enough to avoid direct impacts to the benthos and adjacent to a stable embankment. Use of grounded barges for moorage should be avoided since the grounded barge smothers benthic organisms and disturbs benthic habitat.
3. Unstable embankments should be riprapped to minimize erosion.

### INSTITUTIONAL

4. Include all fleeting sites in the Corps, Section 10 permitting program, or in a similar State or Federal regulatory program. These programs provide an established mechanism for pre-construction planning and coordination. A federal program has the advantage of consistent regulations throughout the river system and would result in a comprehensive listing of all fleeting sites.
5. Improve coordination among land managers, permitting agencies and fleeters. Often it is unclear who operates the fleet, who manages the shoreline, if permission is required from land managers and what the permitting requirements are.
6. Improve the fleet operators awareness of the effects of their activities on the river environment by a series of meetings between fleet operators and field biologists and by developing a brochure or other informational material. Few opportunities have ever been provided for these diverse professionals to meet. It is important to keep open informal lines of communication.

### FUTURE STUDY NEEDS

7. A more detailed background fleeing study is warranted. The study should include:

a. A more detailed literature search including investigation into nation and world-wide study efforts. Contact with the Maritime Technical Information Facility, National Maritime Research Center, Kings Point, NY 11024-1699, phone 516-773-5577 was suggested by the Great Lakes Region Director, Maritime Administration.

b. A concise report beyond the scope of this study, describing all statutory and regulatory requirements should be conducted. It should include presentation of all real estate management laws and regulations pertaining to Corps fee title lands, Service fee title lands, and Cooperative Agreement lands. The report should also discuss the recent planning documents developed for the UMRS (e.g. UMRBC, 1981; USFWS, 1987a; etc.). Synopses of agency regulatory programs, policies and constraints with citations should also be provided.

c. Fleeing sites should be identified by users and commodity activity(ies) in order to evaluate site requirements based on seasonal demands. Fleeing sites should also be identified by three categories: small - emergency needs; medium - 10 to 20 barges; and large - over 20 barges as suggested by the Great Lakes Region Director, Maritime Administration.

8. Quantification of barge fleeing effects is warranted. The study should determine and document the least damaging alternative(s) to fish and wildlife resources and include:

a. The threshold depth of river and substrate at which relatively minor or no impacts occur should be defined. Impacts associated with use of shallower depths, finer substrates and fluctuating water levels should also be defined.

b. The relationship between barge fleeing and bank erosion should be further evaluated. Impacts relative to the pushboat use, distance from shore and the bankline composition in the vicinity and at the site should be defined. Means and methods to minimize erosion should be enumerated.

c. The indirect navigation-related impacts of barge fleeing on the aquatic resource should be further evaluated. The study should compliment ongoing study efforts sponsored by the Corps, St. Louis District and the Long-Term Resource Monitoring Program.

d. The relationship between barge fleeing and the riparian wildlife community should be evaluated. Impacts outlined in this study including tree loss, general disturbance, navigation-related impacts and hazardous spills which should be examined and defined.

9. Fleeing designs which may reduce impacts or possibly enhance aquatic habitat should be explored. These include positioning of a fleet on the outside of an erodible bendway where the fleet may reduce erosion from the thalweg, or a fleet positioned in the open pooled portion of the river where it may reduce wind fetch and suspension of sediments.

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APPENDIX A

BARGE FLEETING SITE LOCATIONS ON THE MISSISSIPPI RIVER  
 (This list has not been verified, some names and locations may not be accurate)

Pool	River Mile	Location	Information		Mooring Method(3)	Operator
			Permitted(1)	Source(2)		
1	857.1 L	Minneapolis, MN	F	P	M	Packer River Terminal, Inc.
1	854.8 L	Minneapolis, MN	F	P	M	Carl Bolander & Sons, Upper River Services
2	843.8 R	St. Paul, MN	F	P	M	
2	841.2-841.0 R	St. Paul, MN	?	O,A	M	Minnesota Harbor Serv
2	841.0-840.6 B	St. Paul, MN	F	P,A	M,T	Capital Barge Service
2	840.4-840.0 L	St. Paul, MN	F(840.1L)	O,P,A	D	Capital Barge Service
2	839.2-838.8 R	St. Paul, MN	F(839.0R)	O,A	D	Dakota Barge Service
2	838.7-838.0 R	St. Paul, MN	F(838.5R)	O,P,A	M	Upper River Services
			F(838.4R)	P	D	Mid-America Trans. Co
2	838.8-837.4 L	St. Paul, MN	F(838.5L)	O,A		Minnesota Harbor Serv
			F(838.0L)	P		Capital Barge Service
2	837.8-836.1 R	St. Paul, MN	F(837.5R)	O,P		American Commercial Barge Line Co.
			F(837.0R)	P		Dakota Barge Lines
			F(836.1R)	P	D,B	Aiple Towing Co.
2	836.0 R	St. Paul, MN	F	P,A	M	Dakota Barge Service
2	835.7-835.5 L	St. Paul, MN	F(835.5L)	O,P,A	D,M	Valley Line Co.
2	835.3-834.9 L	St. Paul, MN	F(835.3L)	O,P,A	M	Dakota Barge Service
2	835.3 R	St. Paul, MN	F	P		
2	835.0-834.1 R	St. Paul, MN	?	O,A	D	
2	834.6-834.1 L	St. Paul, MN	?	O,A	D,M	
2	834.3-833.3 L	St. Paul, MN	F	O,P,A	M	Upper River Services
2	834.1-833.4 L	St. Paul, MN	F(833.3L)	O,P,A	M,B	Upper River Services
		(Pig's Eye Lake)				
2	833.6 R	St. Paul, MN	?	P		St. Paul Marine Fleet Mooring
						Upper River Services
2	832.0 R	South St. Paul, MN	?	P		Packer Fleet Mooring
						Red Wing Municipal Terminal
4	791.5 R	Redwing, MN	F	O,P,A	M	
4	788.7 L	Redwing, MN	N	O,A	B	Red Wing River Towing
4	788.5-789.1 R	Redwing, MN	F	P		Dairyland Power Coop
5	751.5-751.1 L	Alma, WI	F	O,P	D,T	Dairyland Power Coop
5	750.1-749.4 R	Alma, WI		S	T	R & R Services
6	727.3-727.1 R	Winona, MN	F	O,P	M	R & R Services
6	726.6-726.0 R	Winona, MN	F	O,P	M	Winona Port Authority
6	726.5 R	Winona, MN	F	O,P		Winona Port Fleeting
6	727.2-726.3 R	Winona, MN	F	P		Winona Port Fleeting
		(north)				
6	726.9-726.6 R	Winona, MN	F	P		Port Authority of Winona
		(south)				
6	725.2 R	Winona, MN	F	P		Mississippi Valley Public Service Co.
6	725.1 R	Winona, MN	F	P		R & R Services
6	725.0 R	Winona, MN	F	P		
		(Crooked Slough)				

(1) F=Federally permitted, S=State permitted, C=City, (No.)=Location of permit if not entire area, N=None.  
 (2) O=Observed, P=Permit information, A=Aerial photographs.  
 (3) D=Deadman, T=Tree, B=Barge, B(to T)=Barge attached to tree, M=Moored to pier, moor, wall, or anchor.

8	696.3-695.4 R	LaCrosse, WI	F(696.0R)	O,P,A	D	Harbor Service, Inc.
8	696.5-696.0 L	LaCrosse, WI	S	O	M	Brennan Marine, Inc.
9	678.6-677.9 L	Genoa, WI	F,S	O,P,A	M	Dairyland Power Coop
9	678.0-677.7 L	Genoa, WI	S	O	T	
9	660.0-659.4 R	Lansing, IA	F	P	M	Weymiller Marine
9	659.9 R	Lansing, IA	F,S	O,P	M	Interstate Power Co.
9	659.4-659.2 R	Lansing, IA	N	O,A	B	
10	636.2-635.8 R	Marquette, IA	S(636.2)	O,A	D	Cassville River Term.
10	633.3 R	McGregor, IA	F,S	P		Agri Industries
10	632.7-632.3 L	Prairie DuChien, WI	S	O,P,A	D	Cassville River Term.
10	624.2-623.6 R	Clayton, IA	F,S(624.2-624.0R)	O,P,A	D,B,T	Pattison Bros.
10	623.5-622.5 R	Clayton, IA	F,S(622.7)	O,P,A	D,M	Pattison Bros.
11	608.3 L	Cassville, WI	S,F	P	D	Cassville River Term.
11	607.8-607.2 R	Cassville, WI	S(607.5)	O,P,A	D	Cassville River Term.
12	580.0 R	Dubuque, IA (Dove Harbor)	C	P	M	Newton Marine Service
12	579.8 R	Dubuque, IA	C	P	D	Dubuque Harbor Serv.
12	579.7 R	Dubuque, IA	C	P		Dubuque Harbor Serv.
12	578.4-578.0 L	East Dubuque, IL	C	O,A	D,B	Newton Marine Service
12	576.7-576.3 R	Dubuque, IA	S(576.7)	O,P,A	D,B	Dubuque Harbor Serv.
12	576.2-575.4 L	Dubuque, IA	C	O	D	Newton Marine Service
13	536.9 L	Savanna, IL	F	P		J.F. Brennan Co.
13	537.2 L	Savanna, IL	F	P		J.F. Brennan Co.
14	517.6-517.8 L	Clinton, IA (Little Rock Island)	N		D	Clinton Harbor Serv.
14	517.4-516.2 R	Clinton, IA (Beaver Slough)	N	O,A	T	Clinton Harbor Serv.
14	516.9-516.1 L	Clinton, IA	N	O,A	T	Clinton Harbor Serv.
14	513.9-512.4 R	Camanche, IA (Beaver Slough)	N	O,A	D,T	Clinton Harbor Serv.
14	513.4-513.2 R	Camanche, IA (Beaver Island)	N	O,A	T	Clinton Harbor Serv.
14	512.8 R	Camanche, IA (Beaver Island)	N	O	T	Clinton Harbor Serv.
16	475.0-474.6 L	Andalusia, IL (Smiths Isl.)	N	O,A	B	
16	474.6-474.1 L	Andalusia, IL (Island)	N	P	B	
16	473.3-472.8 R	Buffalo, IA	N	O		
16	472.7-472.4 L	Andalusia, IL (Andalusia Isl.)	N	A		
16	471.2 L	Andalusia, IL (Andalusia Isl.)	N	O	T	
16	471.0-470.7 L	Andalusia, IL (Andalusia Isl.)	N	O	T	
16	470.6 L	Andalusia, IL (Andalusia Isl.)	N	O,A	T	
16	470.3 L	Andalusia, IL (Andalusia Isl.)	N	O,A	B	
16	470.3 R	Buffalo, IA	N	A		
16	470.0-469.0 L	Montpelier, IA (Andalusia Isl.)	F	O,P,A	T	Blackhawk Fleet, Inc.
16	466.7 L	Montpelier, IA (Andalusia Isl.)	N	O	T	
17	454.5-453.4 L	Muscatine, IA (Muscatine, Isl.)	N	O,A	T	Blackhawk Fleet, Inc.
17	453.7-453.5 L	Muscatine, IA	N	A		
17	453.1 L	Muscatine, IA	N	O,A	T	
17	452.0-451.1 R	Muscatine, IA	F	P		Steel, A.K. Chemicals
17	451.5 L	Muscatine, IA	N	O	T	
17	451.3 L	Muscatine, IA (Blanchard Isl.)	N	A		
17	450.7 L	Muscatine, IA (Blanchard Isl.)	N	A		Blackhawk Fleet, Inc.

17	450.1-449.8	L	Muscatine, IA	N	A		
18	432.5	R	New Boston, IL	N	O	T	
18	432.5	L	New Boston, IL	N	O,A	T,B	
18	427.8-427.7	L	Keithsburg, IL	F,S(427.7)	O,P	M	R & R Services
18	427.4	L	Keithsburg, IL	F	O,P	D	Lee I. Osborn
18	415.4	L	Oquawka, IL	N	O	B	
19	407.3-406.4	L	Burlington, IA	N	O,A	T	
19	406.1-405.8	R	Burlington, IA (Baby Rush Isl.)	S(405.8)	O,P,A	T	L.W. Matteson, Inc.
19	405.3-405.7	R	Burlington, IA (Baby Rush Isl.)	C	P	M	L.W. Matteson, Inc.
19	405.2-405.0	L	Burlington, IA	N	O,A	T,D	
19	401.6-401.0	R	Burlington	C	P	M	L.W. Matteson, Inc.
19	398.0	L	Burlington, IA	N	A		
19	390.4	R	Dallas City, IL	N	A		
19	390.0-389.8	R	Dallas City, IL	N	O,A	B	
19	382.3-381.3	R	Fort Madison, IA	F	O,A,P	M,B	Hall Towing
19	371.0	R	Galland, IA	S	P,A		Orba Johnson
19	370.8	R	Galland, IA	S	P,A		Transshipment
20	361.7	R	Keokuk, IA	N	A		Orba Johnson
20	360.8	R	Alexandria, Mo	N	O,A	T,B	Transshipment
20	360.4	R	Alexandria, Mo	N	O	B	
20	360.4-359.8	R	Alexandria, Mo	N	O	T,B	
21	342.0-341.0	R	Canton, MO	F	P,A		R. Pulse (Tri-State Perk)
21	326.8-325.8	R	Quincy, IL	N	O,A	T	
21	326.0-325.0	L	Quincy, IL	F	O,P	T	Prince Mfg. Co.
22	312.4	R	Hannibal, MO	N	A		
22	310.6-310.1	L	Hannibal, MO	N	O,A	T	
22	308.7-308.5	L	Hannibal, MO (Shucks Isl.)	N	O,A	T	
22	308.2-307.8	L	Hannibal, MO (Glasscox Isl.)	N	O,A	T	
26	240.8	R	Batchtown, IL	N	A		
26	240.7-240.4	L	Batchtown, IL	N	O,A	T,B	
26	224.6	L	Brussels, IL	F	O,P	B	Calhoun Quarry
26	220.6-219.0	L	Mason Island	F	P		Kiesel Marine Service, Inc.
26	217.3-217.1	L	Grafton, IL	F	P,A		National Marine Service, Inc.
26	210.1-209.2	R	Alton, IL	F	A,P		SCNO Barge Lines,
26	206.9-206.2	L	Alton, IL		O,A	D	
26	205.8-205.6	R	Alton, IL		A		
26	205.8-205.5	L	Alton, IL	F(205.9L)	O,P,A	D,B	Norman Bros., Inc.
B26	200.0	L	Alton, IL		O,A	D,B	
B26	200.0-198.7	R	Alton, IL	F	O,P,A	D,B	National Marine
B26	199.0	L	Alton, IL (Skinny Isl.)	F	P		American Commercial Barge Lines
B26	198.6-198.2	R	Hartford, IL	F(198.6)	O,P,A	T	Economy Boat
B26	198.5-198.2	L	Hartford, IL		O,A	M	
B26	197.4	L	Hartford, IL	F	P,A		National Marine
B26	197.3-195.6	R	Mobile Island	F	O,P,A	D,T,B	Souix City & New Orleans Barge Lines
B26	197.0	L	Hartford, IL	F	P,A		Souix City & New Orleans Barge Lines
B26	196.0-195.5	L	Hartford, IL	F	P,A		American Commercial Barge Lines
B26	192.9-192.2	L	Chouteau Isl., IL	?			Marmac Corp.
B26	191.3	L	St. Louis, MO	F	P,A		Alterius Title Co.
B27	182.1-181.4	L	East St. Louis, IL	F	P		Louisiana Dock Co.
B27	178.9	R	St. Louis, MO	F	P,A		Archway Fleeting & Harbor Service
B27	178.9-178.4	L	East St. Louis, IL	F	P,A		Riverway Harbor

					Service
B27	178.1-177.9 R	St. Louis, MO	F	P,A	Federal Barge Lines
B27	178.0 L	East St. Louis, IL	F	P	Archway Fleeting & Harbor Service
B27	177.7 L	East St. Louis, IL	F	P,A	Archway Fleeting & Harbor Service
B27	177.6 L	East St. Louis, IL	F	P,A	Riverport Terminal & Fleeting
B27	177.4 R	St. Louis, MO	F	P,A	Eagle Boat Store
B27	176.0-174.0 L	East St. Louis, IL (Arsenal Isl.)	F	P,A	Eagle Boat Co. Fleet
B27	175.5 R	East St. Louis, IL (Arsenal Isl.)	F	P	Eagle Boat Store
B27	175.3 L	East St. Louis, IL	F	P,A	Eagle Marine Industries
B27	175.2 R	St. Louis, MO	F	P,A	Federal Barge Lines
B27	175.0 R	St. Louis, MO	F	P,A	Archway Fleeting & Harbor Service
B27	174.8-174.0 L	East Carondelet, IL	F	P	Riverway Harbor Service
B27	174.5 R	St. Louis, MO	F	P,A	Archway Fleeting & Harbor Service
B27	174.2 R	St. Louis, MO	F	P	Archway Fleeting Harbor Service
B27	173.7 R	St. Louis, MO	F	P	Federal Barge Lines
B27	173.2 L	East Carondelet, IL	F	P	Riverway Harbor Service
B27	173.0 R	St. Louis, MO	F	P,A	Archway Fleeting & Harbor Service
B27	173.0-172.0 L	East Carondelet, IL	F	P,A	Riverway Harbor Service
B27	172.5 L	East Carondelet, IL	F	P,A	Riverway Harbor Service
B27	172.4 L	East Carondelet, IL	F	P,A	Riverway Harbor Service
B27	172.3-171.9 L	East Carondelet, IL	F	P,A	LDC-St. Louis
B27	171.8-170.9 L	East Carondelet, IL	F	P,A	Riverway Harbor Service
B27	171.3 R	Lemay, MO	F	P	Notre Dame Towing Co.
B27	168.4 R	Jefferson Barracks, MO	F	P	J.B. Marine Service
B27	168.4-168.0 L	Jefferson Barracks, MO	F	P	J.B. Marine Service
B27	167.8 L	Jefferson Barracks, MO	F	P	Riverway Harbor Service
B27	167.6 L	Jefferson Barracks, MO	F	P	Riverway Harbor Service
B27	167.4 L	Jefferson Barracks, MO	F	P	Riverway Harbor Service
B27	167.3-166.0 L	Jefferson Barracks, MO	F	P,A	J.B. Marine Service
B27	167.1 R	Jefferson Barracks, MO	F	P,A	Riverway Harbor Service
B27	167.0-166.7 R	Jefferson Barracks, MO	N	A	
B27	166.0-164.8 L	Pultight Landing, IL	F	P,A	Luhr Brothers
B27	164.8-163.2 L	Pultight Landing, IL	F	P,A	J.B. Marine Service
B27	163.2-162.8 L	Pultight Landing, IL	N	A	
B27	160.7-159.6 R	Chesley Island, MO	N	A	
B27	155.5-154.8 R	Sulphur Springs, MO	F	P	Mississippi Line Co.
B27	149.7-148.8 R	Crystal City, MO	F	P	Eagle Marine Industries
B27	139.0-138.0 R	Brickeys, MO	F	P	Sterling C. Gousner
B27	129.3-128.9 R	Estab. Towhead, MO	N	A	
B27	127.4-126.5 L	Kellogg, IL	F	O,P,A	B Tower Rock Stone Co.
B27	126.7-125.7 R	Ste. Genevieve, MO	F	O,P,A	D Southern IL Sand Co.
B27	122.4-121.7 R	Ste. Genevieve, MO	F	O,P,A	D,B Southern IL Sand Co.
B27	119.5-118.2 L	Roots, IL	F	P,A	Cargo Carriers, Inc.
B27	118.1-117.7 L	Roots, IL	F	O,P,A	D Peabody Coal Company

B27	115.2-114.6	R	Kaskaskia Isl, IL	F	O,P,A	D,B	Mid-America Transp.
B27	109.0-108.8	L	Chester, IL	N	O,A	D	Southern IL Sand Co.
B27	105.4-104.4	L	Ford, IL	N	O,A	D,M	
B27	99.7-99.3	L	Cora, IL	F	O,P,A	D,B	Cora Dock Corporation
B27	99.1-98.7	L	Cora, IL	N	O	B	
B27	98.1-97.9	L	Cora, IL	N	A		
B27	85.2-84.4	L	Gorham, IL	N	A		
B27	81.2-81.4	R	Witkebrug, MO	N	A		
B27	51.1-50.5	R	Cape Girardeau, MO	F	O,P,A	D	Missouri Barge Line
B27	50.5-50.1	R	Cape Girardeau, MO	F	O,P	T	Missouri Barge Line
B27	50.5-49.0	L	Cape Girardeau, MO	F	P		Cape Girardeau Fleeting, Inc.
B27	47.5-47.2	R	Thebes, IL	N	A		
B27	46.7	L	Thebes, IL	N	O	T,B	
B27	46.7	R	Thebes, IL	N	A		
B27	39.8-39.5	R	Commerce, MO	N	A		

APPENDIX B

BARGE FLEETING SITE LOCATIONS ON THE ILLINOIS RIVER

(This list has not been verified. Some names and locations may not be accurate)

Pool	River Mile	Location	Permitted(1)	Information	Mooring	Operator
				Source(2)	Method(3)	
<u>Alton</u>						
	20.3	R Hardin, IL	N	A		
	32.3	R Kampsville, IL	N	O,A	B(to T)	
	34.8-35.2	R Kampsville, IL	F	P		C & H Marine
	54.5-54.8	R Florence, IL	N	O,A	D	
	55.3	L Florence, IL	N	O,A	B	
	61.4-61.8	L Valley City, IL	N	C,O	T	Naples Marine Service
	63.5-65.1	R Naples, IL	F	P		Consolidated Grain & Barge Co.
	64.9-65.4	L Naples, IL	F	P	Barge Co.	Consolidated Grain & Barge Co.
	65.1-66.2	R Naples, IL	F	P		Naples Terminal Co.
	67.2-67.9	L Naples, IL	N	C		Naples Marine Service
	71.7	R Meredosia, IL	N	A		
	72.2-72.4	R Meredosia, IL	N	A		
<u>LaGrange</u>						
	86.9-87.9	R Beardstown, IL	N	O,C,A,	T,B	Logsdon Tug Service
	87.1	L Beardstown, IL	N	O	B	
	88.8-89.8	R Beardstown, IL	N	A,C		Logsdon Tug Service
	91.1-91.6	L Beardstown, IL	N	C		Logsdon Tug Service
	117.7-120.4	R Havana, IL	N	O,C,A	T	Jack Tanner Towing Co.
	145.7-146.6	L Kingston Mines, IL	N	C		Pekin Harbor Service
	151.2-157.6	R Pekin, IL	N	O,C,A	T,B	Delmar Co.
	151.5-151.6	L Pekin, IL	N	A		
	151.8-152.1	L Pekin, IL	N	A		
	152.2-152.6	L Pekin, IL	N	O,C,A	T,D,B	Pekin Harbor Service
	153.6-154.0	R Pekin, IL	N	O,C	T,B	Pekin Harbor Service
<u>Peoria</u>						
	158.0-159.2	R Peoria, IL	N	C,A	T	Kellers Peoria Harbor & Fleeting Service
	159.5-159.7	L Peoria, IL	N	O,A	M	
	159.6-160.5	L Peoria, IL	N	O,C,A	T,B	Kellers Peoria Harbor & Fleeting Service
	161.1-161.3	R Peoria, IL	N	O	D	
	187.9-188.7	R Lacon, IL	F,S	O,C,A	D,M	Trumbull River Service
	189.5-189.6	L Lacon, IL (Fisher's Slough)	N	A		
	204.0-207.4	R Hennepin, IL	N	O,C,A	D,B,M	Illini Harbor Service
	206.0-207.4	L Hennepin, IL	N	O,C,A	T,B	Illini Harbor Service
	207.8-209.0	R Hennepin, IL	N	C		Illini Harbor Service
	211.6	L Hennepin, IL	N	O,C	B	Louisiana Dock Co.
	212.0	L Hennepin, IL	F	O,A,P	D	Illinois Power Co.
	212.2	L Hennepin, IL	N	C	B	Louisiana Dock Co.
	216.9-218.2	R Spring Valley, IL	N	O,C,A	D,T	Illini Harbor Service
	218.2	R Spring Valley, IL	F	P,A		Rice Grain Corp.
	217.8-218.3	L Spring Valley, IL	N	O,C,A	T	Illini Harbor Service
	221.6-221.8	R Peru	N	A		
	223.2	R LaSalle (I&M Canal)	F	C,P		Lehigh Portland Cement
	223.2-223.4	R LaSalle	N	A	T or D	

(1) F=Federally permitted, (No.)=Location of permit if not entire area, N=None.

(2) O=Observed, P=Permit information, C=Publication by Corps (1984), A=Aerial photographs.

(3) D=Deadman, T=Tree, B=Barge, B(to T)=Barge attached to tree, M=Moored to pier, moor, wall, or anchor.

Starved Rock

235.9-236.4 R	Ottawa (Sheehan Island S.C.)	O,A	B,T,M	
236.0-236.2 R	Ottawa (Sheehan Island S.C.)	O,C,A		Marseilles Marine & Fleeting, Inc.
236.4-236.5 R	Ottawa (Sheehan Island S.C.)	A	T	
236.8-237.0 L	Ottawa	O,C,A		Marseilles Marine & Fleeting, Inc.

Marseilles

247.3 R	Marseilles	P		Allied Marine, Inc.
252.7-253.5 L	Seneca	O,C	M,B	Seneca Harbor Service
253.6-254.1 R	Seneca	C		Seneca Harbor Service
253.6 R	Seneca	P		Continental Carriers
253.3-253.8 L	Seneca	O,A	T	
262.5-262.8 R	Morris	O,C,A	D,B(to D)	Morris Harbor Service
262.6-263.4 L	Morris	O,C,A	D	Morris Harbor Service
264.2-266.2 R	Morris	O,C,A	D,B(to T)	Morris Harbor Service

Dresden Island

273.0 R	Dresden Hights	P		Illinois Harbor Fleeting
278.7-279.0 R	Channahon	O,A	T	
280.6-280.9 R	Joliet	O,A	D,B(to T)	
281.0-281.1 R	Joliet	A		
281.3 L	Joliet	O	B(to T)	
281.6-281.9 L	Joliet	A		

APPENDIX C

LIST OF PERSONS/AGENCIES SENT DRAFT REPORTS

Part I - The following were sent complete reports:

Environmental Management Technical Center, Long Term Resource Monitoring Program Onalaska, WI	Brennan Marine LaCrosse, WI
Illinois Dept. of Agriculture Springfield, IL	American Waterways Operators New Orleans, LA
Sargent-Herkes, Inc. New Orleans, LA	Jim Harder-Recreational Boater Muscatine, IA
Tom Raster-Recreational Boater Hugo, MN	Marilyn Barrett-Work Boat Mandeville, LA
Ingram Materials Co. Nashville, TN	Capital Barge Service St. Paul, MN
U.S. Coast Guard Marine Safety Office Chicago, IL	Lugenbuhl, Burke, Wheaton, Peck & Rankin New Orleans, LA
Jefferson Barracks Marine Service, Inc. St. Louis, MO	Southern Illinois Trans, Inc. Chester, IL
American Commercial Barge Line Company Jeffersonville, IN	Illinois Natural History Survey Havana, IL
Scott Paper Company Mobile, AL	Barre Nall Lemont, IL
Mississippi River Regional Planning Commission La Crosse, WI	Domestic Marine Affairs Transport Institute Camp Springs, MD
McDonough Marine Service Parkersburg, WV	Memco St. Louis, MO
Logsdon Tug Service Beardstown, IL	Marion Havlik LaCrosse, WI

Part II - The following were sent copies of the draft report, summary, conclusions, recommendations and appendices A and B.

C.G.B. Marine Services  
Naples, IL

Marseilles Marine & Fleeting  
Ottawa, IL

Trumbull River Services, Inc.  
Lacon, IL

Logsdon Tug Service  
Beardstown, IL

Joliet Harbor Tug Serv., Inc.  
Lemont, IL

River Docks, Inc.  
Peru, IL

Delmar Marine, Inc.  
Pekin, IL

Lemont Harbor and  
Fleeting Service  
Lemont, IL

Egan Marine Corporation  
Lemont, IL

Morris Harbor Service  
Morris, IL

Hannah Marine Corporation  
Lemont, IL

Bordelon Brothers Towing  
Company Incorporated  
Lockport, LA

Dakota Barge Service, Inc.  
Newport, MN

Blackhawk Fleet, Inc.  
Buffalo, IA

Harbor Services, Inc.  
LaCrosse, WI

Upper River Services, Inc.  
S.St.Paul, MN

Hamms Harbor & Fleeting  
Rome, IL

Lower Illinois Towing Co.  
Milton, IL

Spivey Marine & Harbor Service  
Joliet, IL

C.G.B. Marine Services  
Hennepin, IL

Jack Tanner Towing Co.  
Havana, IL

Marine Handling & Fleeting Co.  
Lemont, IL

Anchor In Marina, Inc.  
Seneca, IL

Keller Peoria Harbor and  
Fleeting Service, Inc.  
Creve Couer, IL

Tabor Marine Service  
Peoria, IL

Material Service Corporation  
Lockport, IL

Calumet River Fleeting, Inc.  
Whiting, IN

Ham Tug and Fleeting Service  
Company Incorporated  
Lemont, IL

Brennan Marine, Inc.  
LaCrosse, WI

Capitol Barge Service, Inc.  
St. Paul, MN

Canton Marine Towing Co., Inc.  
Canton, MO

Weymiller Marine, Inc.  
Lansing, IA

MaHeson Marine Service  
Burlington, IA

Cassville River Terminal/  
Dubuque Harbor Service  
Cassville, WI

Red Wing River Towing, Inc.  
Red Wing, MN

Hall Towing, Inc.  
Fort Madison, IA

Newt Marine Service  
Dubuque, IA

R & R Services, Inc.  
Winona, MN

Iowa Gateway Terminal  
Keokuk, IA

Lewis and Clark Marine, Inc.  
Granite City, IL

Inman Marine  
Batchtown, IA

Cape Girardeau Fleeting, Inc.  
Cape Girardeau, MO

Riverway Harbor Service St. Louis, Inc.  
East Carondelet, IL

Peavey Grain Companies  
St. Louis, MO

Jefferson Barracks Marine Ser., Inc.  
St. Louis, MO

Central Contracting and  
Marine, Incorporated  
St. Peters, MO

Southern Illinois Sand Co.  
Chester, IL

Minnesota Harbor Service, Co.  
Stillwater, MN

R & R Marine, Incorporated  
Oquawka, IL

Clayton Tug Service  
Prairie du Chien, WI

Winona Fleeting Company  
Winona, MN

Pool 24 Tug Service, Inc.  
Kampsville, IL

Clinton Harbor Service  
Camanche, IA

Wayne B. Smith, Inc.  
Louisiana, MO

Jackson Cty PTL River Terminal  
Marion, IL

Louisiana Dock Company  
St. Louis, MO

Norman Brothers, Inc.  
Alton, IL

Wood River Harbor Service  
Wood River, IL

Ory Brothers Marine Service  
America, Incorporated  
Hartford, IL

SCNO Terminal Corporation  
Hartford, IL

Massman Construction Company  
St. Louis, MO

Tabor Grain Company  
LaSalle, IL

APPENDIX D

LIST OF PERSONS/AGENCIES WHO PROVIDED WRITTEN DRAFT REPORT COMMENTS.

ContiCarriers and Terminals, Inc.  
Chicago, Illinois

Egan Marine Corporation  
Lemont, Illinois

Jim Harder  
Muscatine, Iowa

Minnesota Department of Natural Resources - Mississippi Office  
Lake City, Minnesota

Minnesota Department of Transportation  
St. Paul, Minnesota

Missouri Department of Conservation  
Jefferson City, Missouri

Morris Harbor Service  
Morris, Illinois

Southern Illinois Transfer, Inc.  
Chester, Illinois

Trumbull River Services, Inc.  
Lacon, Illinois

U.S. Army Corps of Engineers - Rock Island District  
Rock Island, Illinois

U.S. Army Corps of Engineers - St. Louis District  
St. Louis, Missouri

U.S. Department of Transportation  
Maritime Administration - Great Lakes Region  
Des Plaines, Illinois

Upper Mississippi Waterway Association  
St. Paul, Minnesota

Wisconsin Department of Natural Resources  
La Crosse, Wisconsin

## APPENDIX E

### RESPONSES TO DRAFT REPORT COMMENTS

All comments have been incorporated in the text except the following:

Source: U. S. Army Corps of Engineers, Rock Island District

Comment 1: "As a background study, the report needs a section devoted to statutory and regulatory requirements regarding fleeting. This is basically a desk exercise and would respond to the first 3 recommendations provided on page 35. This section would include presentation of ALL real estate management laws and regs pertaining to Corps fee title lands, FWS fee title lands, and Cooperative Agreement lands. The section would necessarily tie in the recent Refuge Management Plan and the Corps' Land Use Allocation Plan. The section will provide synopses of agency regulatory programs, policies, and constraints, with citations."

Response: This report provided a cursory review of pertinent regulations (p. 4-7). This suggestion, however, was incorporated as Future Study Needs recommendation 7b.

Comment 2: "One reviewer noted the need for substrate analysis other than tactile/visual estimation."

Response: A visual analysis of substrates was considered adequate for a general biological impact study.

Comment 3: "Descriptions of erosion need improvement, especially qualifiers and discussion of bank conditions in the vicinity as well as at the fleeting site itself."

Response: A complete analysis of erosion at the fleeting sites and the surrounding areas was not conducted as part of this study. The only data collected was a general evaluation of erosion at locations where fledged barges were present. A more in-depth study has been included as Future Study Needs recommendation 8c.

Source: Minnesota Department of Natural Resources.

Comment 1: Page 10, #1. Biological Rationale - "Sensitive areas should include fish wintering areas."

Response: Fish wintering areas are important sensitive areas; however, no changes were made to the text since it was a quote.

Comment 2: Page 35, Recommendations: Institutional #1 - "Occasional mooring should be included as "fleeting". Many adverse impacts can result from occasional mooring. This kind of fleeting may be of the greatest concern in some areas."

Response: Occasional mooring was not included in the scope of this study (see Introduction, page 2). For this reason no references to it have been made.

Comment 3: Page 35, #8 - "Barge fleeting will be increasingly controlled by permitting. Any new permits will undergo rigorous review by fish, wildlife and pollution control people. Because of the already high level of concern about barge fleeting, it may be unnecessary to do further studies which document impacts."

Response: Additional studies have been recommended to provide clearer directives to the fleeting industry and regulatory agencies regarding mooring facilities and site selection, and to reduce impacts to fish and wildlife.

Source: Upper Mississippi Waterway Association

Comment 1: "The Upper Mississippi Waterway Association recommends that uniform fleeting regulations be established and that the U. S. Corps of Engineers and the U. S. Coast Guard remain as the principal authorities for the present and future barge fleeting regulation as a part of their mandate to maintain and operate the authorized nine-foot navigation channel."

Response: Comment acknowledged.

Source: Missouri Department of Conservation

Comments 1 and 2: Page 1, paragraph 2. "As written, the definition of fleeting does not take into account temporary barge mooring or staging areas. There are several areas along our reach of river where we believe this is a major problem, including river mile 300R below Lock and Dam 22 where an extensive mussel population has been documented."

Page 35, Institutional. "As previously stated, we are concerned that "occasional mooring" may be a significant problem at some locations and should be addressed."

Response: Occasional/temporary moorings were not included in the scope of this study (see Introduction, page 2). For this reason no references to them have been made.

Source: Great Lakes Region, U. S. Department of Transportation, Maritime Administration.

Comment 1 : "We share your concern for the accuracy of the fleeting sites listed in Appendix A. We have attempted to match up the names and locations with the listings in the most recent Inland River Guide, but are unable to accurately identify sites due to company name changes and consolidations, etc. We suspect that a considerable number of sites are no longer used as observed and identified by your study team. The verification of regularly used fleeting sites is critical to the

accuracy of your study project and may require further on-site visits for verification. (1) We suggest that each fleeting area be sorted in three categories, small - emergency needs; medium - 10 to 20 barges; and large - over twenty barges. Each fleeting area should be identified with some measurable level of activity, such as, fleeting capacity or volume per year to properly measure the actual impact of the operation. (2) Fleeting activity is highly seasonal and related to the various commodity market activities. (3) Fleeting sites should be identified by users and commodity activity in order to evaluate seasonal demands. Perhaps data collection coordinated with State Department of Transportation staff could be of benefit. Listing the sites by pool is a good idea, since most other Long Term Resource Monitoring projects are identified by pool area."

Response: The recommendations are beyond the scope of this study. They have been included, however, as Future Study Needs recommendations 7c-d.

Comment 2: "We suggest developing further detail and inclusion of copies of regulations - state or local - dealing with fleeting site permits. Further detail is needed in order to identify the various existing regulatory control over fleeting sites."

Response: This comment has been included as Future Study Needs recommendation 7b.

Comment 3: "A list of environmentally sensitive areas such as eagle nesting areas; mussel beds; and fish spawning areas should be developed in an effort to coordinate any existing fleeting site regulation in the development of new sites. As we have been more involved in the Upper Mississippi industry contacts, we find the mussel beds appear to be located at every commercial navigation facility. Is there some special attraction to port facilities, or is this situation only identified because of the permits required? The commercial navigation representatives are beginning to question the credibility of endangered species list, particularly clams/mussels, due to their existence at nearly every commercial navigation facility. Perhaps there are more positive benefits from navigation than so far identified."

Response: Natural resources inventories, sponsored by the U.S. Army Corps of Engineers, have been completed for the Mississippi River from Guttenberg, Iowa to Cairo, Illinois. An inventory is in progress for the Illinois River from La Grange Lock and Dam to Lake Michigan.

There is no evidence that mussel beds or federally listed endangered mussels are located "at every commercial navigation facility". Mussel beds and federally listed endangered mussels have been identified in conjunction with some permit applications. See recommendation number 6.

Comment 4: "We suggest that fleeting permits continue to be issued by the individual states with coordination through the Corps of Engineers. The study effort has not demonstrated a need or concern to require all fleeting sites to be permitted and approved by the Corps of Engineers.

Each state has special interests and concerns that should control the permitting process."

Response: Comment acknowledged. All states do not have fleeting permitting programs.

Comment 5: "(a) The recommendation for off-shore or mid-stream fleeting areas in deep water appears to be unworkable in most areas of the Illinois Waterway and Upper Mississippi. What is your concept of "deep-water"? (b) Are there such areas in existence without further dredging? (c) We believe the added cost of developing mid-stream anchorage facilities would create a severe burden to the towboat industry, unless of course, Federal and state funds are available to offset the cost through the UMRS-LTRM program. Another concern for mid-stream fleeting is a matter of safety, particularly during fluctuating water levels. In most areas of the Illinois Waterway mid-stream fleeting would not be physically possible. (d) Shore-side fleeting is more easily monitored and accessible and creates less of a navigation safety hazard to commercial and recreational boaters. In some cases shore-side fleeting may actually be protecting the river bank from further erosion."

Response: (a) "Deep water" is water deep enough so the substrate is not affected by propwash or barge grounding. See Future Study Needs recommendation 9b.

(b) The mid-channel site at Keithsburg, Illinois appears to fit this criteria. However, the opportunities for such additional sites is unknown.

(c) We acknowledge the limitations of narrow channel waterways, particularly parts of the Illinois River.

(d) Future Study Need Recommendation 9 will further evaluate using fleets to protect the river banks from erosion.

Comment 6: "In regard to literature search for background data, we suggest you contact the Maritime Technical Information Facility, National Maritime Research Center, Kings Point, NY 11024-1699- phone 516-773-5577 (FTS 663-8577) for a review of their US and worldwide abstracts of study efforts related to barge fleeting. We are enclosing a recent sample abstract for your review."

Response: This information has been incorporated as part of Future Study Needs recommendation 7a.

Comments 7: "In general, we believe the barge fleeting site areas to be a very minor portion of the total Upper Mississippi River - including the Illinois Waterway system. What is the actual land/water area occupied by fleeting operators in comparison to the total river system? This data should be easily developed once an accurate identification of fleeting areas is determined."

Response: Fleeting impacts in cumulation with other perturbations can result in significant impacts to the Mississippi River System. The actual land/water area occupied by fleeters is unknown and beyond the scope of this study.

Comment 8: "An effort to obtain comments from the towboat industry, shippers and local communities about the feasibility of the study recommendations should be developed through meetings with the towing/fleeting industry. The meetings should be organized and co-hosted with State Departments of Natural Resources and Transportation. Industry needs an opportunity to review the study and comment on the recommendations prior to the document being accepted as a final product."

Response: Meetings between river biologists and the towboat industry are very important for improving communication. The authors and Fish and Wildlife Service staff would be pleased to participate in such a meeting. The draft report abstract, summary, recommendations and appendices were sent out to approximately 65 fleeting operators and companies. Complete draft reports were sent to all requestors. Your assistance in the distribution of this study is appreciated. See Institutional recommendation 6.

Source: Department of Transportation, Minnesota

Comment 1: "Several of the tables do not make sense. The percentages total over 100 percent. The tables are on pages 16, 18, 19, 20, 22, 24, 25, 26, 27, and 29. The percentages in the table on page 23 should be the same as the number of sites since the grand total equals 100."

Response: The percentages do not total 100. A number of sites had entries into more than one category. For example one site may have used moorings to deadmen, grounded barges and trees (Table 1). The same is true of Table 7 on page 24. Some sites were fairly long and the amount of erosion on the upstream and downstream ends were not the same.

Comment 2: Page 6: "There is no documentation to support the statements about impacts to fish and wildlife."

Response: The last sentence of the first paragraph in the "Environmental Impacts to Fish and Wildlife" states that most of the biological effects have not been documented, but that they are possible impacts and should be presented. Direct adverse impacts to mussels have been documented (page 8). See the Future Study Needs recommendations 8a-d regarding suggestions for further documentation of impacts to fish and wildlife.

Comment 3: Page 7, 1st paragraph: "Fleeting does not affect sedimentation of backwaters. Fleeting does not normally occur in backwaters. Most erosion is due to natural causes."

Response: Fleeting does not normally occur in backwater areas; however, where it does occur, adverse environmental impacts may result.

Comment 4: Page 7, 3rd paragraph: "Few toxic or hazardous material spills that enter the river are caused by barges. There is no proof that there is an increased chance of toxic or hazardous material spills in fleeting areas."

Response: Data from the U. S. Coast Guard, from 1980 to 1986, cite that there were 244 vessel spill incidents into the Mississippi River and 4 vessel spills into the Illinois River, (USACE, 1988). The information does not distinguish if a fleeted barge was involved, but it may be available from the U. S. Coast Guard.

Comment 5: Page 15, 2nd paragraph: "There was only 1 site where barges were anchored to a flood wall?"

Response: Only one fleet was observed attached to a flood wall at the time of our field inspection.

Comment 6: Page 17: "Where are the locations in the St. Paul District that barges were attached to trees?"

Response: See Appendix A.

Comment 7: Page 18: "What is the purpose of this table?"

Response: Table 3 on page 18 presents data describing the distance of barges from the shoreline observed during field inspection.

Comment 8: Page 19: "What is the purpose of this table?"

Response: Table 4 on page 19 presents data on river bottom substrates collected near barge fleeting sites.

Comment 9: Page 28, paragraph 4: "The rookery has been growing for many years, Dr. Warner of the University of Minnesota concluded in his study."

Response: Concerns for potential adverse impacts remain.

Comment 10: Page 30, paragraph 2: "Trees for perching will not be significantly reduced by two fleeting areas."

Response: The concern is not just for the loss of a few trees but for the potential cumulative effects.

Comment 11: Page 33, paragraph 4: "Discharge of pollutants mentioned is not documented."

Response: See response to comment 4.

Comment 12: Page 35, point 2: "The Corps of Engineers already exercises jurisdiction over fleeting areas. The Corps already has defined fleeting."

Response: The Corps does not directly exercise jurisdiction over fleeting areas. They are responsible for permitting structures regulated by Section 10 of the Rivers and Harbors Act or special use licenses for Corps-owned lands. Corps fleeting definition has been incorporated into the final report (p.2).

Comment 13: Page 35, point 3: "Fleet operators know who owns the land and what permits are required. Not having the proper permits could cause operators problems."

Response: Comment acknowledged.

Source: ContiCarriers and Terminals, Inc.

Comment 1: "The most recent Inland River Guide lists 26 commercial fleeting companies operating above Alton, Illinois on the Upper Mississippi and 15 operating on the Illinois River south of Lemont. This compares to the 143 fleeting sites on the Upper Mississippi and 63 on the Illinois that were "identified" in the study. One has to believe that many fleeting sites cited in this report may no longer be in use and their inclusion could skew the statistics."

Response: The appendices listing barge fleeting sites is as current as possible. Most of the information was gathered from permit data. It was, however, sent out for verification to a list of fleeting companies provided by Alpha Ames, Director of the Great Lakes Region Director of the U. S. Department of Transportation, Maritime Administration. There are undoubtedly some inaccuracies in the tables, but they are as correct as possible considering time and budget constraints of this study.

The number of fleeting sites is not comparable to the number of commercial fleeting companies. Many companies had several different fleeting sites on the rivers.

Comment 2: "Would it be possible for your group to provide a listing of environmentally sensitive areas (eagle nesting areas, mussel beds, fish spawning areas, etc.) on the Upper Mississippi and Illinois Rivers? It appears from the tone of your statements that every fleet site is in such a location."

Response: See the response to comment number 3 from the Great Lakes Region, U. S. Department of Transportation, Maritime Administration (pages E-3 and E-4).

Comment 3: "While the draft calls for off-shore or mid-stream fleeting as the most desirable type of situation, no mention is made of the potential economic and navigational impacts of such fleets. I urge a thorough analysis of these ramifications and also the feasibility of establishing such fleets without dredging."

Response: The recommendation for off-shore fleeting is related to depth of water and may only be a short distance from the shore. Potential economic and navigation impacts are beyond the scope of this study; however, these factors will need to be included in any fleeting site analyses.

