

# SECTION IX

## *SPECIAL CONCERNS*

### **9.1. INTRODUCTION**

This section addresses areas of Rivers Project programs and projects that are considered to be of particular concern and which require special attention.

Inability to effectively address and resolve these concerns will result in continued inefficiencies, lack of legal and regulatory compliance in some cases, and a failure to respond to public needs and concerns.

### **9.2. ACCESS TO PUBLIC LANDS AND WATERS**

Access to project lands is difficult in many areas due to the lack of a project road system, patterns of private land ownership, remote locations, extensive levee systems and road jurisdiction and maintenance problems.

Access to Rivers Project lands and waters can be grouped into four categories. A brief discussion of problems associated with each type of access and proposed solutions are listed below:

#### **Service Access**

Numerous tracts of public land (excluding islands) are currently inaccessible or only seasonally accessible by land. Vehicle access by project personnel to public lands is critical for resource management and protection activities and safety. Acquisition in fee or easement right-of-ways are necessary in several areas around the project.

#### **Public Access**

Most roads providing access to existing project public use areas are currently substandard in design, construction and maintenance. Public safety concerns and environmental degradation at these sites have increased as a result. There is a need to verify which governmental entities are responsible for which roads that provide primary or secondary access to public lands (federal, state, city, county or township), and to arrive at a mutually acceptable maintenance standard that insures continued public accessibility and safety.

#### **Existing Unauthorized Accesses**

Over the years, numerous unauthorized roads and vehicle accesses have been developed on public lands throughout the project area. These illegal accesses are used by the public mainly for recreational purposes. However, destruction of real property, trash dumping and reduced public safety are some of the negative impacts of unauthorized and unregulated vehicle access on public lands. Title 36 Code of Federal Regulations prohibits unauthorized off road vehicle (ORV) operation on federal lands.

Efforts to resolve these problems will likely result in closing some of the unauthorized accesses and authorizing and maintaining others for legitimate public use. Public islands, which are only accessible by boat, also need to be evaluated to determine public use patterns and needs.

### **Boater Access**

The existing boat accesses along the Rivers Project Area generally occupy the most suitable areas for river access. However, there are some existing access points that are becoming silted in and use is severely limited. Equitable distribution of boat accesses is an issue with many boaters. In some areas, there are many accesses available, in other areas, there are none. Many shoreline areas, including some where access facilities are needed, present severe obstacles to the development of additional accesses. Some accesses could be relocated just upstream or downstream to provide better access year round.

Seasonal high-water and flooding are also factors which prohibits adequate access in some areas. Many boat ramps and parking areas are not usable during normal flood pulses. Only a limited number of private accesses are usable during these periods as well.

New and improved boat access facilities need to be designed, distributed and managed to protect the natural resources and meet increasing public demand.

### **Rivers Project Comprehensive Public Access Plan**

To systematically and objectively resolve concerns associated with public access to and on Rivers Project managed public lands and waters, it is proposed to develop a Comprehensive Public Access Action Plan. This effort will require extensive public involvement and interagency and partner coordination and support.

Development and approval of this plan will provide a strategy to resolve public and agency access concerns and improve project operational efficiency.

This plan will be a supplement to the Rivers Project Master Plan and be reflected and further detailed in the Rivers Project Operational Management Plan for implementation. A Primitive Camping and Shoreline Management Plan will be developed during this planning process as well.

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## **9.3. UNIVERSAL ACCESS COMPLIANCE**

Design of older recreational facilities did not address the needs of disabled and elderly visitors. The Corps has committed itself to take a look at the older recreational facilities to provide a quality outdoor recreation experience which includes an accessible, safe and healthful environment for a diverse population. All designs shall provide for equal access to and utilization of facilities by all visitors. Standards for the design of universally accessible facilities are presented in Uniform Federal Accessibility Standards. The standards are to be applied during design, construction and alteration to building and facilities. There are however, certain situations when these provisions are not required:

- At certain overlooks such as observation towers or decks that are only accessible by steep trails or a series of stairways.
- Within a common recreational area when at least one comfort station is already accessible.
- At campsites within a campground where an appropriate number of accessible sites are already included.
- At primitive camping sites.
- At certain hiking, walking and nature trails.

All existing recreational facilities will be evaluated for rehabilitation to meet the Uniform Federal Accessibility Standards/American Disabilities Act Standards as funds are available.

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#### **9.4. PRIMITIVE CAMPING**

In accordance with Title 36 Rules and Regulations, camping on public lands is only permitted at sites or areas designated by the District Engineer. Designation of camping sites on project lands can make camping safe and sanitary for visitors and impacts to the natural resources can be minimized. Controlled and maintained camping areas will also encourage safe and manageable use of project lands. Currently there are no designated camping areas on Corps managed lands.

Traditionally, visitors have used any project lands along the Mississippi and Illinois Rivers for primitive camping sites for lack of more suitable managed areas. The majority of camping takes place on secluded areas such as islands and sandbars. To access these areas, campers boat in from public launch facilities. People often camp at or adjacent to public accesses and cottage areas, often over-crowding the area or engaging in activities inconsistent with its intended use. Historically, conflicts have arisen between compliant visitors such as cottage owners, people hunting, fishing, boating, etc., and visitors camping in non-camping areas.

Camping sites can be designated and managed to reduce these conflicts. Opportunities are present throughout the project to use current low-density recreation lands as camping areas. Coordination with other government agencies and public input will provide a list of optimum sites that can be managed for this use. Where private exclusive use at cottage areas has been reduced, public lands traditionally used for cottage sites could be designated as camping areas. Many of these cottage sites currently have suitable public roads that can serve as accesses, and their locations are typically on or near the shoreline.

Throughout the project area, many potential camping sites exist that will provide the visiting public with optimum camping opportunities. The identification and management of these sites will reduce user conflicts, negative impacts to the natural resources, and can provide safe camping opportunities, while providing the visiting public with a more enjoyable recreation experience.

Site locations, access, and primitive camping regulations will be addressed in a Rivers Project Public Use Access Action Plan as outlined in Section 9.2 Access to Public Lands and Waters, as well as the Shoreline Management Plan that is scheduled for development.

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#### **9.5. RECREATIONAL USE SURVEYS AND VISITATION ANALYSIS**

Throughout the life of the project, visitation data collection and analysis has been very sporadic and poor at best. While visitation is clearly very high at the Rivers Project, the lack of visitor survey information prohibits a sound identification of visitor use and trends, recreational needs, public use facility needs and an analysis of efficiency of operation. Comprehensive visitor use surveys are useful in providing the realistic data necessary to make management decisions.

It is the policy of the Corps of Engineers that:

- Recreation use surveys shall be conducted at water resource projects in order to maintain and report accurate visitation and public use information.

- Recreation use surveys shall be conducted and analyzed in accordance with the Visitor Estimating and Reporting System (VERS). This is the official and only authorized reporting procedure that is used for computing visitation at Natural Resource Management Systems (NRMS) projects. VERS is comprised of four microcomputer based programs designed to estimate and report recreation use on Corps projects.

The estimates used by VERS to compute visitation are based on recreation use surveys conducted at recreation areas where car counters are used to monitor vehicular traffic. The goal of conducting recreation use surveys is to develop visitation estimates which are consistent, reliable and credible for all Corps projects.

The priorities for Visitation Surveys and analysis at the Rivers Project are:

- To document visitation and visitor activities associated primarily with Corps recreation areas under Rivers Project jurisdiction.
- To document visitation and activities with as many non-Corps Recreation providers as possible within the Rivers Project Service Area.
- To survey and assess facility needs; document non-traditional uses and special user groups; to assess levels and types of dispersed visitors as well as visitors who originate from areas adjacent to but contiguous with the Rivers Project Service area.

Once collected and analyzed, it is believed that this data will be useful in guiding future operation and management efficiencies, recreation and environmental program successes and increased visitor satisfaction.

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## **9.6. BACKLOG MAINTENANCE AND MAJOR REHABILITATION OF RECREATION INFRASTRUCTURE**

Over the years, Rivers Project Natural Resource Management Program budget constraints have caused continued deferred maintenance to recreation infrastructure and facilities. Without needed attention, further degradation of the environment and recreation standards, customer dissatisfaction and possible closure of facilities and structures for public health and safety concerns will continue. Minimal maintenance is not sufficient to ensure many structures and facilities are safe and serviceable. Deferred maintenance has caused a significant backlog of maintenance and has reached a point where replacement is becoming necessary. The recreation infrastructure along the river is not generally highly developed because of its location on the floodplain and susceptibility to frequent flood pulses. A justified level of service appropriate to sustain the recreation infrastructure and facilities in a safe and healthful condition will only be achieved with a commitment of additional funds to insure base program requirements are met.

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## **9.7. PUBLIC SAFETY CONCERNS**

Ensuring visitor safety is one of the highest priorities on Rivers Project public lands. Public lands provide opportunities for many activities ranging from boating on the river to strolling along trails in natural areas. Due to the diverse amount of activities, and the river and floodplains' natural and constructed features, many different potential hazards exist. Recognizing and minimizing risks associated with these hazards presents a formidable challenge.

Project safety plans are developed to monitor hazards and ensure public safety. Included are plans to remove the hazards if possible, to identify hazards with proper signs, to ensure that facilities are maintained, and to educate the public about potential hazards through programming, staff presence, public service announcements, and partnering.

Many natural features, public facilities, and structures built and maintained by the Corps or leaseholders, require safety controls and hazard abatement. All facilities and areas are inspected on a regular schedule to ensure structural safety. However, hazards still exist. Rangers patrol public lands to assist visitors and enforce Title 36 Rules and Regulations to reduce hazards that occur from misuse. In areas of high visitation, it becomes difficult to put enough patrol rangers in the field to ensure a safe recreational environment. As an aid to ranger patrols, coordination with other federal, state, and local agencies provides an opportunity to leverage resources to ensure that these areas receive the effective and efficient patrols. To maintain public safety, cooperative law enforcement agreements have been executed to provide personnel and resources to assist visitors and aid rangers during high use times in high use zones. Currently agreements are in place with St. Charles County, Missouri, and Madison County, Illinois. Agreements with Pike County, Illinois; City of Madison, Illinois; and City of Alton, Illinois are also needed and will be initiated when and if funding becomes available. However, as usage rises or additional problems are documented, additional agreements with other counties will be negotiated to assist with patrols on public lands.

The river supports a large, diverse group of activities and users. Some of these activities include commercial navigation, recreational boating, hunting, fishing, wildlife viewing and sight seeing. Industrial uses occur in some same areas as heavy recreational use. Industrial activities include port areas, power plants, factories, treatment facilities, and a wide array of other activities. Along with the wide range of uses on the river and the potential for user conflicts that compromise safety, there are also the hazards created naturally by the river including undertows, fast currents, snags, changing water levels, and under water obstructions.

With all of the activities the river provides, it is important to pay special attention to user safety and monitor it to ensure that hazards and hazardous use are kept to a minimum. Coordination with other agencies in managing the river for user safety is essential. The river falls under many jurisdictions of federal, state, and local agencies. The USCG holds primary responsibility for navigational safety on the river including channel boundaries, identifying hazards, and enforcement of maritime regulations. However, many other agencies have a responsibility to maintain a safe and healthful environment and help enforce safety rules and regulations. Traditionally, these agencies have lacked a structured approach to facilitate working together as a functioning unit that is both effective and efficient. Steps have recently been taken towards organizing all agencies involved with management and enforcement on the river into a functioning water safety council. There is continuing pressure for this council to improve coordination among the many agencies and groups and methods to ensure the safety of the public when they are visiting the Mississippi River and its tributaries. This council is comprised of individuals with various expertise and responsibilities, representatives of federal, state, and local agencies and private sector businesses with an interest in a safe recreational environment. The council is addressing all aspects of water safety by focusing on public education and awareness, regulatory patrols and enforcement, search and rescue, and emergency management. The council has also been active in providing inter-agency cross training to improve the effectiveness of agencies within the council. Needs are being identified to

enable the Corps to re-examine its presence on the river and adjust its water safety focus accordingly through increased visitor assistance patrols, education programs, and community awareness.

On both public lands and waters, safety is of utmost importance. A diverse amount of activities and conditions can create hazards for project visitors. Timely maintenance, coordination, visitor assistance, signage, and educational programming must be increased to ensure safety for the visiting public.

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## **9.8. PUBLIC CONFUSION ABOUT INTER-JURISDICTIONAL MANAGEMENT**

The Corps maintains primary administrative authority over all fee title lands and waters acquired for construction and operation of the Mississippi River Project. The Corps has the responsibility and authority to manage the natural resources on Corps fee title lands, which includes forest, fish and wildlife, water, aesthetic and vegetative resources of the project. The majority of lands acquired for the Nine-Foot Navigation Project are managed by the Department of Interior USFWS, for fish and wildlife management purposes under a General Plan and Cooperative Agreement and are known as General Plan lands.

The Cooperative Agreement, signed 14 February 1963, described a General Plan between the Bureau of Sport Fisheries and Wildlife (now the USFWS) and the Corps for management of General Plan lands, in accordance with the Fish and Wildlife Coordination Act. There are approximately 50,000 acres of the General Plan lands included under this Agreement, which were released to the States of Iowa, Illinois and Missouri for fish and wildlife management. The USFWS administers separate Cooperative Agreements with each of the States, subject to the provisions of the USFWS/Corps Agreement. All three of these Agreements are older than the current USFWS/Corps Agreement and need to be updated.

Over the years there have been numerous points of confusion involving these interagency relationships, mainly as a result of subsequent legislation and policy changes within the involved agencies. Elements in the Agreement which were included for secondary economic use considerations have at times conflicted with other agency goals. Overall, antiquated language contained in the document does not convey the mutually desired outcome for river corridor management, which is shared by each partner agency. The primary purpose of areas released by the Secretary of the Army remains the navigation project. The Coordination Act permits the Corps to make "adequate provision consistent with the primary purposes of such impoundment, diversion, or control, shall be made for the use thereof...for conservation, maintenance and management of wildlife resources thereof...in accordance with general plans...for administration...by the Secretary of the Interior...in such manner as he may deem advisable..." Navigation purpose primacy is not subject to negotiation between the agencies. However, there are within the Agreement many elements that are discretionary under the law.

Aside from updating interagency agreements to better reflect current conditions, and management to address confusion among federal and state managing partners, there needs to be concerted inter-jurisdictional effort undertaken to better inform the public. Increased public information programming, informational brochures, site bulletins, and special events are various venues for conveying an accurate message concerning the overlapping and separate roles each agency plays in the management of public lands and waters that make up the Nine-Foot Navigation Project. Increased attention to proper identification of project boundary lines through adequate well maintained signage, well maintained directional

signage at public access points, and well maintained bulletin boards with information addressing rules and policies governing public usage are each important and needs attention. Increasing the regularity of public forums beyond those designed to generate public comment during planning efforts would also be useful.

## 9.9. PRIVATE EXCLUSIVE USE

Engineering Pamphlet 1130-2-540 defines Private Exclusive Use as the use or occupancy of individually owned permanent structures for human habitation sited on public land and water areas at Corps civil works projects. Any action at a Corps project that precludes use of the land and waters by the general public is considered to be "private exclusive". Lesser forms of private use, such as individual houseboats, private boat docks and piers, fencing, signing, landscaping, etc., are excluded from this definition, since they are the subject of concern under the Corps' shoreline management program.

In 1944, Section 4 of the Flood Control Act, (later amended by PL 99-662, 17 November 1986) authorized the Secretary of the Army to grant leases of lands at water resources development projects for such periods, and upon such terms, and for such purposes as he may deem reasonable in the public interest. As a result of this the Government advertised certain sites along the Mississippi and Illinois Rivers to be developed as recreational cottage sites in the early 1950s. Within the St. Louis District, nearly 800 such leases were advertised and executed, the major intent of which was to provide recreational cottages only, not permanent residences.

In 1965, the St. Louis District ceased granting any new cottage site leases on project lands in the navigation pools to be consistent with Corps policy of discouraging the public from constructing habitable structures in the floodplain. To provide a reasonable phase-out period with minimum inconvenience to current lease holders, the Chief of Engineers established the policy that, when existing cottage and residential site leases expired, they would be extended to 30 November 1988, provided the land was not needed for priority use and the lessee continued to comply with the terms and conditions of the lease. Subsequently, Public Law 97-140 established a moratorium until 31 December 1989 on enforced removal of certain existing private exclusive use type structures, which had been previously authorized or permitted on project areas under the jurisdiction of the Corps. Ultimately, Public Law 99-662 instructed the Corps to continue in effect any lease or assignment thereof until such time as such lease was either terminated by the leaseholder, terminated by the Corps for substantial lease violations, or the property covered by the lease was determined needed for immediate use for public park purposes or other higher public use or for navigation or flood control.

In 1988, there were 764 privately owned recreational cottages on leased fee-owned lands on pools 24, 25, and 26. The Corps' Regional Plan, consistent with Corps policy and the Master Plan established a prohibition on future private exclusive use and a programmatic effort to phase out such use began. As of 2000, 368 cottage leases remain. Of the original 23 subdivisions, only 13 remain with 5 or more active leases.

The Regional Plan for the Upper Mississippi and Illinois Rivers project lands and waters administered by the St. Louis District was revised to comply with requirements of Section 1134 of PL 99-662. The Regional plan was developed to determine whether private exclusive use

Table 9-1  
Breakout of Cabins by County

COUNTY	SUBDIVISIONS	CABINS
St. Charles, MO	3	94
Lincoln, MO	3	7
Jersey, IL	7	161
Calhoun, IL	4	55
Pike, IL	6	51
<b>TOTAL</b>	<b>23</b>	<b>368</b>

would be prohibited in the UMR region and to formulate a program to phase out private exclusive use structures on project lands. The revised Regional Plan was approved 1 December 1988 by the Mississippi River Valley Division. The plan prohibits private exclusive use on navigational pools 24, 25, and 26 because the project resources are required for the benefit of the general public. This plan is in consonance with prohibiting private exclusive use on other navigational pools on the Upper Mississippi River administered by the Rock Island and St. Paul Districts.

Following the 1993 flood, 220 cottages were abandoned, destroyed, and/or revoked for non-compliance. Following lease termination, acreage previously leased was re-zoned vegetative management and will remain as such to reduce impacts to potentially sensitive areas. However, recognizing that most of the subdivisions enjoy adequate public road access and given their river front location some vacated lots will be assessed for their potential to serve as public access points to the river in accordance with project authorities. In all instances, thoughtful consideration will be given to selection of sites to be utilized as vegetative areas or recreation areas insuring that minimal impact to lands and to operational expenditures is accomplished.

In the future it will be the continued policy to phase out private exclusive use on public lands. Efforts will be made to include cabin leases in new initiatives that discourage floodplain development and encourage those individuals to utilize private lands outside of the floodplain. This continued momentum to phase out private exclusive use will inevitably lead to the reduction of these privately held cabin structures on public land that dot the banks of the Mississippi and Illinois Rivers.

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## 9.10. INDUSTRIAL LEASES

The Rivers Project Office has eight existing industrial leases totaling approximately 811 acres. The uses of these leases range from docking and loading facilities to multipurpose industrial development.

These lands have been leased to commercial entities for many years. As such, these lands have been effectively reduced to perpetual private exclusive use and are not available for other uses nor are they available to the general public. Public funds are spent to administer these leases, however, they are not available to the general public.

Corps administrative procedures are often seen as cumbersome for for-profit tenants. Leaseholders are sometimes required to duplicate forms, inspections, and tests already requested by other licensing agencies. In some instances, Corps regulations are superceded by more stringent ones required by agencies that directly regulate the specific activity, and this can cause confusion for lessees.

For the above reasons, it is the policy of the Rivers Project Office and the St. Louis District to refrain from entering into any new industrial leases. Furthermore, the Rivers Project will endeavor to reduce or eliminate existing industrial leases through methods such as land exchange or sale of land as best supports federal and public interests.

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### **9.11. DRAINAGE CONFLICTS WITH ADJACENT PRIVATE LANDS**

In a number of recorded instances the drainage of water from adjacent landowners is being impeded or hampered in its passage across Corps administered Project lands toward the river by natural obstructions and sediment buildup. Separate cases have been documented in Calhoun and Madison Counties, in Illinois and in St. Charles County, Missouri. Numerous inquiries have been made by adjacent landowners in attempt to address the problem.

Over many years sediment has built up in off channel areas throughout the impounded portion of the project. During high water events water backs up into the lower reaches of natural and constructed drainage outlets. Sediment transported into these drainage outlets during these events has significantly decreased their drainage capacity. This problem is confounded by obstructions such as beaver dams, deadfalls, and flood debris that over time are partially or completely blocking outlets. The drainage area of these outlets typically encompass significant upland areas with considerable relief. During heavy spring rains it is common for water to back up off project lands and onto private agricultural lands and stand there for days at a time preventing or delaying spring and fall planting and in many instances resulting in significant crop losses.

In most cases local attempts to remove these obstructions or regularly perform ditch maintenance has failed due to complications encountered in securing permission to perform necessary work on project lands. Over time many of these drainage outlets have become unserviceable. When water reaches the project boundary it simply spreads out across a wide indeterminate flowage area finally reaching the river.

Heavy maintenance is required to return these outlets to their original capacity. However, destruction of habitat often is a consequence and comes into conflict with stewardship objectives for which the Corps, USFWS, and states are chartered to pursue.

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### **9.12. FLOODING AND FLOOD DAMAGE REDUCTION AND FLOODPLAIN DEVELOPMENT**

The Mississippi and Illinois Rivers fluctuate throughout each year, depending on rainfall, snow melt, drought and water control operations. Often the rivers reach flood stage, commonly from 1 time to 4 times per year. During these periods, public use of many of the river's existing recreation facilities including boat ramps, parking lots, courtesy docks and day use facilities is severely restricted or closed entirely. With the loss of these recreational facilities for an extended time, a significant negative impact may be experienced. Future design/siting of access infrastructures that are rehabilitated or replaced needs to better address water level constraints to minimize impacts to use.

The Mississippi River has an extensive system of flood control levees in place. These levees are a combination of private and federally sponsored. The levees vary in the levels of protection they provide. They range from the low end which offer protection from a 10-year flood event, to the top end urban type levee which offer protection from a 500-year flood event, and any level of protection in between. Almost all of the Rivers Project access areas and facilities are located within the floodplain and outside of the protection of levees.

The rehabilitation and replacement of outdated facilities will look at innovative ways to modify/enhance traditional structure design to eliminate high operation and maintenance costs. When looking at the

rehabilitation of facilities, the main concern will be to eliminate the high costs for maintenance due to seasonal high river stages.

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### **9.13. SHORELINE PROTECTION NEEDS**

Within the Rivers Project, only a portion of the shoreline in each navigation pool is federally owned in fee title and managed by the Corps. The bulk of these lands extend from the 'hinge point' downstream to the locks and dam for each navigational pool. Traditional uses of the shoreline are varied and concentrated. In almost all cases, the uses compete with one another for the shoreline and in extreme cases they are exclusive. Some of the uses include river access (roads, parking lots, boat ramps), recreation activities (picnicking, primitive camping, fishing, hunting, water skiing, swimming), intense recreational development (marinas, campgrounds, parks, lodges, casinos), aesthetics (Great River Road, sight seeing, eagle viewing) industrial development (docking, loading facilities), navigation support facilities (fleeting, waiting, dry dock), and wildlife (refuges, nesting areas). Placement of waterfowl blinds along public shorelines for recreational purposes is regulated. Each state administers a lottery system for allocation of these blinds. Numerous private docks also exist that were permitted in the past on a case-by-case basis.

In order to resolve conflicts and to protect the shoreline, the Rivers Project Office will develop a Shoreline Management Plan in the near future. This plan will be developed in accordance with pertinent Corps policy and regulations as outlined in Section 8.08 of this plan. All planning efforts will involve significant public, special interest, and other federal and state agency input. Public input workshops and meetings will be held throughout this process to ensure an acceptable plan is developed.

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### **9.14. EROSION, SEDIMENTATION AND WATER QUALITY CONCERNS**

#### **Erosion And Sediment Management Strategies**

The management of erosion and sedimentation in the UMR watershed will remain a major environmental issue for many years to come because of the magnitude of the problem and the size of the watershed. It is widely acknowledged that erosion and sedimentation is the number one environmental problem in the watershed. However, there is no comprehensive management plan to deal with the problem. There have been numerous activities by various state and federal agencies to control erosion in different parts of the watershed over the years. However, these activities are not coordinated and well documented. Monitoring of erosion, sediment transport and sedimentation are scarce and intermittent making it difficult to evaluate the effect of different activities and the trend in the overall problem. The need for a coordinated and comprehensive approach to deal with the problem of erosion and sedimentation is well known. However, at this point there is no such plan and it will require significant effort by federal and state agencies to come up with a comprehensive plan.

A comprehensive erosion and sedimentation management plan should consist of several management alternatives appropriate to the specific problems. Because of the size of the watershed and the different causes of erosion, many different types of erosion control measures have to be implemented. Similarly different sediment management alternatives have to be developed for different river and backwater areas depending on the source of sediment and the planned use of the area. The different

management strategies can be grouped into two main categories: erosion control and sediment management.

### ***Erosion Control***

For the UMR watershed, there are three major types of erosion that contribute significant amounts of sediment. These are watershed erosion, streambank erosion, and bluff erosion. The relative significance of these three major sources cannot be accurately quantified based on available data. Depending on the location along the River, any one of the three sources could be the primary source of sediment to an area.

#### **■ Watershed Erosion**

Watershed erosion is used here to refer to erosion in the watershed primarily consisting of sheet, rill, and gully erosion in agricultural and non-agricultural areas. However, since more than 80 percent of the watershed is used for agriculture, erosion due to agricultural practices contributes the bulk of watershed erosion. Erosion from construction sites could also contribute significant amounts of sediment. Section 402 of the Clean Water Act now requires land disturbance permits for any construction site greater than 5 acres. This process requires an erosion control plan.

With respect to watershed erosion it is well known that most of the erosion takes place within a small portion of the watershed defined as critical erosion areas that generate significant amounts of sediment. It is therefore important that these areas are identified throughout the watershed so that limited resources could be allocated where they can be most effective.

In most of the watershed, erosion control activities are carried out by the Department of Agriculture through the NRCS. For example, a major initiative in Illinois to control erosion from agricultural lands is known as "T by 2000." The goal of this initiative is to reduce erosion in Illinois to tolerable soil loss limits ('T') by the year 2000. 'T' is defined as the maximum average soil loss in tons per acre per year that can be tolerated by the soil and still sustain production into the future. The full realization of the "T by 2000" program through state and federal funding will go a long way in controlling erosion and sedimentation problems in the Illinois River basin and positively impact the Mississippi River as well.

#### **■ Streambank Erosion**

Most streams experience some form of bank erosion. In cases where vegetation has been removed from streambanks leaving them unprotected, bank erosion is excessive. Many channelization projects and river crossing structures such as bridges tend to increase the streambank erosion potential. There have been some studies which attempted to quantify the percent of a stream's sediment load that originates from bank erosion. Percentages ranging from 20 to 80 have been reported by different investigators. The actual value will depend on the local conditions of a particular stream. Streambank erosion is believed to be a major contributor of sediment in streams in the UMR basin. Placement of rip rap on highly erodible banks is one method used to prevent this. However, there is no basin wide program to control streambank erosion. Realizing the significance of the problem and the fact that sedimentation problems will not be solved unless control of excessive streambank erosion occurs there is a need for a comprehensive streambank erosion control program. The program needs to identify major streambank erosion areas throughout the watershed and quantify the problem. There is a need to know how many miles of stream channels in the river basin are eroding at a significant rate. Along with identification of the erosion sites, the types of streambank failures and the suspected causes need to be documented. This is important because all streambank erosions are

not of the same type and they are not initiated by the same cause. Once the locations, types and causes of streambank erosion in the basin have been identified, then the appropriate bank stabilization techniques can be recommended.

### ■ Bluff Erosion

Because of its geological formation, the UMR valley is much larger than the present day River. The width of the River valley ranges from a mile to nearly ten miles. The edge of this large valley with relief from 100 to 300 feet is defined as the bluff area. The slope of the bluff areas is extremely steep reaching up to 30 percent resulting in excessive erosion. There is also significant amounts of land dislodging or washing along the steep slopes. Small streams draining the bluff areas generally carry significantly higher amounts of sediment than streams in other settings. The cumulative significance of the bluff areas as sediment sources become important when one considers the total length of the valley. Two erosion control studies have been completed and erosion control measures are being implemented by the NRCS in conjunction with the Swan Lake and Batchtown EMP projects.

After the identification of the major causes of erosion in bluff and hillside areas, there is a need for developing bluff erosion-control strategies.

### ***Sediment Management***

The major issues related to sediment management in the UMR Basin can be grouped into four main problem areas: sedimentation in backwater lakes and side channels, sediment in the navigation channel, a decline in suspended sediment loads in the unimpounded open river reaches, and sediment quality. The areas most significantly affected by sedimentation are the backwater lakes, many of which have, on the average, lost approximately 70 percent of their capacity to sedimentation to date. Their physical characteristics and ecological and habitat values are continuously changing. If appropriate rehabilitation projects are not implemented these important habitats and recreational areas could be lost forever. It is important that these backwater lakes are managed to provide essential habitat diversity and connectivity to the main channel.

Sedimentation in the navigation channel is not as environmentally degrading as that of the backwater lakes. The higher flow velocities in the navigation channel tend to keep the sediment moving in the channel except at shallow areas or crossings. Some deposition can occur at or downstream of the mouth of tributary streams that carry coarse sediment into the navigation channel.

A second major difference between the sedimentation problem in backwater lakes and the navigation channel is the existence of the Nine-Foot Navigation Channel. The majority of the material dredged for channel maintenance is clean sands. Therefore the sedimentation problem in the navigation channel is being managed by the Corps. Currently, the Corps is also implementing sediment management technique through the Dike and Revetment Program with input from the Avoid and Minimize team. Through these efforts, dredging has been reduced significantly in the last 30 years. The Corps continually evaluates alternatives for sediment management and is attempting to balance the impact of these alternatives to the dredging operations and do what least impacts the environment on a site by site basis.

Every dredge and disposal location in the St. Louis District is fully coordinated with the state and federal environmental agencies. These agencies comment and approve all of the dredging that takes place on a case by case basis prior to dredging being performed. In addition, the other agencies put together dredging guidelines that outlines both site specific

and general rules to help enhance habitat using dredge disposal. These guidelines have been used to enhance habitat by the construction of islands, moist soil units, disposal into chevrons, and much more. Limited dredging authorities, facility capability and funds often restrict ideal dredge disposal techniques for environmental purposes.

#### ■ Sedimentation in Backwater Areas

Studies have documented that sedimentation in backwater lakes has accelerated in the last 50 years. Many backwater lakes have lost over half of their storage capacity and some of them have completely filled in with sediment. It is therefore essential that appropriate management strategies are developed to manage the sediment in some of the backwater lakes if these lakes are to be retained and used for fishing, recreation, and fish and wildlife habitat. Future soil erosion control measures in the upland watershed will not remove all the sediment that has already accumulated in the lake over the years. If appropriate sediment management is not developed and implemented, all the bottomland backwater areas will eventually fill-in with sediment and transform to mudflats and herbaceous marshes even under the most optimistic soil erosion rates.

To save some of these deepwater habitats from elimination, the following actions are being implemented:

- Identify the most important and valuable lakes.
- Conduct sedimentation surveys of these lakes.
- Develop techniques to control sediment inflow from the river.
- Develop techniques to control sediment inflow from local tributaries.
- Develop appropriate sediment removal techniques.
- Develop appropriate sediment disposal techniques including the creation of islands.
- Develop shoreline management technology, especially wetland restoration, as a component of an overall lake management plan.
- Work closely with NRCS to solve problems on targeted areas.

#### ■ Sedimentation in the Main Channel

As mentioned earlier there is also a sedimentation problem at crossings in the navigation channel. The problem is not as severe as those found in the backwater lakes. The Corps is required to maintain the navigation channel at nine-foot depth or deeper at all times and accomplish this by routinely dredging problem areas. Dredge disposal is closely coordinated with state and federal environmental agencies to get the most environmentally sound, least cost disposal alternative. Currently, exact aquatic impacts are still unknown, but through the Avoid and Minimize (A&M) program and efforts of the district, environmental monitoring is taking place in areas prioritized by the A&M team. In addition, sediment management techniques like the use of chevron dikes and off bankline revetment have been proven to both benefit navigation and increase habitat. The Corps is evaluating alternative techniques to reduce the amount and frequency of dredging.

#### ■ Sediment Quality

Whenever there is potential for dredging sediment, there is the necessity and legal requirement to evaluate the quality of the sediment. Fine grained sediment can potentially be contaminated by various pollutants. The contamination amount can vary from place to place. The Inland Testing Manual provides guidelines for dealing with contaminants associated with fine grained sediment.

Since the passing of the Clean Water Acts and the implementation of the Conservation Reserve Programs in the Farm Bill, the presence of contaminants associated with fine grained sediments has been greatly reduced.

The first step to evaluate dredged material is to perform grain size analysis. When grain size analysis indicates the presence of fine grain material the Inland Testing Manual should be followed. The final step is to obtain State 401 Water Quality Certification for the desired disposal. When an area has a high frequency of dredging, alternatives to dredging and beneficial uses of dredged material should be evaluated.

If the samples taken are greater than 20 percent fine grained material, it must be analyzed for contaminants. The only areas requiring frequent dredging that have been found to contain particle size greater than 20 percent fines are around the Chain of Rocks Canal and Melvin Price Locks and Dam. In both cases, these areas are within the guidelines for contaminant levels. The district is currently investigating ways to reduce the amount of sedimentation that forms in these areas. The St. Louis District channel maintenance program does not have a contaminated sediment problem. The nature of channel maintenance dredging is to remove sediment that is transient and that is deposited during high flow events. Most of the dredging that takes place is in areas that are dredged on a periodic basis. Therefore it is very rare that pre-project material is being disturbed. The contamination and material classification is well documented. In order for the district to comply with water quality certification, a yearly report is produced showing sample results for all of the dredged and disposal locations performed in the previous year. Pooled reaches in side channels may also have fined grained material. If this material is removed, contamination levels will need to be evaluated.

### ***Water Quality Concerns***

#### **■ Non-Point Source Pollution**

The major sources of pollution to the Mississippi River within the St. Louis District can be categorized as non-point sources.

Run off from agricultural fields and feed lots are of great concern and are possibly the most difficult to control. Agricultural field run off introduces a tremendous amount of sediment into the river system. Along the river banks and particularly on the islands, accretion depths of three feet or more are not uncommon. While not overly destructive, this accretion is an indicator of the amount of sediment carried by the river. This sediment eventually settles to the bottom and significantly adds to the dredging requirement for maintenance of the navigation channel. This sediment also increases the turbidity of the river and limits the production of aquatic vegetation and reduces habitat values. The run off from the feed lots adds additional nitrates and other nutrients to the system. This effects dissolved oxygen and other water quality parameters which in turn effect the aquatic habitat and other uses of the water.

Agricultural field run off also introduces agricultural chemicals into the system. Some of these chemicals settle out and are incorporated into the bottom substrate. Other chemicals join the water column and course down the Mississippi to the Gulf of Mexico. These are the primary cause of the hypoxia phenomenon, the so called "Dead Zone", in the Gulf of Mexico. This Dead Zone is increasing in size and is the object of intense study.

The agricultural run off is a difficult problem to solve. The source of the problem is off project lands, which traditionally have been excluded from consideration by the Corps. However, the scope of the problem is compelling and has to be accounted for. It requires close coordination and cooperation with MDC, IDNR, MDNR, IEPA, NRCS, USFWS, private

and corporate land owners, and the Corps of Engineers in order to effectively address the problem system wide. A joint Memorandum of Agreement, which outlines a plan of action, could be negotiated and signed by all agencies. However, given the inter-jurisdictional nature of the issue, any plan of action will require a multi-state public/private buy-in to be successfully effected.

Erosion of the streambanks and islands is a natural process within the river system. Due to human development within the floodplain over the last 200 years, the erosion process has accelerated, increasing the sediment load of the river and the turbidity of the water. Over the last 50 years, the NRCS, the Corps and other agency partners have been working to reduce these processes to tolerable levels. Some success in sediment reduction has become apparent, particularly in the past 25 years but more effort is needed to further control this problem.

In rural settings, septic system run off used to be a significant problem. With improved systems, more stringent local and state regulations, and improved enforcement, this problem is being corrected and significant improvement has been achieved. By continuing to enforce current legislation and government actions and with continued improvement in technology, this problem should be significantly reduced within the near future.

#### ■ Point Source Pollution

Point source pollution discharges are not as great a problem as they were thirty years ago. The development of the National Pollution Discharge Elimination System (NPDES) was a major advancement. The Clean Water Acts created the NPDES permit system which regulated industrial and municipal discharges. This did not totally eliminate point source problems but did greatly reduce the impacts to the quality of the water and sediment within the river system.

#### ■ Environmental Spills

Many potential sources of spills exist throughout the river system, including highway and railroad crossings, pipelines, municipal and industrial plants, barge traffic, and terminals. Potential spill sources are discussed in detail in the Upper Mississippi River Spill Response Plan and Resource Manual (UMRBA 1991). In addition, it describes resources available for responding to a spill. Hazardous material with the highest bulk movement and thus highest probability for a spill are chemicals, chemical products, fertilizer, petroleum products and coke petroleum pitches (USACE 1988a).

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## 9.15. KASKASKIA RIVER NAVIGATION PROJECT CHANNEL REMNANTS

The Kaskaskia Navigation project authorized, in addition to the lock and dam, the construction and maintenance of a 36 mile long navigation canal. The canal shortened the distance from Fayetteville to the river mouth by 14.3 miles (from Kaskaskia RM 50.5 to Kaskaskia RM 36.2). As the canal was built, 26 of the original river meanders were cut off leaving remnant channel segments. Since the old river channel has been cut off, the mouth of the river is now part of a straight navigation canal. As with most systems, the meandering characteristics would eventually reappear without bank stabilization practices.

Most of the original meanders were closed off on the upstream end to minimize sediment introduction. The lower ends of these remnant channel segments are experiencing significant sedimentation effectively isolating these areas. These are valuable fishery habitats supplying the majority of quality over wintering and spawning areas within the

navigation project. In order to rectify the environmental degradation, these silt plugs will be removed in order to restore connectivity of the remnant channel with the navigation channel. This will be accomplished as part of the Corps' operation and maintenance responsibility. During this process, the Corps will investigate the use of structural methods which may offer practical assistance in reducing the rate of sedimentation at the mouths of selected remnant channel segments. The challenge is to acquire and maintain adequate resources in order to carry out this important habitat restoration/maintenance work.

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## 9.16. REGIONAL HABITAT LOSSES

### Historical Overview

Before Euro-American settlement, many portions of the floodplain along the Upper Mississippi River (UMR) were comprised of vast marsh, prairie and forested wetlands (Finiels 1797). The presettlement bottomland forests were diverse in age structure and high in species richness because the Mississippi River and its tributaries meandered freely within the floodplain environment.

Bottomland hardwood forests, bottomland wet prairies and other wetland habitats along the Upper Mississippi River have been drastically reduced in acreage during the nineteenth and twentieth centuries. Conversion to agricultural land, timber harvesting, and river modifications for flood prevention and navigation and urban development are the primary factors that have caused habitat changes. Navigation structures and flood prevention levees have altered the fluvial geomorphic dynamics of the river and floodplain system.

### The Open River

In 1927, Congress authorized the development of a navigation channel nine-feet deep and 300-feet wide between the mouth of the Missouri River near St. Louis, Missouri, to the Ohio River, near Cairo, Illinois. The Nine-Foot Channel Project resulted in much more extensive flow-constriction and bank stabilization structures. This portion of the UMR is approximately 195-miles long and is referred to as the "open river" or "middle river" because locks and dams are not used along this stretch of river to maintain the navigation channel.

During the 1990s, the USGS - EMTC (Yin, Nelson, Lubinski) studied bottomland forest changes along the UMRS. According to the General Land Office (GLO) records analyzed for the southernmost portion of the UMR near Cape Girardeau, Missouri, the 1809 presettlement floodplain landscape was dominated by forests (71.4 percent) with open water and prairie-marsh habitats occurring in the remaining areas. In 1809, GLO surveyors recorded 19 tree taxa along the Mississippi River as witness trees. Cottonwood (*Populus deltoides* Marshall) and sycamore (*Platanus occidentalis* L.) were the two most dominant species of these taxa. Farther away from the river in that portion of the floodplain which today is shielded by the mainline levee, GLO surveyors recorded a total of 31 tree taxa. Of these taxa, elm (*Ulmus* L.), sweetgum (*Liquidambar styraciflua* L.), and ash (*Fraxinus pennsylvanica* Marshall, *F. spp.*) were the most dominant species. Close associates included hickories (*Carya* spp), white oak (*Quercus alba* L.), American beech (*Fagus grandifolia* Ehrh), and yellow poplar (*Liriodendron tulipifera* L.).

From 1809 to 1989, the forested landscape decreased to 18.9 percent in the Cape Girardeau area floodplain. Agricultural lands increased from non-existent in 1809, to 62 percent of the landscape in 1989.

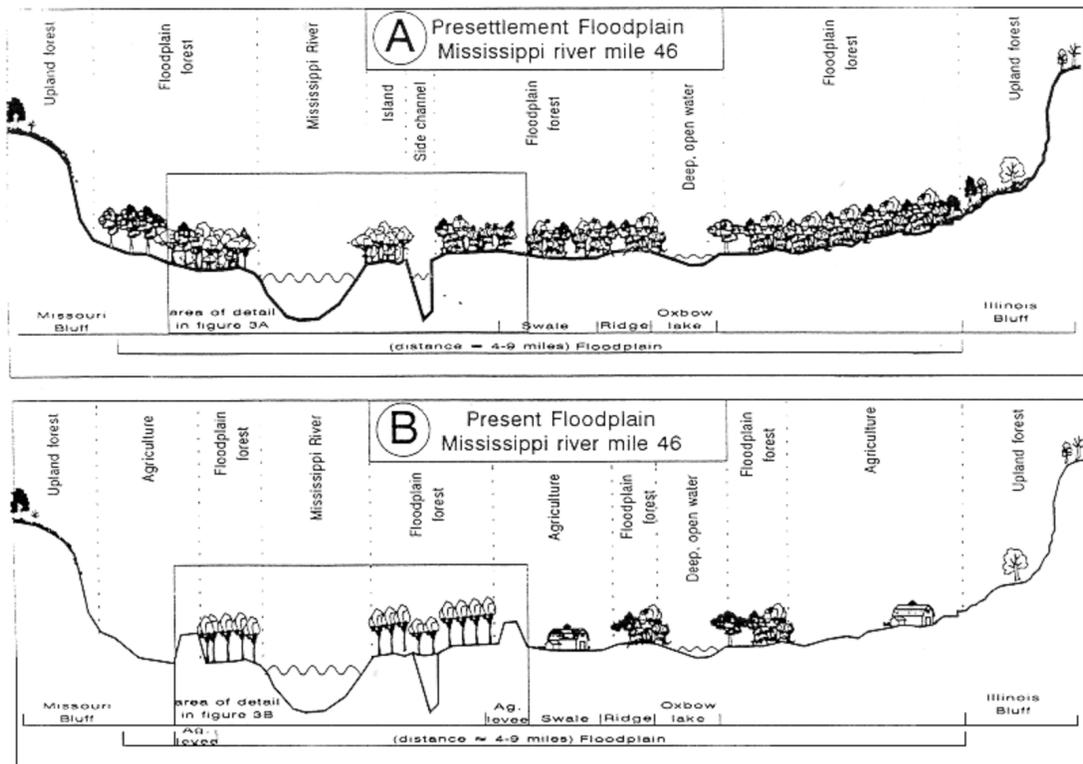
Today federal levees and navigation structures have changed the character of the Mississippi River and its hydrologic regime at the open

river reach. Because floodwaters are restricted to a much narrower area between levees, intensity and duration of flooding are aggregated, but upstream reservoirs have counteracted this effect. Elevated floodwaters are now more likely to overtop tree root crowns and remain so for an extended period of time. As a result, tree growth may be adversely affected and some less flood-tolerant tree species may disappear (Johnson, et al. 1974). Within levee districts, moisture and nutrients are no longer replenished by periodic overbank flows and less moisture may be available from the underground water table when the river flow is low.

A 1993 survey at the open river reach near Cape Girardeau, Missouri, indicates that changes in forest composition and structure since presettlement are related to agricultural practices, logging, urban development and changes in hydrology resulting from navigation structures and the Federal levees. The number of species encountered has decreased on both sides of the levees. Adjacent to the Mississippi River and between levees, species such as oak (*Quercus* spp.), American beech, walnut (*Juglans* spp.), pecan, and hickory have disappeared and the abundance of cottonwood and sycamore, two pioneer species that require newly formed and somewhat sandy substrates for regeneration, have also decreased significantly.

Willow and silver maple have replaced cottonwoods and sycamores as the dominant species. Sediments which rapidly accumulate in the fields between wing dams have narrowed the river channel. These newly formed sites usually are quickly invaded by willow, which is soon replaced by silver maple. Outside the mainline levee and within the levee districts, tree species typical of pioneer and transitional forests such as cottonwood, sycamore, elm and hackberry have decreased since presettlement. Pin oak has become the most dominate species because

Figure 9 – 2 Cross section of the Open River Floodplain at RM 46. In the presettlement era (Part A), the floodplain was covered with bottomland hardwood forests. Presently (Part B), levees and dikes restrict river meandering and most of the bottomland hardwood forests have been cleared for agriculture



the floodplain has been drained for agriculture and flooding has been significantly reduced; pin oak prefers the resulting drier site conditions.

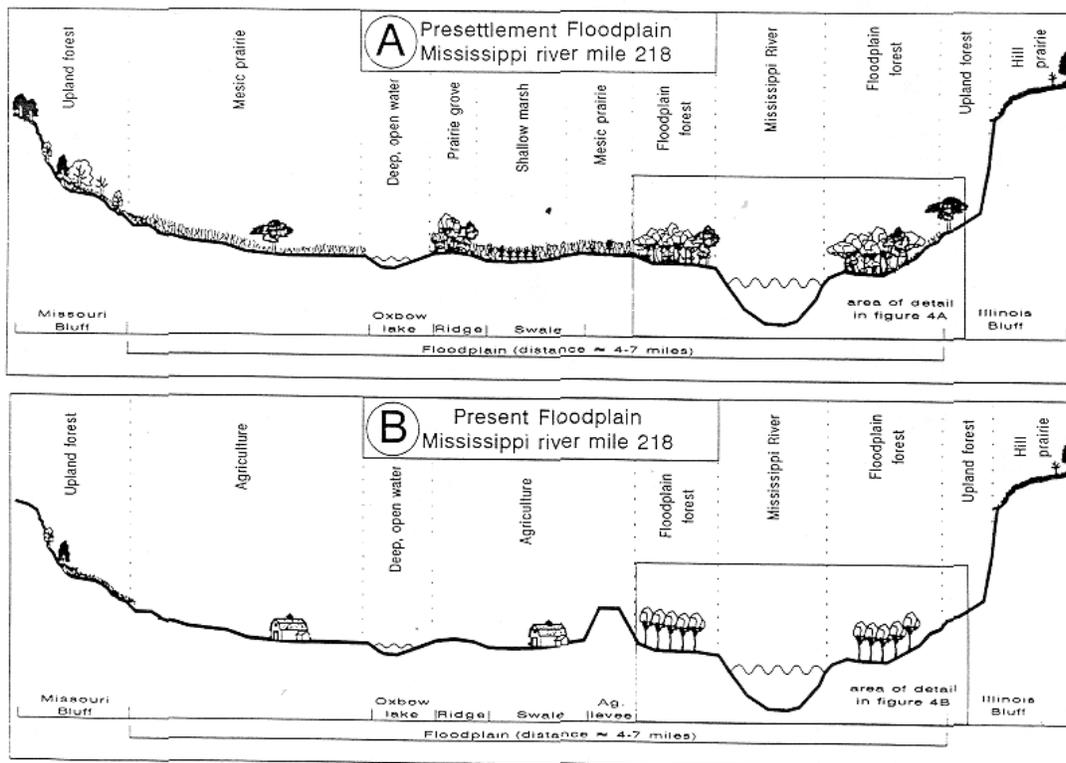
### The Pooled River

In 1930, Congress authorized the extension of the nine-foot channel between St. Louis, Missouri, and St. Paul, Minnesota. During the 1930s, a series of 27 locks and dams were constructed for this purpose. Each dam impounds water during the low river flows to maintain a minimum nine-foot deep navigation channel. This portion of the UMR is approximately 652 miles long and is referred to as the “impounded” or “pooled river.”

In the impounded river near St. Louis, Missouri, prairies dominated the presettlement floodplain landscape. Forests were restricted to areas along the riverbanks, tributary systems, and isolated groves surrounded by floodplain prairies.

In the early 1990s, the Illinois Natural History Survey (Nelson, Redmond and Sparks) conducted a study on historical changes in floodplain vegetation in the Calhoun Point area of Navigation Pool 26 on the Mississippi. Government Land Office (GLO) survey records were used to reconstruct the presettlement floodplain landscape at the confluence of the Illinois and Mississippi Rivers at Calhoun Point. Presettlement prairie and forest land covers were determined by digitizing GLO plat maps using a computerized geographic information system (GIS). A case history of land cover change was determined by comparing this presettlement map to GIS land cover maps for 1903, 1935, and 1975. Data from witness trees and current forest samples were used to compare presettlement and present day forest composition and structure. Results indicate that approximately 56 percent of the presettlement floodplain was forested, while 41 percent was prairie and

Figure 9 – 3 Cross section of the Pooled River Floodplain at RM 218. In the presettlement era (Part A), the floodplain was dominated by prairie wetlands. Presently (Part B), agriculture has replaced the prairies but many of the floodplain forests still remain, although less diverse in structure and number of species.



open wetlands. The presettlement forests were generally open (86.8 stems/ha) and consisted of several dominant tree species.

General Land Office (GLO) surveyors at the confluence of the Illinois and Mississippi Rivers in 1817 recorded 18 taxa of witness trees. These forests were dominated by hackberry, pecan (*Carya illinoensis* [Wangenl] K. Koch), elm, willow (*Salix* spp.) and close associates including silver maple (*Acer saccharinum* L.), pin oak (*Quercus palustris* Muenchh), and ash.

In contrast, the present forest is more dense (489 stems/he) and is dominated by silver maples (*Acer saccharinum* L.). Early settlement had little effect on the spatial distribution of forest cover, but river impoundment in 1939 reduced forests to approximately 35 percent of the floodplain. Prairies were converted to agriculture during the middle 1800s and now occupy only 6 percent of the floodplain.

The rivers flood regime has been altered due to human needs and development over the years. Forests species now bordering the river in impounded reaches must be well adapted to higher soil moisture content throughout the growing season. Silver maples and willows are well adapted to the modified conditions and have therefore become the most abundant species on the floodplain. It is quite possible that our future forests may be entirely dominated by silver maples because this species is best adapted to modified conditions, especially high soil moisture content and increased flood disturbances.

Agricultural and urban development and poor timber harvesting practices are the primary causes for rapidly diminishing forests throughout most of the UMR floodplain. A recent study revealed that by 1989, forests occupied only ~14 percent of the total area from bluff to bluff in the UMR floodplain (Lastrup and Lowenberg 1994) The percentage of forested areas is highest in Navigation Pools 2 to 13 (18.2 percent), intermediate in Pools 14 to 27 (13.6 percent) and lowest in the open river reach (12.4 percent).

Agriculture had nearly eliminated the prairies by 1891, while forests were less affected.

Field notes of GLO office surveyors from 1817 and plat maps based on the same GLO surveys indicate that the Pool 26 floodplain was

Figure 9-4

The Percent Distribution of Several Types of Land Cover Types in 1817, 1903, 1935 and 1975 on Navigational Pool 26



approximately 63 percent prairie wetlands with forests bordering the riverbank and tributary streams.

In summary, a significant loss of open native prairies, wetlands and bottomland forest cover, and less diversity within the remaining forests and in newer successional forests, are critical habitat problems on the UMRS.

### **Tree Mortality in the Upper Mississippi River Floodplain Following the Flood of 1993**

Periodic seasonal flooding is a critical factor influencing forest composition, productivity, and distribution within large river-floodplain ecosystems. Forest communities of large river floodplains are established corresponding to the degree of species adaptation to flood regimes. The distribution patterns of individual plant species or plant communities on the floodplain are considered a reflection of flood gradient. The most flood-tolerant species and communities are found in areas least subject to periodic inundations. Forest succession along this flood gradient is strongly influenced by the long-term flow regime or average flood pattern, as well as unusual hydrologic events such as extreme droughts and floods that are not seasonal or predictable (Wistendahl 1958; Lindsey et al. 1961; Johnson et al. 1976; Johnson 1974).

Few experts predicted that the 1993 flood in the Upper Mississippi River System would have long-lasting effects on floodplain forests until the real magnitude of those effects became evident after many trees failed to leaf out in the spring of 1994. During 1994, seven reaches of the UMRS floodplain were investigated to assess post-flood tree mortality. The seven river reaches were Navigation Pools 4, 8, 13, 17, 22 and 26, and an open river reach near Cape Girardeau, Missouri.

An unusual wet weather pattern persisted over the Upper Midwestern United States in 1993, causing record flooding throughout much of the basin (Parrett et al. 1993; Wahl et al. 1993). The flood was unusual in terms of its timing and duration. Above normal river stages persisted throughout most of the 1993 growing season in the UMRS. At St. Louis, Missouri, river water reached floodstage on June 26 and remained above floodstage until mid August. Study results reveal the highest mortality rates and impacts occurred in the Rivers Project Service area.

From the UMRS headwaters (Pool 4) downriver (Pool 26), mortality rates increased progressively, from 1.1 percent to 37.2 percent for trees and from 1.8 percent to 80.1 percent for saplings. Further downriver, in the open river reach, mortality rates were similar to those in Pool 26 with 32.2 percent of mature trees dead and 77.2 percent of saplings dead. Overall mortality rates varied among species and were negatively correlated with tree diameter and positively correlated with flood duration and flood amplitude. The impacts of the 1993 flood, as evidenced in subsequent years, demonstrate that extreme flooding in a single growing season is enough to constitute a severe disturbance to the river-floodplain ecosystem lasting many years.

#### ***Tree Mortality and Species***

On Pool 22, just upstream of the St. Louis District boundary, a total of 529 trees of 16 species was sampled. The forest was dominated by silver maple. Dead trees belonged to 10 species; boxelder, silver maple, sugarberry (*Celtis laevegata* L.), hackberry, green ash, white mulberry, Eastern cottonwood, pin oak, American elm, and slippery elm. Based on percent mortality rates, hackberry, white mulberry, and sugarberry were less tolerant of flooding; silver maple and slippery elm were moderately tolerant; and black willow, sycamore (*Platanus occidentalis* L.), eastern

cottonwood, and American elm were more tolerant. In Pool 26, a total of 712 trees of 22 species was sampled. Silver maple was the dominant species, with American elm and hackberry as co-dominant species. Dead trees belonged to 10 species, including box elder, silver maple, hackberry, hawthorn (*Crataegus spp. L.*), persimmon (*Diospyros virginiana L.*), green ash, white mulberry, eastern cottonwood, pin oak, and American elm. Based on percent mortality rates, hackberry was less tolerant to flooding; box elder and eastern cottonwood were moderately tolerant; and pecan, silver maple, hawthorn, green ash, and American elm were more tolerant.

In the open river, the magnitude of flood impact was similar to that in Pool 26. Here, a total of 590 trees of 14 species was sampled. Silver maple, black willow and box elder were the three dominant species of the forest. Dead trees belonged to 10 species; box elder, silver maple, hackberry, green ash, white mulberry, sycamore, eastern cottonwood, sandbar willow (*Salix exigua Nutt.*), black willow and slippery elm. Based on percent mortality rate, hackberry and white mulberry were less tolerant to flooding; boxelder, silver maple, sycamore, and sandbar willow were moderately tolerant; and black willow and slippery elm were more tolerant.

### ***Sapling Mortality and Species***

In Pool 22, just upstream of the St. Louis District boundary, a total of 436 saplings of 12 species was sampled. Dead saplings belonged to 11 species: boxelder, silver maple, sugarberry, dogwood (*Cornu spp. L.*), hawthorn, swamp privet (*Forestiera acuminata Michx.*), green ash, white mulberry, American elm, and slippery elm. In Pool 26, a total of 694 saplings of 22 species was sampled. Dead saplings belonged to 11 species; boxelder, silver maple, hackberry, dogwood, hawthorn, persimmon, swamp privet, green ash, pin oak, sandbar willow, and American basswood (*Tilia americana L.*). In the open river, a total of 545 saplings was sampled. Dead saplings belonged to 12 species, which were boxelder, silver maple, hackberry, sugarberry, dogwood, swamp privet, green ash, white mulberry, sycamore, sandbar willow, black willow and slippery elm.

### **Future Approaches**

It is a great challenge to river biologists and managers to sustain multiple uses and at the same time protect the ecological integrity of the UMR. Preserving and restoring forests and other habitats on the UMR floodplain will require a continuous effort. As a part of this effort, it is important to study presettlement floodplain ecosystems as well as the qualitative changes of the existing habitats such as natural regeneration, diversity and productivity. Future research efforts need to quantify the relationships between hydrologic regimes (including flood timing, frequency, intensity and duration) natural regeneration, and growth, composition and species survival rates in floodplain habitats. Experimentation and on-site documentation of the reaction of trees to water table and water table fluctuations remain an open field for investigation (Bedinger 1978). Habitat simulation models may be developed to synthesize field data and to predict the effects of different river regulation schemes. (Bedinger 1978). Restoring habitat diversity through ecologically sound methods of regulating river flow, coupled with artificial regeneration of some species, should be set as the short-term goal.

A long-term management strategy should take a watershed approach that integrates forest management with the management of water, navigation, and land use. (Sparks et al. 1990, Sparks 1995, Gore and Shields 1995). The Rivers Project Office will use available data and the Forest Cover Act authorities to pursue forest recovery efforts.

## 9.17. FOREST MANAGEMENT

The Forest Cover Act of 1960 (Public Law 86-717) provides the Corps a statutory mandate for multiple use forest management and other vegetative cover management such as wetlands and grasslands on project lands and waters. Forest habitat management will be applied to develop, maintain, protect, and/or improve vegetation conditions for timber, fish, wildlife, soils, recreation, water quality and other beneficial uses. Section 9.16, Regional Habitat Losses documents some of the primary floodplain/riparian forest concerns in the Rivers Project area.

As an agency entrusted with stewardship of public lands, a key management objective is to promote and maintain a healthy, diverse forest resource which will produce and support a variety of sustainable benefits such as wildlife and fish habitat, public outdoor recreation opportunities, scenic values, pest control and watershed protection.

Wherever the opportunity exists to sustain diverse and appropriate conditions in support of these benefits, proper management techniques will be applied.

Section 2 of the Forest Cover Act provides authority for the Corps to manage project lands and waters for any or all conservation purposes, including fish and wildlife conservation. The Corps will conduct fish and wildlife management activities which seek to maintain populations of targeted wildlife species through the manipulation and management of habitat. The Corps will coordinate and conduct its program in conjunction with other federal, state and local agencies having fish and wildlife management responsibilities using a variety of techniques.

Key objectives identified to respond to forest management needs consistent with Forest Cover Act provisions on Rivers Project lands are:

- Improve and maintain the aesthetic qualities of the resource for recreation.
- Promote age and species diversity of the forest on a long-term basis through various silvicultural practices to recover healthy riparian plant and animal communities.
- Improve the quality of the forest resource as wildlife habitat in accordance with USFWS, State and Corps wildlife management objectives.
- Protect and, where appropriate, rehabilitate wetlands and preserve environmentally sensitive areas, particularly unique or regionally important terrestrial and aquatic habitats.
- Prescribe forest management activities which advance regional ecological priorities.
- Enhance effective working collaborations with other federal, state and local agencies and with all other interested parties.
- Encourage a cooperative exchange of management philosophies, techniques and information with other natural resource management professionals and academia.
- Implement an inventory and monitoring program which will provide data on the long and short term effect of forest management practices on the environment.
- Work within the Corps to effect close collaboration with the Rock Island District and St. Paul District to insure a complimentary program that is responsive to forest management needs identified for the UMRS floodplain.

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## 9.18. LACK OF LEVEL ONE AND LEVEL TWO INVENTORIES

The Corps stewardship responsibility is to manage, conserve, and protect this natural resource for sustained use by future generations. Natural Resource inventories are required on project lands and waters to provide quantitative and qualitative data for use in determining resource management needs. There are two types of inventories: Level One and Level Two.

The Level One inventories are general in nature and are conducted to provide baseline information. Inventories are conducted in sufficient detail to determine general plant and animal composition, acreage of dominant vegetative types, soil types, land use capabilities, and the presence of special status species and their critical habitat occurring on project lands and waters. A Level One inventory shall be accomplished using available information from a variety of sources, such as USGS maps (LTRM), county soil surveys, USFWS information, aerial photography, Corps real estate maps, project planning and design memorandums, and state DNR resource information.

The Level Two inventories are prepared in support of the resource objectives and/or land use classifications and are generally more detailed or specific. These inventories are required for the effective development, execution and evaluation of specific natural resources management prescriptions.

Previous efforts to adequately fund inventories have fallen short. Consequently, the Rivers Project Office has not conducted Level One and Two inventories for forest habitat, prairie habitat, wetland habitat, aquatic habitat and endangered species. Completion of these inventories has been elevated as a funding priority of the Rivers Project Office as they are critically needed to protect and sustain habitats, fish, wildlife and endangered species and other stewardship opportunities.

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## 9.19. HISTORIC RESOURCES PROTECTION NEEDS

In Missouri and Illinois, the greatest concentrations of archaeological sites are found in the river corridors, which are the most fertile and accessible areas. The Illinois and Mississippi River valleys are major areas to find prehistoric remains.

The river floodplain constitutes an area of great archaeological potential based on a large number of physiographic and ecological features. These non-renewable and non-replaceable sites occur from the bluffline to the shoreline and are distributed throughout the floodplain. On frequently flooded portions of the floodplain, cultural materials are often found out of context due to the frequent disturbance caused by flooding and erosion. As a result, the value of the information gained from these sites is often diminished. Regardless, development and management plans have to be sensitive to the fragility of these cultural resources and should incorporate measures to protect and conserve them.

The river valley is rich in historic sites, buildings of architectural interest, old river towns, and seasonal cultural events as well. Most river towns, which once served as steamboat landings, still retain historic aspects of their association with the rivers.

The operation and maintenance of a navigation project creates a number of indirect problems in preserving cultural resources. These problems pertain to secondary development induced by the presence of the waterway, and to channel maintenance activities. Any substantial land-use change may affect unknown cultural resources.

Dredging operations have the potential to bury unknown archaeological sites. The construction of dikes and placement of riprap along the shoreline can adversely affect cultural resources. If sites are located, appropriate testing, evaluation, and compliance procedures will be followed before construction will occur. Erosion also represents a problem in managing archaeological and historical resources.

A historic properties management plan is required and is being prepared to enhance identification, evaluation, and management of these resources. In part, the plan is designed to address and provide for solutions to this resource management challenge.

Pursuant to various federal legislation, particularly the National Historic Preservation Act of 1966 as amended, the St. Louis District Rivers Project office will implement a program to identify, evaluate, and manage archaeological sites on operational lands within the project area. Data synthesis will be completed which summarizes all known archaeological information, including descriptions of each site, and identifies existing gaps in our knowledge about the River's archaeology. Components of future investigations shall include: (1) Landform sediment analysis to predict locations of burial archaeological sites (2) Bank erosion analysis to identify locations subject to destruction (3) Comprehensive archaeological surveys of the ground surface and (4) Shipwreck inventories and surveys.

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## 9.20. ENDANGERED SPECIES PROTECTION AND RECOVERY

Policy for the administration and management of project natural resource activities is contained in ER 1130-2-540. Guidance for the administration and management of environmental stewardship and natural resource management activities is contained in EP 1130-2-540.

### General

The Endangered Species Act (ESA) mandates the project to utilize its authority to carry out programs for the survival, conservation and recovery of federally listed endangered (E) and threatened (T) species, including participation in the implementation of endangered species recovery plan efforts. The following federally listed endangered and threatened species are known to occur on project lands and waters and have existing recovery plans:

Project lands and waters will be managed in a manner, which will assist in the overall survival, conservation and recovery of Special Status species known to occur on project lands. Special Status species include endangered and threatened listed and proposed for listing species by the USFWS under the provisions of the Endangered Species Act, candidate and sensitive species designated by the USFWS, species designated under the Migratory Bird Treaty Act, and potential endangered or extinct species protected by state statute. Detailed, level 2, inventories will include information conducted at frequencies necessary to determine presence, abundance and significant changes of existing population levels, the presence of new populations, type of occurrence and critical habitat of Special Status species. Inventory measures and procedures will be utilized which will enable the protection of these Special Status species and their habitat, and participation in their recovery. Recovery plans will be reviewed and assessments made of potential project natural resource management actions identified in each recovery plan, including a determination of reasonableness for each action and incorporation into operational management plans. Level 2 inventories and recovery plans reviews will be conducted in association with the preparation of operational management plans that are scheduled to be completed by 2005.

The project is assisting in the recovery of the Bald eagle, Peregrine falcon, Interior least tern, Pallid sturgeon, Fat pocketbook and Higgins' eye pearly mussels, and Decurrent false aster.

**ESA Section 7 Consultation Covering Operation and Maintenance of the Nine-Foot Navigation Channel**

The Mississippi Valley Division and Region 3 of the USFWS entered into formal Section 7 Consultation under the Endangered Species Act in April 1998. This consultation was concluded in August 2000. The consultation was based on the operation and maintenance of the Nine-Foot Navigation Channel effect on the river.

The consultation resulted in the following Biological Opinion for the St. Louis District:

- Adverse affect resulting in Incidental Take with no significant Reasonable and Prudent Measures (RPM) statement for Decurrent false aster, Bald eagle, and Indiana bat (predicated on increasing ongoing management efforts.)
- Adverse affect resulting in Incidental Take with a RPM statement for the Least tern.
- Jeopardy decision with a Reasonable and Prudent Actions (RPA) statement and Incidental Take with a RPM statement for the Pallid sturgeon.

Implementation of the Biological Opinion covers a fifty-year time frame; however, the decisions for the Least tern and Pallid sturgeon include much shorter and definite time frames for specified actions.

*Table 9-5  
Federally Listed Endangered and Threatened Species on Project Lands and Waters*

Gray bat	<i>(Myotis grisescens)</i> - E
Indiana bat	<i>(Myotis sodalis)</i> - E
Bald eagle	<i>(Haliaeetus leucocephalus)</i> - T
Interior least tern	<i>(Sterna antillarum)</i> - E
Peregrine falcon	<i>(Falco peregrinus anatum)</i> - E
Pallid sturgeon	<i>(Scaphirynchus albus)</i> - E
Fat pocketbook pearly mussel	<i>(Potamilus capax)</i> - E
Higgins' eye pearly mussel	<i>(Lampsilis higginsi)</i> - E
Decurrent false aster	<i>(Boltonia decurrens)</i> - T
Sicklefin Chub	<i>(Macrhybopsis meeki)</i> - Candidate
Sturgeon Chub	<i>(Macrhybopsis gelida)</i> - Candidate

**9.21. OPEN RIVER ISSUES**

**Introduction**

The Mississippi River Nine-Foot Navigation Channel Project is a project with a single purpose: navigation. This single purpose authorization provides no clearly defined mandate to manage the Mississippi River as a system and to address all of the resources and uses of the river. This limited authority is further restrictive on the Open River because the Corps does not own or operate fee title lands and waters for the Nine-Foot Navigation project as it does on the pooled portion of the river. As the Corps pursues its channel maintenance activities on the open river, opportunities to benefit wildlife or the vegetative community are often noted and, in some cases, habitat improvements are realized through innovative engineering techniques used to improve and maintain the navigation channel. However, with limited authority, many opportunities are generally not pursued except as required by the NEPA, FWCA and the ESA.

**Habitat degradation concerns**

The overall biological health of the open river is a concern. The main channel, main channel border, side channel and terrestrial riparian corridor habitat types are is varying degrees of distress. Rehabilitation and protection efforts are needed in many locations. At least three

endangered species, one threatened species and two candidate species are known to be present in the open river area.

The degradation and loss of side channels habitat is of particular concern within the open Mississippi River. These habitats not only supply important nursery and over-wintering areas, they are an extremely important carbon energy generator for the entire river system. Due to the aquatic habitat losses, it is important to conserve and rehabilitate existing side channels in a manner that is compatible with, or complementary to channel improvement and maintenance activities.

Since the late 1960s, an interagency team composed of Corps, USFWS, IDNR and MDC personnel have worked together to develop consensus on dredging activities and placement of river regulating works for navigation purposes. The scope of the team was generally confined to input on basic navigation channel O&M activities. Since the early 1990s, the scope of this team, now known as the River Resources Action Team, has expanded. A system-wide view of navigation and environmental concerns are now addressed with emphasis on non-traditional, innovative and environmentally sustainable methods for managing the river for navigation. This team identifies and, through the use of navigation O&M practices, various cost sharing authorities and partnering strategies, attempts to catalyze into action opportunities to protect, restore and enhance environmental conditions on the river in a manner that is harmonious with navigation purposes.

### **Open River Side Channel Inventory and Restoration Priority Ratings**

Through field investigations and evaluations, the restoration potential of the existing major side channels are grouped by priority: High, Medium, Low, Further Investigation, and Monitor. This is a preliminary ranking system and the side channel/areas within each ranking category are not prioritized.

#### ***High Priority (needs attention now and good value for effort):***

- Salt Lake Chute (RM 139.0 - 136.0 L)
- Fort Chartes Chute (RM 134.3 - 132.2 L)
- Establishment Chute (132.5 - 130.0 R)
- Jones Chute (RM 98.3 - 94.9 R)
- Crawford Chute (RM 73.9 - 71.5 L)
- Buffalo Island Chute (RM 26.3 - 24.5 R)
- Area between RM 98.2 and 73.8 (no side channels, islands or off-channel habitats).
- Marquette Chute - plans and specs ready, awaiting construction (RM 51.0 - 47.0 L)
- Schenimann Chute - Plans and specs ready, awaiting construction (RM 62.5 - 57.0 R)

#### ***Medium Priority (existing conditions not critical and good value for effort)***

- Maple Island (RM 198.5 - 200.8 R)
- Mosenthein/Cabaret/Chouteau side channel (RM 185.1 - 189.0 L)
- Atwood Chute (RM 161.5 - 160.8 L)
- Calico Island Chute (RM 148.2 - 147.1 L)
- Osborne Chute (RM 146.3 - 144.1 L)

- Picayune Chute (RM 60.8 - 54.7 L)
- Liberty Chute (RM 103.0 - 100.0 L)

***Low Priority (area in relatively good shape and little or no action required):***

- Moro Chute (RM 122.6 - 120.0 L)
- Beaver Island/Horse Island and adjacent channels (RM 117.9 R)

***Further investigation (observe different water conditions, ownership, etc):***

- Arsenal/Cahokia Chute (RM 176 L)
- Beard/Carroll J. B. Chute (RM 167.7 - 166.5 L)
- Chute (RM 105.2 - 104.4 R)
- Billings/Powers Island (RM 31.2 - 35.6 R)
- Thompson Chute (RM 15.7 R)
- Sister Chute (RM 14.4 - 11.9 R)
- Boston Bar Chute (RM 10.2 - 7.6 L)
- Angelo Chute (RM 5.2 - 1.3 L)
- Area at RM 24.5 - 21.8 L)
- Brown's Bar (RM 24.5 - 21.8 L)

***Monitor (initial work completed and need to confirm reaction of side channel):***

- Santa Fe Chute (RM 40.4 - 35.0 L)
- Chute/Island (RM 31.0 - 29.0 L)

Realizing implementation of the habitat restoration needs on the open river will most likely require use of numerous authorities, approvals, funding mechanisms and partners over a number of years. It is unlikely that all features within a side channel will be built using just one authority. It is also probable that not every action will be completed within a side channel prior to moving on to other side channels. In essence, the requirements for any given side channel may be funded using different authorities for each feature and may be staged over several years. It is also possible that individual features within a side channel plan would be built solely under the authority of our partner agencies/organizations and be totally funded by them. Therefore, any comprehensive open river habitat restoration effort should be considered a series of projects with numerous implementation processes, partners and inter-jurisdictional responsibilities.

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## **9.22. INTER-JURISDICTIONAL WATERSHED AND ECOSYSTEM PLANNING NEEDS**

### **Overview**

The natural resources and recreational opportunities available within the Rivers Project Service Area is fairly representative of those found throughout the Mississippi-Illinois-Kaskaskia River basin systems. These watershed systems offer unique sets of values, natural beauty and biological productivity which is worthy of conservation, management and interpretation. The diversity and extent of the land and water areas provide a valuable resource for fish and wildlife habitat, recreation, and scenery. The social and economic benefits of the rivers for humans is of extreme importance as well. The federally owned lands and waters

managed by the Corps and other agency partners provide the nearest river oriented recreation areas for people in the St. Louis Metropolitan area and many other regional communities.

The wetlands associated with the rivers are the most extensive in the region and are critical for the survival of hundreds of species of fish, wildlife and waterfowl. These areas must be protected wherever possible from development that would detract from their existing and potential values.

This is the challenge faced by the numerous management and regulatory agencies, the scientific communities and the many concerned private organizations and individuals throughout the region.

Today there still lacks a sound mechanism on the river that ensures the many concerned entities work together and coordinate activities for the general welfare of the public and the natural resource. Plans and actions are fragmented and focused generally on specific segments of the river watersheds, not on the entire basin. For example, this Master Plan can only address the river areas and issues within the jurisdictional boundaries of the St. Louis District from primarily an operations and maintenance viewpoint, on lands for which the Corps has administrative responsibility for management. Past basin-wide efforts have still not solidified primarily due to institutional and economic barriers that inhibit total support and achievement of watershed level objectives and goals.

While attempts at watershed planning have achieved only limited successes to date, this effort should not be abandoned, but should be accelerated. Scientific and economic knowledge and technology today further reinforce the need to manage our rivers on the watershed level utilizing ecosystem management principles and sustainable development practices. It is not controversial to say that there needs to be biologically and economically viable rivers in the next century. The need is well understood. How to do it is still being defined and established. Only through development of some kind of comprehensive regional watershed or basin plan that is acceptable and implementable can we truly sustain the health of our large river watersheds.

### **Watershed Planning Strategy**

Because of the size of the river's watershed and the complexity and number of environmental, social and economic issues that would be addressed in a comprehensive management plan, it is logical to group issues into major categories. For the Upper Mississippi River (UMR) basin, the most appropriate categories may correspond to the physical characteristics of the basin and the nature of the issues. Discussion of the issues, and management strategies may be facilitated more efficiently if the issues were organized as follows:

- River Channel Issues
- Riparian Zone Issues
- Watershed Issues
- Institutional Issues

### ***River Channel Issues***

The main river channel issues are those that are related to the condition and management of the main river channel of the UMR. The major factor in the management of the main river channel are of course the requirements for navigation and its environmental impacts. Therefore the important issues may include the following:

- River regulation for navigation
- Navigation impacts (Commercial and Recreational)
- Sedimentation and dredging
- Water quality
- Accidental spills of hazardous materials

### ***Riparian Zone Issues***

The riparian issues are those that deal primarily with the backwater and floodplain habitats of the UMR valley. Because of the size of the UMR valley and the importance of the aquatic and terrestrial habitats there are a number of issues that are especially relevant. These issues include the following:

- Backwater lakes and side channels
- Vegetative cover
- Flood pulse and floodplain management
- Levees
- Wetlands
- Stream bank and bluff erosion
- Sedimentation
- Water quality
- Sediment quality
- Recreation
- Public Lands
- Wildlife Usage
- Refuges

### ***Watershed Issues***

Issues that are more pertinent with respect to the large watershed outside of the river channel and the valley would be addressed under watershed issues. These issues may include:

- Floodplain Development
- Agriculture
- Urban development
- Watershed erosion types and sources
- Point and Non-point source pollution
- River corridor management
- Inter-jurisdictional responsibilities
- Greenway development

***Institutional Issues***

A comprehensive management plan for the watershed has to include guidelines on how the recommendations will be implemented. Two very important issues would be how the plan proposals would be financed and which agencies or organizations will be responsible for implementation. Because of the number of issues and the size of potential projects, many federal, state, and local agencies and private organizations will have to be involved. Therefore the mechanism for coordination and cooperation of the different agencies will be one of the most important issues that has to be dealt with in a comprehensive management plan. Implementation of most of the recommendations of a comprehensive management plan for a basin the size of the UMR will require significant financial outlay, which is unlikely to be available under existing programs. Therefore, new authorizations and funding mechanisms have to be developed and proposed as well.