# CHAPTER 1--ATTACHMENTS

# CHAPTER 1—ATTACHMENTS


| Attachment | Page |
|---|---|
| A Relationship of Planning Study to Major Environmental Requirements | 64 |
| B Environmental Conditions Summary | 72 |
| C Ecosystem Restoration Measures Description | 88 |
| D Screening of FDR Measures to Advance Environmental Sustainability | 98 |
| E Environmental Philosophy on FDR Situational Areas | 116 |
| F Environmental Prioritization Methodology | 119 |
| G Number UMRS Environmental Objectives and Ecosystem Restoration Projects Identified by Pool Location and HNA River Reach | 150 |
| H State and Federal Ecosystem Restoration Incentive Programs And Potential Federal Actions to Improve Effectiveness of Existing Incentive Programs | 172 |
| I Federal Agency Authorities for UMRS Management | 185 |

# CHAPTER 1—ATTACHMENT A

## RELATIONSHIP OF PLANNING STUDY TO MAJOR ENVIRONMENTALREQUIREMENTS

## ATTACHMENT A, TABLE 1. LEGISLATION AND PLANNING GUIDANCE DOCUMENTS APPLICABLE TO UMRCP STUDY*

| LEGISLATIVE TITLE | POPULAR NAME(S) | U.S. CODE or E.O. | CORPS PLANNING GUIDANCE DOCUMENTS (See Document Code) | SUMMARY |
|---|---|---|---|---|
| Archeological Resources Protection Act of 1979 | ARPA | 16 USC 470 *et seq* | 12, 15, 1, 2 | The Act was enacted to preserve and protect resources and sites on Federal and Indian lands. It fosters cooperation between governmental authorities, professionals, and the public. The Act prohibits the removal, sale, receipt, and interstate transportation of archaeological resources obtained illegally (i.e., without permits) from public or Indian lands and authorizes Federal agency permit procedures for investigations of archeological resources on public lands under the agency's control. Permits are required to excavate and remove those cultural remains covered by the Act. |
| Bald Eagle Protection Act | Bald Eagle Act; Bald Eagle Protection Act | 16 USC 668, 668 note, 668a-668d | 12 | This Act prohibits wantonly possessing, selling, transporting, or trading of a bald or golden eagle or eagle part, alive or dead. Whoever so violates will be subject to criminal or civil penalties. The statute authorizes searches, seizures and arrests for enforcement purposes. The Secretary of the Interior can issue a permit for taking, possession and transporting of bald and golden eagles for scientific, exhibition, and religious purposes, and may permit the taking of golden eagle nests if they interfere with resource development or recovery operations. |
| Clean Air Act | CAA; Air Pollution Prevention and Control Act | 42 USC 7401-7671g | 12 | Corps activities resulting in the discharge of air pollutants must conform to National Ambient Air Quality Standards (NAAQS) and State Implementation Plan (SIP) unless the activity is explicitly exempted by EPA regulations. Section 173 (42 U.S.C. 7503) requires a permit from EPA to construct or operate a new or modified major stationary source. Major stationary sources are required to obtain a Title V Operating Permit in addition to permits to construct. Maximum achievable control technology (MACT) must be attained for sources for which a MACT standard has been promulgated. |
| Clean Water Act | Federal Water Pollution Control Act; FWPCA; CWA | 33 USC 1251 *et seq* | 13 | Corps projects are required to obtain certification from the State of Missouri stating that a proposed water resources project is in compliance with established effluent limitations and water quality standards (Section 401). The Army Corps of Engineers retains primary responsibility for permits to discharge dredged or fill material into waters of the United States (Section 404). Corps proposed construction projects involving such an activity must follow the guidelines of Section 404 (b) (1) of the Clean Water Act. The investigations and analyses required by the Section 404(b) 1) guidelines must be included in the Feasibility report. Dredged materials and sediments beneath navigable waters proposed for dredging must be tested and evaluated for their suitability for disposal in accordance with the guidelines and criteria derived from Section 404. |
| Comprehensive Environmental Response, Compensation, and Liability Act | CERCLA; Superfund; SARA; Solid Waste Disposal Act Amendments | 42 USC 9601-9675 | 10, 9, 23 | CERCLA, as amended by the Super Fund Amendments and Reauthorization Act of 1986, provides for liability, compensation, cleanup, and emergency response for hazardous substances released into the environment and cleanup of inactive substance disposal sites. |

| LEGISLATIVE TITLE | POPULAR NAME(S) | U.S. CODE or E.O. | CORPS PLANNING GUIDANCE DOCUMENTS (See Document Code) | SUMMARY |
|---|---|---|---|---|
| Endangered Species Act of 1973 | ESA; Conservation, Protection and Propagation of Endangered Species | 16 USC 1531 *et seq.* | 12 | This act establishes specific coordination procedures between the U.S. Fish and Wildlife Service (USFWS) ort the National Marine Fisheries Service (NMFS), as appropriate, regarding Federally listed endangered species. |
| Farmland Protection Policy Act, Subtitle 1 of Title XV of the Agriculture and Food Act of 1981 | Farmland Protection Policy Act | 7 USC 4201 *et seq.* | 12 | The Corps of Engineers must contact the Natural Resource Conservation Service (NRCS) for identification of prime or unique farmland that might be impacted by proposed Corps actions. Prior to taking any action that would result in conversion of designated prime or unique farmland to nonagricultural uses, the Corps must examine the potential impacts of the proposed action and if there are adverse affects on farmland must consider alternatives to lessen the adverse effects. |
| Fish and Wildlife Coordination Act | Coordination Act; Fish Conservation and Water Resource Developments Coordination; FWCA | 16 USC 661*et seq.* | 12, 7, 8 | The Corps and other federal agencies involved in water resources must consult the USFWS and the state agency that administers wildlife resources where the proposed action will occur. Corps regulations require that the coordination begin at the reconnaissance phase and continue through feasibility planning, engineering, and design. Recommendations provided by the USFWS and states via Coordination Act Reports must be specifically addressed in Corps feasibility reports. The district must make the reports and recommendations of these entities an integral part of any reports presented to Congress. |
| Food Security Act of 1985 | "Swampbuster;" 1985 Farm Bill; Food Agriculture, Conservation and Trade Act of 1990; Federal Agriculture Improvement and Reform Act of 1996; 1996 Farm Bill; Erodible Land and Wetland Conservation and Reserve Program | 16 USC 3801-3862 | 10 | The Corps coordinates its flood control plans involving agricultural lands with the Natural Resources Conservation Service, and alerts project sponsors and affected farmers of their responsibilities for meeting requirements set forth in the "swamp buster" provisions. The act provides for certain "third party" exemptions that may be available to landowners who receive ancillary drainage benefits from Corps projects. It is the responsibility of the individual landowner, not the Corps, to request such an exemption. |

| LEGISLATIVE TITLE | POPULAR NAME(S) | U.S. CODE or E.O. | CORPS PLANNING GUIDANCE DOCUMENTS (See Document Code) | SUMMARY |
|---|---|---|---|---|
| National Environmental Policy Act of 1969 | NEPA | 42 USC 4321-4347 | 5, 14, 18, 20 | NEPA requires that a detailed statement accompany every recommendation or report on proposals for legislation and other federal actions significantly affecting the quality of the human environment. The Corps of Engineers normally prepares statements for feasibility reports for authorization and construction of major projects. An environmental assessment (EA) is prepared to assess whether significant affects are likely to occur to the environment. A finding of no significant impact (FONSI) is prepared if significant affects are not anticipated to occur. If significant affects are expected, then an Environmental Impact Statement (EIS) is prepared. The EIS identifies the reasonable project alternatives, including the "no action alternative", designates the environmentally preferable alternative or alternatives and the agency's preferred alternative, the relevant factors including economic and technical considerations, statutory missions, and national policy. Prior to completion of the EIS, a record of decision (ROD) is written stating which alternative has been selected, and whether all practicable means to avoid or minimize environmental harm have been adopted, and if not, why.<br><br>The Council on Environmental Quality developed "Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500-1508)". The regulations require that environmental information be made available to public officials and citizens before decisions are made and actions are taken. It also provides requirements for public involvement, requiring that agencies make diligent efforts to involve the public in preparing and implementing their NEPA procedures. These regulations go on to mandate that the general public be involved in the scoping of the project. They also ensure that the public be invited to comment on draft and final EIS, and that the federal agency provide responses to those comments. |
| National Historic Preservation Act | None Identified | 16 USC 470 *et seq.* | 12, 24 | Federal agencies having direct or indirect involvement in a proposed federal or federally assisted undertaking shall take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. Federal agencies shall afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on each undertaking (Section 106 (16 U.S.C. 470f)). The Corps of Engineers must be able to document compliance with the Act by including relevant coordination or consultation correspondence, study results, agency views and comments, and, if required, mitigation plans in Corps project reports and NEPA documents. The Corps must also consult with Native Americans, Native Hawaiian groups, and Native Alaskans on each project. |

| LEGISLATIVE TITLE | POPULAR NAME(S) | U.S. CODE or E.O. | CORPS PLANNING GUIDANCE DOCUMENTS (See Document Code) | SUMMARY |
|---|---|---|---|---|
| Native American Graves Protection and Repatriation Act | NAGPRA | 25 USC 3001 et seq. | 12, 4, 3 | The Act provides for the protection of Native American and Native Hawaiian cultural items, and establishes a process for the authorized removal of human remains, funerary objects, sacred objects, and objects of cultural patrimony from sites located on lands owned or controlled by the Federal Government. The Act also explains the transfer of ownership of cultural items to Native American or Native Hawaiian individuals (e.g., direct lineal or cultural descendants), organizations or tribes. It addresses the recovery, treatment, and repatriation of Native American and Native Hawaiian cultural items by Federal agencies and museums. In accordance with Section 3 (c ), (25 USC 3002) USACE Commands should not claim ownership or permanent control of specified cultural items discovered on Federal or tribal lands after 16 November 1990: 1) when lineal descendants are identified who claim human remains and associated funerary objects; 2) if the Native American tribe or Native Hawaiian organization with the closest affiliation presents a claim; or, 3) when the tribe or organization which aboriginally occupied the territory presents the strongest claim. (There may be instances in which the Corps may take temporary custody until ownership is determined.) The Act distinguishes between pre-enactment and post-enactment (November 16, 1990) resources. NAGPRA contains data gathering, reporting, consultation, and permitt8ing provisions. The Corps interim guidance covers the basis for repatriation, the timing of repatriation, and how to handle competing claims for pre-and post-enactment covered resources. The emphasis of the Act is on consultation with Native American tribes and Native Hawaiian organizations to ensure that these entities play a major role in the treatment of specific cultural objects.<br><br>DECW-AO/CECW-PD/CECC 1995 Memorandum, "Application of the Native American Graves Protection and Repatriation Act to Water Resources Development Activities", explains that NAGPRA does not apply to lands in which the Federal government has merely been provided access by a landowner and/or local sponsor, for water resources development studies or projects. "However, as the Corps may accept ownership of cultural items it recovers, when they are voluntarily offered by a landowner and/or local sponsor, transferred items are subject to NAGPRA-like activities, at such time as the transfer of ownership is executed." |
| Noise Control Act | None Identified | 42 USC 4901-4918 | 10 | Each federal agency is required to limit noise emissions to within compliance levels. The Corps is responsible for operating its facilities within compliance noise levels set forth in federal regulations, and state and/or local laws. |
| Resource, Conservation and Rehabilitation Act | RCRA; Solid Waste Disposal Act; SWDA; Federal Facilities Compliance Act; FFCA | 42 USC 6901 *et seq.* | 12, 18 | Federal and state solid waste laws are applicable to civil works projects. Also, RCRA may impose substantial requirements on Corps projects that manage even small amounts of hazardous waste. The Corps may be regulated as a generator and/or potentially a holder of hazardous waste (e.g. waste solvents, waste cleaning compounds). Other RCRA regulated activities may include offsite disposal of contaminated dredge material, and disposal of construction debris such as cleaning solvents and paints containing lead and chromium. |

| LEGISLATIVE TITLE | POPULAR NAME(S) | U.S. CODE or E.O. | CORPS PLANNING GUIDANCE DOCUMENTS (See Document Code) | SUMMARY |
|---|---|---|---|---|
| Rivers and Harbors Acts | | 33 USC 401-413 | 12 | The Rivers and Harbors Acts address projects and activities in navigable waters and harbor and river improvements. Several of these Acts provided a number of regulatory authorities, the implementation of which has evolved over time. For example, Section 10 of the Rivers and Harbors Act prohibits the unauthorized obstruction or alteration of any navigable water of the United States. This section provides that the construction of any structure in or over any navigable water of the United States, or the accomplishment of any other work affecting the course, location, condition, or physical capacity of such waters is unlawful unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of the Army. The Secretary's approval authority has since been delegated to the Chief of Engineers. |
| Protection and Enhancement of Environmental Quality | | EO 11991 | | The Council on Environmental Quality was directed to write regulations so that the Environmental Impact Statement process was more useful to decision-makers and the public; to reduce paperwork and the accumulation of extraneous background data, so that the focus is on real environmental issues and alternatives; to make an EIS be concise, clear, and to the point. The Counsel's regulations should also require the establishment of procedures for early preparation of Environmental Impact Statements and the referral of conflicts between agencies concerning the implementation of NEPA. Federal agencies are to comply with regulations set forth by the Council except where such compliance would be inconsistent with statutory requirements. |
| Protection and Enhancement of the Cultural Environment | | EO 11514 | | Federal agencies were charged with providing leadership in preserving, restoring and maintaining the historic and cultural environment of the nation. They will (1) administer the cultural properties under their control in a spirit of stewardship and trusteeship for future generations; (2) initiate measures necessary to direct their policies, plans, and programs in such a way that federally owned sites, structures, and objects of historical, architectural or archaeological significance are preserved, restored and maintained, and (3) in consultation with the Advisory Council on Historic Preservation (16 U.S.C. 470i), institute procedures to assure that federal plans and programs contribute to the preservation and enhancement of non-federally owned sites, structures and objects of historical, architectural or archaeological significance. |
| Floodplain Management | | EO 11988 as amended by EO 12148 | | Federal agencies should avoid to the extent possible, the long and short-term adverse impacts associated with occupying and modification of floodplains. They should also avoid direct or indirect support of floodplain development wherever there is a practicable alternative. |
| Protection of Wetlands (EO 11990) | | EO 11990 as amended by EO 12608 | | Federal agencies are to avoid, to the extent possible, long and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. |

| LEGISLATIVE TITLE | POPULAR NAME(S) | U.S. CODE or E.O. | CORPS PLANNING GUIDANCE DOCUMENTS (See Document Code) | SUMMARY |
|---|---|---|---|---|
| Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations | | EO 12898 | | To the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on the National Performance Review, each federal agency shall make environmental justice part of their mission. Agencies can achieve this by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. |

## TABLE 1. (Continued) Documents Referenced:

| UMRCP Reference Code | Document Code | Document Title |
|---|---|---|
| 1 | 36 CFR 800 | Protection of Historic Properties Sec 106 Review Process |
| 2 | 36 CFR 79 | Curation of Federally-Owned and Admin. Archeological Collection |
| 3 | AO/CECW-PD/CECC Memorandum | Application of the Native American Graves Protection and Repatriation Act to WRDA Activities |
| 4 | CECW-O/CECW-P | Interim Guidance for the Native American Graves Protection and Repatriation Act, PL 101-601, 5 June 1991 |
| 5 | ER 200-2-2 | Procedures for Implementing NEPA |
| 6 | EC 1105-2-206 | Project Modifications for Improvement of the Environment |
| 7 | EC 1105-2-209 | Implementing Ecosystem Restoration Projects in Connection with Dredging |
| 8 | EC 1105-2-210 | Ecosystem Restoration in the Civil Works Program |
| 9 | EP 1165-2-1 | Digest of Water Resources Policies and authorities |
| 10 | ER 1105-2-100 | Guidance for Conducting Civil Works Planning Studies. Chapter 5 |
| 11 | ER 1105-2-100 | Guidance for Conducting Civil Works Planning Studies. Chapter 6 |
| 12 | ER 1105-2-100 | Guidance for Conducting Civil Works Planning Studies. Chapter 7 |
| 13 | ER 1105-2-100 | Guidance for Conducting Civil Works Planning Studies. Chapter 7 and Appendix N |
| 14 | ER 1105-2-100 | Guidance for Conducting Civil Works Planning Studies. Chapter 7 and Appendix F |
| 15 | ER 1130-2-433 | Collection Management and Curation of Archeological & Historical Data |
| 16 | ER 1130-2-435 | Project Operations, Preparation of Master Plans |
| 17 | ER 1165-2-130 | Federal Participation in Shoreline Protection |
| 18 | ER 1165-2-132 | Hazardous, Toxic and Radioactive Waste Guidance for Civil Works Projects |
| 19 | ER 1165-2-400 | Recreational Planning, Devel.and Mgt Policies, Chapter 1 |
| 20 | PGL 29 | Expenditures on Aesthetics at CW Projects |
| 21 | PGL 30 | Recreation Cost Sharing Credit for Increased Real Estate Interest for Recreation Development at Non-Reservoir Projects |
| 22 | PGL 36 | Recreation Development at Structural Flood Control Projects (Non-Reservoir) |
| 23 | PGL | Real Estate Policy Letter 13 Sep 91 and Amended 8 May 1992 |
| 24 | PGL 18 | Cost Sharing for Historic Preservation |

* A more detailed description of the applicable laws and regulations can be found in IWR Report 96-PS-3, July 1996, entitled Civil Works Environmental Desk Reference.

# CHAPTER 1—ATTACHMENT B

# ENVIRONMENTAL CONDITIONS SUMMARY

## ATTACHMENT B, TABLE 1. ENVIRONMENTAL CONDITIONS SUMMARY

| Significant Resource: | **Physical/Chemical Environment—Water & Sediment Quality** |
|---|---|
| Background | A diverse river biota requires a diverse mix of physical, chemical and biological conditions. The quality of water and sediment is related to factors both natural and man-induced. These factors include long-term changes in land-use, and short-term changes in point source contaminants, toxic spills, and floods. Flow is the single most important variable controlling water/sediment quality. The annual flood triggers a spectrum of water quality changes causing a variety of biotic responses. For example, excess suspended sediment and turbidity may be a factor in the abundance of aquatic plants in certain locations. Contaminants can adhere to sediment particles and be transported great distances downriver. Organisms exposed to contaminated sediments can be adversely impacted, and toxic effects from contaminants can linger for many years. |
| Pre-Settlement Condition: | Water quality changes during this period, were naturally induced, and within the tolerance range of species adapted to those conditions. Watershed sediment and nutrient loads were in equilibrium with the natural river processes. |
| Early Settlement Condition: | Just prior to 1938 a severe sewage induced pollution problem existed in the region below St. Paul. This pollution reduced dissolved oxygen (D.O.) levels. Low D.O. levels can adversely affect fish and pollution-sensitive species such as mayflies. Pollution was reduced in the upper MR with the construction of a wastewater treatment plant at St. Paul in 1938.<br><br>In response to UMRS basin agricultural expansion, timber harvesting, mining and urban development, sediment loads from the tributaries have increased greatly over that of pre-settlement rates. Moving downriver from the upper impounded MR, suspended sediment material increases, as does turbidity. At St. Louis, the Missouri River is a major source of sediment to the MR. Reservoirs have reduced the sediment yield from the UMR by one-half. Since the 1930s the navigation dams have trapped sediment. Also, much sediment is stored in the banks and beds of tributaries. Many deep floodplain areas filled with sediment following the placement of the navigation dams.<br><br>Contaminants have originated from agricultural, industrial, municipal, and residential sources since European settlement. These contaminants have included heavy metals, pesticides, and numerous other chemicals. Significant contaminants reached the UMR in wastewater effluents and urban runoff. Industrial pollutants also contaminated the river. Some contaminants accumulated in aquatic organisms and biomagnified in concentration in organisms near the top of the food web, with negative effects (e.g. PCBs bioaccumulation in mink). |
| Modern Historic (Post-Engineering Improvements) Condition: | Water quality has improved greatly over the past several decades. This has been the result of municipalities and industries responding to the Clean Water Act. The St. Paul primary treatment facilities were upgraded to secondary treatment in 1978. Raw sewage discharge in the St. Louis area continued until 1970 when the first of two Metropolitan Sanitary District treatment plants were opened. The last upgrade to secondary treatment was in 1993.<br><br>The principal contributors of nutrients are crop fields, feedlots, and urban areas. The most significant source of nutrients has been the application of fertilizers to crop fields, which has increased about 6-fold between 1950 and 1980.<br><br>Contaminant levels have been greatly lessened in response to the implementation of national water quality regulations.<br><br>The UMR above the Missouri River has yielded up to 50% of the pesticides load to the system, even though it produces only 22 percent of the flow. These chemicals enter tributaries as both runoff and groundwater. Herbicide concentrations are greatest near the confluences of the Iowa, Des Moines, Illinois, and Missouri Rivers. Sampling during the period 1987-1992 did not show contaminant levels to exceed the maximum contaminant levels of EPA drinking water standards. |

## ATTACHMENT B, TABLE 1. ENVIRONMENTAL CONDITIONS SUMMARY (Continued)

| Significant Resource: | **Physical/Chemical Environment—Water & Sediment Quality (Continued)** |
|---|---|
| Existing Condition: | The treatment plant now processes 80 percent of the St. Paul metropolitan areas wastewater. Mayflies (an indicator of good water quality) have started recolonizing suitable habitats. LTRMP monitoring puts the reaches upstream of St. Louis at D.O. concentrations close to saturation, while for the river below the Missouri River, the median concentration is about 80% of saturation. Insufficient time has passed to gage the biological response to the St. Louis facilities upgrade.<br><br>Systemic sediment loading continues to be a severe problem.<br><br>Recent LTRMP data shows a strong relationship between turbidity and suspended solids with the abundance of aquatic plants in certain river reaches.<br><br>The UMRS carries moderate to high levels of nitrogen and phosphorous. These excessive nutrient inputs are having adverse effects, including algal blooms, degraded water quality and is potentially contributing to biotic declines in the Gulf of Mexico, and on human health via the contamination of drinking water supplies.<br><br>The application of fertilizer has been holding fairly constant since 1980. |
| Future Without Project Condition: | Continued minor improvements in water and sediment quality. Continued existing levels of nutrient loading to the system, with potential for adverse hypoxic effects in the Gulf of Mexico. Moderate gains in controlling sediment erosion in the UMRS watershed at its source, but backwaters will continue to receive significant sediment loads during river floods. |
| References: | LTRMP Status and Trends Report, 1998 |
| Informational Needs: | Continued water quality and sediment quality monitoring. |
| Significant Resource: | **Physical/Chemical Environment—Pool Aging and Sedimentation** |
| Background | As navigation pools age, sediments (from watershed uplands, and island and bank erosion) settle into the deeper aquatic habitat areas, resulting in a loss of depth diversity, and the simplification of aquatic habitats in the navigation pools. |
| Pre-Settlement Condition: | During pre-settlement times, new backwaters were created by the river as quickly as old backwaters were extinguished. |
| Early Settlement Condition: | Similar to pre-settlement condition. |
| Modern Historic (Post-Engineering Improvements) Condition: | UMRS sediment accumulation within the navigation pools occurred at a progressively decreasing rate compared to the earliest years post-impoundment. Changes on the IR were more rapid than on the UMR, due to a relatively higher sediment input from tributaries. |
| Existing Condition: | Conditions are not self-sustaining; the pools are continuing to fill. |
| Future Without Project Condition: | It is predicted that the pools will continue to progress toward a shallower, more uniform conditions. Dissolved oxygen problems, high turbidity, poor substrate quality will be potential repercussions. Active management will be needed to maintain ecosystem quality under navigational impoundment. |
| References: | LTRMP Status and Trends Report, 1998 |
| Informational Needs: | River pools sediment monitoring and budget analysis. Resurvey of bottom bathymetry at lake reservoir sites. |

## ATTACHMENT B, TABLE 1. ENVIRONMENTAL CONDITIONS SUMMARY (Continued)

| Significant Resource: | **Physical/Chemical Environment—River Discharges & Water Levels** |
|---|---|
| Background | Water control structures can change can make the river's hydrologic regime less natural and less suitable to the needs of the river's ecosystem. |
| Pre-Settlement Condition: | A free flowing system ,with a hydrologic regime to which the river's biota is well adapted. |
| Early Settlement Condition: | Not significantly different that the pre-settlement condition. Between 1880 and 1917, the number of days above flood stage at St. Louis was 217, for Pool 24 it was somewhat higher at 295 days. |
| Modern Historic (Post-Engineering Improvements) Condition: | At equivalent low discharges, water elevations are lower today than in the past, and at equivalent high discharges, water elevations are higher today than in the past. The number of days an area is above flood stage is also increasing. For St. Louis it was 485 days between 1956 and 1993, and it was 1,166 days for Pool 24. In response to watershed drainage, stream channelization, and levee construction—the system has become more "spiky". |
| Existing Condition: | The estimated number of days the river at St. Louis is above flood stage is still on the increase. |
| Future Without Project Condition: | It is unknown whether increased hydrologic variability will stabilize, or continue to increase over time. |
| References: | LTRMP Status and Trends Report, 1998 |
| Informational Needs: | Continued monitoring of river discharges and stages. |
| Significant Resource: | **Physical/Chemical Environment—Land Cover and Land Use** |
| Background | Land cover/land use controls a number of physical/biological conditions on the UMRS. It affects snowmelt, rain runoff, and sediment/nutrient/contaminants delivery. |
| Pre-Settlement Condition: | Before European settlement, these substances moved at rates to which the ecosystem was adapted. High and low flows were buffered by the storage capacities of the undisturbed natural sub-basins with forests, prairies, and wetlands. |
| Early Settlement Condition: | Over the past century, agriculture has become the dominant land cover/land use feature in the UMRS basin. |
| Modern Historic (Post-Engineering Improvements) Condition: | These uses release large amounts of sediments, nutrients, and contaminants (fertilizers and herbicides). Also, the delivery of water run-off to the river is faster than in the past, and results in higher river stages.<br><br>The basin's man-made connection from the IR to the Great Lakes has created an avenue for the invasion of exotic species (e.g. zebra mussels, European ruffe, and round goby). |
| Existing Condition: | Much of the UMRS basin is now in agricultural use (especially corn and soybeans). |
| Future Without Project Condition: | Moderate gains in natural habitat types as a result of continued habitat restoration initiatives. Potential exists for at least some continued urban encroachment on the floodplain, encouraged in part by improvements to site-specific improvements to the river's flood protection system. |
| References: | LTRMP Status and Trends Report, 1998 |
| Informational Needs: | Continued monitoring of land cover and land use via GIS program. |

## ATTACHMENT B, TABLE 1. ENVIRONMENTAL CONDITIONS SUMMARY (Continued)

| Significant Resource: | **Physical/Chemical Environment—Annual Flood Pulse** |
|---|---|
| Background | A flood pulse is a seasonal rise in river levels, beyond bankfull, due to snowmelt and rain that triggers a complex variety of physical and biological processes that help maintain a health river ecosystem. Fish spawning and annual recruitment, nutrient cycling, and plant production are closely tied to the duration, extent and timing of the annual flood pulse. |
| Pre-Settlement Condition: | The river's natural annual flood pulse effect prevailed, and represented conditions to which floodplain species were well adapted to respond. |
| Early Settlement Condition: | Little change from the pre-historic condition. |
| Modern Historic (Post-Engineering Improvements) Condition: | Navigation dams caused the perpetual inundation of areas that once drained and were exposed during much of the year. Levees essentially removed large portions of the floodplain from river flooding. These changes have limited the ecological health of the UMRS. |
| Existing Condition: | Same as modern historic condition. |
| Future Without Project Condition: | Moderate gains in restoring annual flood pulse as habitat restoration initiatives like EPM continue. |
| References: | LTRMP Status and Trends Report, 1998 |
| Informational Needs: | Continued research into methods to mimic the river's annual flood pulse (e.g. environmental pool management, moist-soil management units, levee fish passage structures, etc.) |
| Significant Resource: | **Physical/Chemical Environment—Infrequent Natural Events** |
| Background | Floodplain rivers are dynamic in response to hydrologic events that occur at great intervals. These events include floods at one extreme and droughts at the other. Such changes can result in lowered species diversity, and decreases in forest community age structure. |
| Pre-Settlement Condition: | Flood and drought events occurred at their natural frequency and magnitude. |
| Early Settlement Condition: | Similar to the pre-settlement condition. |
| Modern Historic (Post-Engineering Improvements) Condition: | With the placement of dams and levees, the long-term structural dynamics of all UMRS reaches has been reduced. Extensive areas of floodplain that once flooded—no longer flood. Certain areas of the levee unprotected floodplain no longer dry out at the same frequency and magnitude as they once did. EPM and moist-soil management in limited reaches of the river have helped to occasionally mimic infrequent natural events. |
| Existing Condition: | Same as modern historic condition. |
| Future Without Project Condition: | A somewhat more natural water regime will be possible at various locations along the river in response to EPM and moist-soil management operations. |
| References: | LTRMP Status and Trends Report, 1998 |
| Informational Needs: | Continued research into methods to mimic infrequent natural events (e.g. environmental pool management, moist-soil management units, etc.). |

## ATTACHMENT B, TABLE 1. ENVIRONMENTAL CONDITIONS SUMMARY (Continued)

| Significant Resource: | **Submersed Aquatic Vegetation** |
|---|---|
| Background | Submersed aquatic vegetation (SAV) is plants with leaves and stems growing on or beneath the waters surface. Functions served by SAV include: D.O. production, sediments stabilization, nutrients uptake, and suspended sediments filtering, and provide food and cover for waterfowl and fish. |
| Pre-Settlement Condition: | SAV was less abundant on the system prior to the construction of the Locks and Dams system. |
| Early Settlement Condition: | Similar to the pre-historic condition, but SAV communities in the IR declined in the early 1900s due to sewage pollution. Sewage treatment in the 1920s improved water quality and SAV reappeared. |
| Modern Historic (Post-Engineering Improvements) Condition: | Impoundment favored SAV by increasing the acreage of shallow water and by stabilizing low-discharge water levels. The mid-pool areas were the most SAV productive. In the 1950s, pollution and sediments led to a decline in SAV populations along the lower IR, and this resource has not recovered. SAV on the IR is presently confined to leveed waterfowl management areas. UMRS longitudinal distribution has been uneven due to water clarity and water level gradients. SAV is most abundant in the upper UMR impounded reach. SAV died out in the mid-1950s on the IR in response to deteriorating water quality. However, sediment-related factors in the 1950s eliminated the SAV. Post-impoundment, the water-surface area has declined slightly in response to sedimentation, and the habitat has become more shallow and uniform. |
| Existing Condition: | Abundance of SAV in the impounded UMR is annually highly variable in response to annual water and sediment conditions. Overall, the presence of SAV continues in the UMRS, suggesting that physical conditions have not declined past acceptable ecological levels. To date SAV of the IR has not recovered. Aquatic plants in the lower UMR and the IR are restricted to backwaters isolated from the river system and managed with drawdowns to promote waterfowl habitat. |
| Future Without Project Condition: | Excessive sedimentation and the filling of upper UMR backwaters could eventually lead to declines in SAV similar to those in other river reaches. |
| References: | LTRMP Status and Trends Report, 1998 |
| Informational Needs: | Long-term SAV monitoring is needed to better understand the impact factors and the effectiveness of remedial measures taken. |

## ATTACHMENT B, TABLE 1. ENVIRONMENTAL CONDITIONS SUMMARY (Continued)

| Significant Resource: | **Macroinvertebrates** |
|---|---|
| Background | Macroinvertebrates include insects, worms, some crustaceans, and some mollusks. They are found in all areas of the river, and are used as environmental quality indicators. Most studies focus on benthos (bottom dwelling macroinvertebrates), and in particular fingernail clams and burrowing mayflies. These groups are a critical food source for diving ducks and many species of river fish. Spatial patterns of waterfowl use likely shift with changes in benthos distribution/abundance. |
| Pre-Settlement Condition: | Fewer catastrophic drops in population levels than what has been observed in modern times. |
| Early Settlement Condition: | Probably similar to the pre-historic condition. |
| Modern Historic (Post-Engineering Improvements) Condition: | Long-term declines in benthos have had major adverse impacts on river fishes and birds.<br><br>A major decline of fingernail clams and mayflies along the middle and lower IR occurred during the 1950s.<br><br>In the UMR, benthic levels are typically higher in non-channel aquatic areas than in channel areas. Densities of fingernail clams in the IR are just the reverse—probably due in part to sediment and water quality related problems. Population levels have varied in the impounded UMR. In Pool 19, population levels greater than 100,000 per square meter were recorded in the 1960's, but dropped to zero by the early 1990s, and then recovered after the 1993 flood. Pools 2-9 showed declines in clams through the 1980s. LTRMP data shows recent clam densities more typical of the mid-1970s.<br><br>Mayflies showed lower levels in the 1970s, then increased up until 1984 and then held fairly constant. |
| Existing Condition: | The water quality of the UMRS is presently of fair to good quality. Sediments effects are still a major concern. |
| Future Without Project Condition: | Water quality is anticipated to remain the same (i.e. of generally good quality) or improve somewhat further. However, in the absence of active management—macroinvertebrates populations could further decline in response to sediment effects. |
| References: | LTRMP Status and Trends Report, 1998 |
| Informational Needs: | Knowledge of long-term population cycles is weak, and this makes it difficult to tell apart short-term man-induced changes from those caused by natural factors. More information is needed to assess benthic community status. Advances in this area will help to set meaningful management objectives for benthos and the services they provide to the food web. |

## ATTACHMENT B, TABLE 1. ENVIRONMENTAL CONDITIONS SUMMARY (Continued)

| Significant Resource: | **Fish** |
|---|---|
| Background | The UMRS supports an unusually large number of fish species (at least 260 species have been reported). This diversity is due in large part to the system's great physical complexity. |
| Pre-Settlement Condition: | The UMRS supported an unusually large number of fish species. |
| Early Settlement Condition: | There is little evidence to suggest a significant loss of species in the UMRS since the 1800s. |
| Modern Historic (Post-Engineering Improvements) Condition: | No significant losses of species, but man-induced alterations have changed species distribution and abundance. There is no evidence of a riverwide decline in fish species over time. Shifts in distribution and abundance of fish species have been documented with species richness (and physical complexity) being higher in the northern rather than southern reaches of the river. Studies suggest that the abundance of centrarchids may be limited by the availability of backwater habitat.<br><br>Navigation dams appear to have resulted in the increased abundance of lentic fish species (e.g. bluegills and largemouth bass). On the other hand, the dams have impeded fish movement of many species. Species richness is higher in the upper impounded reaches of the river than the lower impounded and unimpounded reaches of the UMRS-- probably the result of greater physical diversity in the impounded area.<br><br>A consistent pattern exists of greater numbers of prey species (such as gizzard shad and emerald shiners) in the impounded river reaches versus the unimpounded reaches.<br><br>Pallid sturgeon, once important to the commercial fishery is now rare. Lake sturgeon, once common is uncommon in recent LTRMP samples. Shovelnose sturgeon may be increasing in abundance.<br><br>Mobile riverine fishes that may have been negatively affected by the locks and dams include the blue sucker, skipjack herring, sturgeons, paddlefish, and American eel.<br><br>There is no recent evidence of a decline in species richness on the UMRS.<br><br>Among the riverine fishes, in Minnesota: walleye populations are relatively stable over time, but sauger populations may vary widely. In Illinois, channel catfish populations have increased over time, while smallmouth buffalo have not shown a strong trend. Common Carp have increased since 1193.<br><br>In Illinois, bluegill populations increased in the 1980s and dropped slightly in the 1990s. Largemouth bass numbers have increased in Illinois waters of impounded reaches, but are missing from the unimpounded reach. Illinois black crappie have shown little fluctuation since 1976, while white crappie abundant in 1976 have remained at lower numbers since that time. For centrarchids, water-level changes may impact reproductive success or over winter survival.<br><br>There is no apparent trend in the abundance of Illlinois gizzard shad and emerald shiners.<br><br>On the IR, pollution tolerant fish (common carp and goldfish) were 60 percent of the catch in 1963, but by 1992 represented only 5-10 percent of the catch. The abatement of pollution has helped, but the fisheries are still severely impacted by sediments. |
| Existing Condition: | A diverse fish fauna continues to exist on the UMRS. |
| Future Without Project Condition: | In the absence of active management, fish species distribution and abundance will continue to change, and some potential exists for lost species diversity. |
| References: | LTRMP Status and Trends Report, 1998 |
| Informational Needs: | Future monitoring is needed to better describe the ecological processes that maintain the species richness of the UMRS. Issues include the role of backwaters on the open river, the role of over wintering fish habitat, and the concern over the loss of river islands. |

## ATTACHMENT B, TABLE 1. ENVIRONMENTAL CONDITIONS SUMMARY (Continued)

| Significant Resource: | **Migratory Birds** |
|---|---|
| Background | Diving ducks, cormorants, swans, and pelicans use the open water pools of the river. Dabbling ducks, egrets, herons, bitterns, rails, and many neotropical songbirds use the river's shallow backwater habitat. Bottomland forest habitat is utilized by bald eagles, ospreys, egrets, herons, wood ducks and hooded mergansers. Waterfowl populations fluctuate greatly from year to year, probably due to changes in water and food conditions and the weather. For example, fingernail clams (the major food item for diving ducks) declines during drought periods, can contribute to a decline in diving ducks. |
| Pre-Settlement Condition: | Historically, nearly 300 species of bird use the MR corridor for migration, or remain as year-round residents. |
| Early Settlement Condition: | Similar to pre-settlement condition. |
| Modern Historic (Post-Engineering Improvements) Condition: | Major changes to the riverine landscape have occurred in response to the demand for urbanization, agriculture, and industry. Migratory birds have been subjected to the adverse cumulative effects of sedimentation, 9-foot Channel O&M, pollution, and runoff. Since the 1940s dabbling duck populations have declined steadily. Mallard numbers in the 1940s exceeded 1.5 million birds. Habitat use shifts more to the UMR and away from IR after 1960. Fish-eating birds and wading birds were affected by the use of DDT after WWII. DDT was banned in 1973 with a recovery noted for many fish-eating/ wading bird species. Data published in the late 1970s suggests that populations of herons, egrets, and cormorants may have declined on the UMR perhaps in response to poor water quality, loss of nesting trees and foraging areas. Double-crested cormorants were common breeders and abundant migrants on the UMR from St. Louis to St. Paul) during the 1940s and 1950s.<br><br>Little is known about songbird breeding success or its use of the river corridor during migration. Based on the breeding bird survey, it appears that the songbird population trends match continental trends. Trends were calculated for 119 species from 1966 to 1994, of which 35 species showed significant change. Twenty-one were positive and 14 were negative trends. For six species, factors that influence populations may differ from that of the rest of the continent.<br><br>Counts of 20,000 to 40,000 cormorants occurred in the 1940s. Recent numbers of cormorants remain much lower than historic levels. By 1991-1992 the number of cormorants seen during the fall migration was only 5,000 to 7,000 birds.<br><br>IDNR has conducted surveys of heron nests within its borders since 1983. The number of nests from 21 colonies increased from 2,111 in 1987 to 5,045 nests from 20 colonies in 1991. There has been speculation that tree die-offs from the 1993 flood could be negatively impacted. |
| Existing Condition: | Once abundant, migratory birds populations are now much reduced in along the Middle and Lower MR and the IR. Combined populations of divers and dabblers barely exceed 500,000 birds. This is a two-thirds decrease from the populations of pre-1950 levels.<br><br>Important areas for migrating diving ducks (e.g. canvasback, lesser scaup, redhead and ring-necked ducks) are Navigation Pools 5,7,8,9, and 19. These pools have large open water areas and much aquatic vegetation. Canvasback numbers are presently high, but scaup numbers in the upper impounded MR have declined somewhat. Surveys indicate high densities of nesting mallards in Pools 7,8,11, and 13. |
| Future Without Project Condition: | Continued habitat restoration efforts on the river system should help reduce the magnitude of future swings in the migratory bird population numbers. |
| References: | LTRMP Status and Trends Report, 1998 |
| Informational Needs: | Continued aerial surveys, ground counts, and habitat utilization surveys needed to ensure the future health of these populations. |

## ATTACHMENT B, TABLE 1. ENVIRONMENTAL CONDITIONS SUMMARY (Continued)

| Significant Resource: | **Habitat—Side Channels and Backwaters** |
|---|---|
| Background | Side channels and backwaters are either contiguous (connected to the river) or isolated from the main river by levees. |
| Pre-Settlement Condition: | All side channels and backwaters were contiguous, with riverine species able to freely ingress/egress between river and off channel habitat areas. |
| Early Settlement Condition: | Similar to pre-settlement condition. |
| Modern Historic (Post-Engineering Improvements) Condition: | Loss of contiguous side channels and backwaters follow closely the amount of agriculture in the floodplain. |
| Existing Condition: | The distribution of leveed areas as a proportion of total floodplain is 3% north of Pool 13, 50% from Pool 14 through Pool 26, and 80% in the open river. It is 60% along the lower 160 miles of the Illinois River. Backwater aquatic area classes are more prominent in the northern pooled reaches, and channel habitats are more prominent in the southern pooled reaches. |
| Future Without Project Condition: | Some improvement in side channels along the open river is anticipated as a result of ongoing channel habitat restoration projects. |
| References: | HNA Report, 2000 |
| Informational Needs: | Continued bathymetric surveys of side channel habitat areas, and continued development of side channel restoration tools. |
| Significant Resource: | **Habitat—Grasslands** |
| Background | |
| Pre-Settlement Condition: | During pre-settlement times about 45% of the Pools 13 to 26 UMR reach would have been in grasslands. Along the IR, the distribution of grassland would have been about 20%. |
| Early Settlement Condition: | Expansion of agriculture reduces the grasslands cover. |
| Modern Historic (Post-Engineering Improvements) Condition: | Agricultural development resulted in the loss of most grasslands habitat. |
| Existing Condition: | Today, grasslands comprise only 5% of the Pools 13 to 26 UMR reach. Grassland patch connectivity has been highly reduced. |
| Future Without Project Condition: | No change is anticipated in the absence of programs to proactively restore grasslands habitat. |
| References: | HNA Report, 2000 |
| Informational Needs: | Continued monitoring of existing prairie habitat demonstration projects. |

## ATTACHMENT B, TABLE 1. ENVIRONMENTAL CONDITIONS SUMMARY (Continued)

| Significant Resource: | **Habitat—Bottomland Forests** |
|---|---|
| Background | Floodplain forests include three strata of plants: ground cover, understory, and canopy. Important forest functions include the reduction of soil erosion, water quality improvement, leaf litter is a source of organic matter for secondary aquatic production, they serve as habitat for many bird species. |
| Pre-Settlement Condition: | |
| Early Settlement Condition: | In 1817, forests at the confluence of the MR and IR covered 56% of the landscape. Forests in the river reach below St. Louis covered 71 percent of landscape in 1809. |
| Modern Historic (Post-Engineering Improvements) Condition: | By 1975 the MR/IR confluence forests declined to 35 percent of the landscape. The middle Mississippi floodplain covered only 18% of the landscape in 1989. These changes were due to agricultural land clearing, wood fuel for steamboats and the harvesting of lumber.<br><br>Mast-producing trees declined greatly because the rarely flooded, well-drained ridges where these trees grew were more desirable for wood fuel, lumber, and agriculture.<br><br>Navigation improvements reduced the river's ability to reshape itself and maintain a variety of tree successional stages.<br>In response to long duration flooding (as evidenced by the flood of 1993) it is evident that the UMRS retains some of its ability to regenerate early successional forest communities. In Pool 26, 37% of trees >4" DBH were killed. Willow and cottonwood did regenerate in the unimpounded river reach, but not very well in the impounded reaches. |
| Existing Condition: | Today 303,933 acres of floodplain forest has been identified within the UMR valley, and 78,467 acres within the IR valley. Many of the existing woodlands are the product of successional change following the abandonment of cropland acquired by the Corps for the navigation system. These lands contain few mast-producing trees. The current UMRS mix of forest is willow and cottonwood (5%), mixed silver maple (80%), oak-hickory (10%), and other types (5%). Given current land-use practices, forest losses to agriculture and urban development cannot recover. |
| Future Without Project Condition: | Potential exists for reevaluating UMRS woodlands for their ability to support mast-producing trees. Willows and cottonwood could be promoted by creating openings within silver maple communities in the impounded reaches. |
| References: | LTRMP Status and Trends Report, 1998 |
| Informational Needs: | Continued monitoring and research into methods forest habitat restoration. |

## ATTACHMENT B, TABLE 1. ENVIRONMENTAL CONDITIONS SUMMARY (Continued)

| Significant Resource: | **Recreational Activities (Including Hunting/Fishing)** |
|---|---|
| Background | Water resources (including the UMRS) provide a major recreational opportunity. Private groups can provide recreation facilities such as boat docks, boat clubs, marinas, boat charter companies, and campgrounds. Additional facilities are provided by city, township, county, state, and Federal agencies. These facilities include boat access; slip rental; parks for river watching, fishing, and camping; trails for hiking, horseback riding, and bicycling; and access. Although many facilities may exist along rivers the facilities can vary greatly in quality and capacity and can be unevenly distributed along the rivers. Rivers can also be an important focal point for sport fishing and hunting activities. |
| Pre-Settlement Condition: | Not applicable. |
| Early Settlement Condition: | Not applicable. |
| Modern Historic (Post-Engineering Improvements) Condition: | Backwater recreational opportunities have decreased in recent decades due to off-channel sedimentation effects. However, the total recreational days of use and expenditures have continued to increase.<br><br>Eventual contraction of off-channel areas could lower the monetary yield of sport fishing and waterfowl hunting on the UMRS. |
| Existing Condition: | The UMRS provides a major recreational opportunity within the Midwest, including 1,200 miles of river with about 450 recreational sites and 200 boat harbors or marinas. Important recreational activities include boating, picnicking, camping, swimming, water skiing and sightseeing. Diverse natural features enhance the areas recreational attractiveness. The total recreation days and dollar values for the UMRS is 37 million days and $143 million.<br><br>The top six UMR sport fish based on harvest data include the bluegill, crappie, white bass, drum, sauger, and walleye. Carp, bullhead, green sunfish, bluegill, largemouth bass, are the most abundant fish on the IR. Total annual expenditures on UMRS is about $55 million with about 11 million annual fisherperson days. Major resource threat is backwater filling with sediments, and less than optimal water regulation.<br><br>The UMRS is a major flyway for waterfowl. The mallard is the most abundant duck of the flyway. Other important species include the wood duck, teal, pintail, gadwall, shoveler, scaup, canvasback, and redhead ducks. The dollar value of this resource is about $6.5 million. The loss of backwater acres and of submerged aquatic plants due to sediment effects may have contributed to past waterfowl declines.<br><br>Deer is the major big game, and squirrel the major small game mammals of the bottomland forests. Annual value for big/small game hunting is $1.6 million for the UMRS. |
| Future Without Project Condition: | Backwater recreational opportunities are expected to decrease due to continued off-channel sedimentation effects. However, the total recreational days of use and expenditures are expected to continue to increase.<br><br>Eventual contraction of off-channel areas could lower the monetary yield of sport fishing and waterfowl hunting on the UMRS. |
| References: | FEIS Second Lock at L&D 26 (R) |
| Informational Needs: | |

## ATTACHMENT B, TABLE 1. ENVIRONMENTAL CONDITIONS SUMMARY (Continued)

| Significant Resource: | **Cultural Resource Properties** |
|---|---|
| Background | Cultural resources concern is today reflected by several key environmental laws: the Archeological Resources Protection Act, National Historic Preservation Act, and the Native American Graves Protection and Repatriation Act. |
| Pre-Settlement Condition: | The UMRS was occupied by pre-historic period Native Americans. |
| Early Settlement Condition: | Euro-American immigrants populated the region during the 18th, 19th, and 20th Centuries. |
| Modern Historic (Post-Engineering Improvements) Condition: | Same description as provided below for existing conditions. |
| Existing Condition: | A comprehensive survey database of the UMRS is still under construction. The GREAT Study inventory of known and reported sites for Pools 11 to 22 indicated 4,000 historic site densities are expected elsewhere in the UMRS. |
| Future Without Project Condition: | Increased impacts to cultural resources can be expected due to river bank erosion and from anticipated expanded floodplain development. |
| References: | FEIS Second Lock at L&D 26 (R) |
| Informational Needs: | |

| ATTACHMENT B, TABLE 1. ENVIRONMENTAL CONDITIONS SUMMARY (Continued) | |
|---|---|
| Significant Resource: | **Managed Lands (Conservation Areas)** |
| Background | Large tracts of land adjacent to rivers are sometimes managed for fish and wildlife resources by state of federal entities. In general, the goal is to preserve, restore, and manage wildlife environments for the continued enjoyment and benefit of the American people. Such lands can be particularly important to the management of migratory waterfowl populations. |
| Pre-Settlement Condition: | Not applicable. |
| Early Settlement Condition: | Not applicable. |
| Modern Historic (Post-Engineering Improvements) Condition: | The construction of the 9-foot navigation channel project provided an opportunity to federally acquire a large acreage of land for subsequent fish and wildlife management use. |
| Existing Condition: | There are two major refuges within the UMRS: the Upper Mississippi River Wildlife and Fish Refuge (UMRR 194,000 acres) and the Mark Twain National Wildlife Refuge (MTNWR 73,000 acres). Important problems facing the refuges are water regulation, pollution, siltation, and land use. |
| Future Without Project Condition: | The same problems will persist in the future, but will be moderated to some extent by such ongoing ecosystem restoration programs as: the Environmental Management Program, the Navigation Ecosystem Restoration Program, and the Environmental Continuing Authorities Program (e.g. Section 1135 and Section 206 projects). |
| References: | FEIS Second Lock at L&D 26 (R) |
| Informational Needs: | |

## ATTACHMENT B, TABLE 1. ENVIRONMENTAL CONDITIONS SUMMARY (Continued)

| Significant Resource: | **Threatened and Endangered Species (State & Federal)** |
|---|---|
| Background | The UMRS provides significant habitat to numerous species, including a number that are considered to be threatened and endangered at the state or federal level. |
| Pre-Settlement Condition: | Habitat conditions had not been significantly altered by man, and thus the threat of humans on the existence of most species was low. |
| Early Settlement Condition: | Early settlement with its limited agriculture and logging represented a moderate degree of ecological disturbance that adversely affected the existence of floodplain biota (including species that are now regarded as threatened and endangered). |
| Modern Historic (Post-Engineering Improvements) Condition: | River regulation, impoundment, dredging, material placement, channel training structures, navigation traffic, recreation traffic, levees, draining, urban development, mining, parasites and disease, and exotic species have provided a host of habitat changes adversely affecting many of today's state and federally listed T&E species. The Endangered Species Act of 1973 has played an important role in controlling adverse impacts upon federally endangered species. Likewise, the states have also instituted there own programs to help safeguard these species. |
| Existing Condition: | A total of 16 freshwater mussel species, 18 fish species, 4 invertebrates, 5 mammals, 22 birds, 18 reptiles and amphibians, and 68 plants are listed as state T&E species may potentially be found within the UMRCP study area. Three mussel species, 1 fish, 1 invertebrate, 2 mammals, 1 bird, 1 reptile, and 1 plant are listed as federal T&E species. |
| Future Without Project Condition: | The future success of T&E species will in part depend upon the extent of future efforts in habitat restoration. |
| References: | UMRCP Appendix C |
| Informational Needs: | An improved understanding of the processes linking ecological disturbances with the affected T&E species. Also the preparation of biological assessments for any future site-specific FDR projects. |

## ATTACHMENT B, TABLE 1. ENVIRONMENTAL CONDITIONS SUMMARY (Continued)

| Significant Resource: | **Marsh Wetlands** |
|---|---|
| Background | Wetland areas are of great ecological productivity, and environmental diversity, providing natural flood control, improved water quality, recharge of aquifers, flow stabilization, and fish and wildlife habitat. |
| Pre-Settlement Condition: | |
| Early Settlement Condition: | The historical changes in marsh fragmentation are difficult to assess. River marshes were not well mapped in early periods and are inherently fragmented. |
| Modern Historic (Post-Engineering Improvements) Condition: | Marsh habitats are more abundant, widely distributed, and common in northern river reaches. |
| Existing Condition: | Approximately 71,000 acres of marsh wetland exist in the UMRS. Important problems facing the refuges are water regulation, pollution, siltation, and land use. |
| Future Without Project Condition: | The same problems will persist in the future, but will be moderated to some extent by such ongoing ecosystem restoration programs as: the Environmental Management Program, the Navigation Ecosystem Restoration Program, and the Environmental Continuing Authorities Program (e.g. Section 1135 and Section 206 projects). |
| References: | HNA Report, 2000; FEIS Second Lock at L&D 26 (R) |
| Informational Needs: | |

# CHAPTER 1—ATTACHMENT C

# ECOSYSTEM RESTORATION MEASURES DESCRIPTION

# CHAPTER 1—ATTACHMENT C

# ECOSYSTEM RESTORATION MEASURES DESCRIPTION

## ATTACHMENT C, TABLE 1. ECOSYSTEM RESTORATION MEASURES DESCRIPTION

| Measure | | Sub-Measure Examples | | | Sub-Measure Description |
|---|---|---|---|---|---|
| 1 | SIDE CHANNEL CONNECTIVITY | a | Channel Closures | | The placement of a submerged weir at the entrance of a side channel for the purpose of deflecting sediment-laden river waters. Also serves to direct cleaner water from the upper water column into the side channels. |
| | | b | Flow Enhancement | | The dredging of sediment deposits, the placement of hard points, dike removals, dike notching, or other actions that help restore the movement of water flows within side channels. |
| | | c | Channel Dredging | | Dredging can be used to reconnect a side channel to the main channel at the lower end and to provide deep-water habitat to fish. |
| | | d | Hardpoints | | A series of alternating dikes (or hard-points) to an elevation near the top of the bank to create additional physical and biological diversity, and to cause channel creation in some of the areas experiencing sedimentation. |
| | | e | Notched Dikes | | Notches in side channel dikes provide for fish passage during most river stages. Notches do not negatively impact the hydraulic or sediment transport characteristics of a side channel, or the integrity of the navigation channel. |
| 2 | ISLAND PROTECTION | | | | Various methods used to control the detrimental effects resulting from island bank erosion. Revetment in the form of rip-rap or chevron dikes has been used. |
| 3 | DIKE MODIFICATION | a | Notched Wing Dams | | Notches contribute to a more diverse bottom substrate configuration. Notches do not negatively impact the hydraulic or sediment transport characteristics of a side channel, or the integrity of the navigation channel. |
| | | b | Chevron Dikes | | U-shaped rock structures placed in the river's main channel border and behind which dredge spoil material is placed to form islands. |
| | | c | Log Piles | | Logs used as piles that are driven into the river's substrate. They function similar to the hardpoints described above. |
| 4 | ISLAND AREA | a | Seed Islands | | Man-made structures to initiate the process of natural sediment deposition for the purpose of creating a new river island. |
| | | b | Chevrons Islands | | U-shaped rock structures placed in the river's main channel border and behind which dredge spoil material is placed to form islands. |
| | | c | Barrier Islands | | Islands can be created and stabilized to serve as a barrier to wave action. |
| | | d | Low Islands (with mud flats/sand bars) | | Modified regulating works and dredged material disposal operations to create a low elevation island habitat isolated from the mainland. |
| 5 | FISH PASSAGE | | | | Any means by which fish are permitted to circumvent existing physical barriers to movement, such as by fish ladders, modified dam gate operation, or riffle-pool by-passes. |
| 6 | WATER LEVEL MANAGEMENT—POOL | a | Environmental Pool Management | | Modified water level regulation at the navigation dams using drawdowns to provide opportunistic conditions for vegetation growth. |

## ATTACHMENT C, TABLE 1. ECOSYSTEM RESTORATION MEASURES DESCRIPTION (Continued)

| Measure | | Sub-Measure | | | Measure Description |
|---|---|---|---|---|---|
| 7 | WATER LEVEL MANAGEMENT--BACKWATER | a | Water Control Units | Units—for Wildlife Management | Sluice, stop-log, or similar gates used in combination with pipes or concrete box-like structures used in combination with berms and/or pump units to control interior water levels for the management of wetlands for waterfowl and other wetlands associated wildlife species. |
| | | b | Dam Point Control | Units—for Fisheries Management | Using many of the above listed structures, wetland unit water levels can also be regulated independent of river stage to the advantage of fish and other aquatic organisms. |
| | | c | Flow Enhancement | Enhanced Flow to Backwater Areas | Any number of devices such as levee removal, gated structures, dredging, etc. to help restore the movement of water into backwater areas. |
| | | | | Restore Flow to Levee Isolated Floodplain—Gated Structures | The use of water control structures to reconnect flows between the river and floodplains interior for environmental purposes. |
| | | d | Flow Diversion | Temporary Diversion at Deltas | The rerouting of flows at the mouth of tributaries until the tributary's hydrologic regime has been restored to a more desired configuration. |
| | | | | Divert Tributary Flows to Open Impounded Areas | The diversion of tributary water into open impounded areas to remove sediment from the system. In certain situations, it can also be used as a means of restoring a more natural wetlands hydrology. |
| | | | | Flow Diversion into Backwaters to Increase D.O. | Diversion of waters at the upstream end into stagnant backwater areas during periods of low dissolved oxygen levels. |
| 8 | FLOODPLAIN CONNECTIVITY | a | Conservation Easements | Habitat Incentives on Private Lands | The acquisition of temporary or permanent land use rights for the purpose of fish and/or wildlife management. Examples of this measure at the Federal level are the Conservation Reserve Program (CRP) and the Wetlands Reserve Program (WRP). USDA administers both programs. The CRP is a multi-year program, intended to convert highly erodible and other cropland to perennial vegetation. The WRP program helps landowners work toward a goal of no net loss of wetlands. |
| | | b | Tax Revenue Equalization | | This measure would help to offset the adverse effects of lost tax revenues to local governments, resulting from the conversion of croplands to conservation use. An example of this measure is the provisions of the Refuge Revenue Financing Act administered by the USFWS. |
| | | c | Fisheries Management | Woody Debris Incorporation | The placement of woody material in the water to serve as aquatic habitat structures |
| | | | | Aerators | Various mechanisms (e.g. pumps, water falls, water diversions, water releases, etc.) that can be used to help raise water dissolved oxygen levels. |
| | | | | Create Rock/Gravel Substrate Areas | The placement of rock and gravel within aquatic areas to enhance fisheries habitat. |
| | | | | Fish Removal | The removal of rough fish (e.g., species of Asian carp) by various methods such as netting, and drawdowns to strand eggs. |
| | | | | Enforce Regulations for Fishing | The strict enforcement of state laws governing the consumptive use of fish populations. |

| ATTACHMENT C, TABLE 1. ECOSYSTEM RESTORATION MEASURES DESCRIPTION (Continued) | | | | | |
|---|---|---|---|---|---|
| Measure | | Sub-Measure | | | Measure Description |
| | | d | Wildlife Management | Bird Nesting Structures | The placement of nesting structures in areas deficient of such |
| | | | | Species Reintroduction | The reinstallation of plants and animals to areas from which they were previously eradicated due to habitat degradation or over exploitation. |
| | | | | Protected Special Habitat Areas | Protecting from human development, certain habitat areas of exceptional biological value. |
| | | | | Habitat Corridors | Interconnected strips of habitat adjacent to the river (e.g. an unbroken riparian tree corridor created for the improvement of neotropical songbirds). |
| | | | | Enforce Regulations for Hunting/Trapping | The strict enforcement of state laws governing the hunting and trapping of wildlife populations. |
| | | e | Vegetation Management | Plantings—Emergent Aquatic Vegetation | The direct planting of preferred vegetative species of emergent aquatic plants. |
| | | | | Plant Flood Tolerant Crops | The use of water tolerant crop species in areas subject to frequent flooding events. |
| | | | | Plan Agricultural Crops | Flooded crop fields can be a food source for certain waterfowl species and standing crop at field margins can be an important food source for bottomland wildlife species. |
| | | | | Plantings—Native Prairie Vegetation | Prairie vegetation can be restored in floodplain areas via clearing, seeding, and subsequent mowing and burning operations. |
| | | | | Plantings/Restoration -Forest | Tree Plantings fo facilitate the restoration of forest habitat by filling in areas to create larger tracts of forest cover. |
| | | | | Reestablish Disease Resistant Elms | This measure would attempt to offset the devastating effects of the Dutch elm disease during the past century, by introducing elms resistant to that disease. |
| | | | | Growing Season Drawdowns for Emergent Aquatic Vegetation | Water control structures can be used to lower water levels during the summer to expose mud flats conducive to the growth of emergent herbaceous vegetation, and then subsequently inundated as habitat beneficial to both fish and waterfowl. |
| | | | | Drawdowns—Sediment Consolidation | Water control structures can be used to lower water levels for the resolidification of soft bottom substrates. |
| | | | | Plantings on Dredged Material Sites | Vegetative plantings on dredge material sites can help to stabilize that material from erosion, and also serves as wildlife habitat. |
| | | | | Create Mix of Successional Stages | Habitat diversity and species diversity and productivity within a management unit can be enhanced with a patchwork of vegetation in mixed stages of growth. |

| ATTACHMENT C, TABLE 1. ECOSYSTEM RESTORATION MEASURES DESCRIPTION (Continued) | | | | | |
|---|---|---|---|---|---|
| Measure | | Sub-Measure | | | Measure Description |
| | | g | Encourage Use of Existing Fish/Wildlife/Vegetation Management Programs | | UMRCP report verbiage supportive of the ongoing floodplain management efforts of other agencies and organizations. |
| | | h | Exotic Species Control | Bioengineered Control | A primarily futuristic prospect for controlling an exotic species using another exotic species. |
| | | | | Construct Barriers | The construction of a barrier to deter the movement of exotic species. Examples of which include bubble screens, electric barriers, and sonic barriers. |
| | | i | Lease of Lands for Conservation Purposes | | Lands acquired for the project in fee simple and subsequently zoned for wetlands development and/or other floodplain restoration purposes. |
| 9 | TOPOGRAPHIC DIVERSITY | b | Confined Dredge Material Placement | Confined Placement in Floodplain Using Berms | The discharge of dredged material into an area contained by a low profile earthen berm. |
| | | c | Thalweg Dredge Material Placement | Unconfined Open Water Placement | The discharge of dredged material into the river's main channel. |
| | | d | Behind Levee Dredge Material Placement | | Material placed as improved levee berms subsequently planted to trees or other wildlife beneficial vegetative cover. |
| | | e | Uplands Dredge Material Placement | Material Placement Outside of Floodplain | The placement of floodplain dredged materials in areas above ordinary high water, and thus out side of Clean Water Act Section 404 jurisdiction. |
| 10 | DEPTH | a | Beneficial Dredging | Side Channel Dredging | Utilize dredging to restore lost water depths and physical diversity within side channel areas. |
| | | | | Backwater Dredging | Utilize dredging to restore lost water depths in backwater areas as fish over-wintering habitat or as means of enhancing water conveyance for wildlife species management. |
| | | | | Tributary Dredging | Utilize dredging to help restore tributary channels. |
| | | | | Potholes Excavation | Using bulldozers, draglines and other heavy equipment to remove sediment deposits from pothole areas. Restoring the depth of potholes can also be accomplished via blasting with dynamite |

| ATTACHMENT C, TABLE 1. ECOSYSTEM RESTORATION MEASURES DESCRIPTION (Continued) | | | | | |
|---|---|---|---|---|---|
| Measure | | Sub-Measure | | | Measure Description |
| 11 | SHORELINE PROTECTION | a | Revetments | Rock Revetment | Eroding bank lines can be stabilized using a number of different approaches; one approach is with the application of a stone blanket along the shoreline—commonly referred to as riprap. |
| | | b | Off Bank Revetment | | Stone structures placed 50 to 100 feet out from, and parallel to, the natural bankline. The top of the structure is 1-2 feet emergent at normal pool elevation. At selected distances, gaps are left to allow for fish passage and the exchange of water. The quiet water created behind these structures is conducive for fish reproduction and as over wintering habitat. |
| | | c | Bank Revegetation | | Stabilization of stream banks through the recontour and planting with vegetation (typically water tolerant with an extensive root system). |
| | | d | Bull Nose Dikes | | A semi-circular stone structure placed at the head of an existing island to protect the island from erosion and to create a sediment protected and flow protected backwater for fish reproduction and over wintering. |
| 12 | DAM POINT CONTORL | | | | Modified water level regulation at the navigation dams to provide improved conditions for fish spawning and over-wintering habitat and for migratory waterfowl habitat above and beyond that possible utilizing EPM alone. Elements of dam point control include modification of the water control master plan, dam gates automation, and additional lands acquisition. |
| 13 | FP IMMEDIATE PROJECTS | | | | Ecosystem restoration projects in an advanced stage of planning awaiting implementation and funding authority for implementation. Examples of these projects include the Spunky Bottoms project, Emiquon project, and Hennepin project. |
| 14 | OTHER--WATERSHED MANAGEMENT | a | Conservation Farming | Contour Farming/Terraces | Contour farming entails the cultivation of crop fields parallel to the prevailing topographical contours. Terraces involve the creation of a series of earthen plateaus along steep hillsides slow down water and water and soil runoff. |
| | | | | Conservation Tillage | Refers to fall no-till farming as a method for reducing soil erosion. |
| | | | | Grassed Waterways | Grassed buffer strip placed in crop fields susceptible to slow sediment movement during rain evens. |
| | | b | Sediment Trap | Sediment Trap Barrier | Small hillside impoundments, such as farm ponds and dry detentions, equipped with open pipes. They allow a specified volume of impounded storm water to drain completely or partially within a defined time period. Detention time allows a portion of the watersheds incoming sediments to settle out. |
| | | | | Sediment Trap Dredging | The periodic revitalization of hillside sediment traps by the re-excavation of accumulated sediment by dredging. Rework |
| | | | | Incentives for BMPs | The NRCS Conservation Reserve Program (CRP) and the Wetlands Reserve Program (WRP) are two examples incentive programs to encourage farmers to implement soil conservation Best Management Practices (BMPs). |
| | | | | Large Reservoirs—Tributary Locations | The construction of additional large flood control reservoirs to delay flows and river stage effects on the mainstem river system. |
| | | c | Tributary Stream Restoration | Riparian Buffer Strips | Vegetative cover along streams adjacent to open areas of agriculture or urban development. |
| | | | | Restored Meanders | Remeandering of a channelized stream to restore its original sinuosity, length and physical diversity as aquatic habitat. |
| | | | | Tributary Stream Bank Stabilization | Rock or vegetative based bank stabilization of tributary banks. |

| ATTACHMENT C, TABLE 1. ECOSYSTEM RESTORATION MEASURES DESCRIPTION (Continued) | | | | | |
|---|---|---|---|---|---|
| Measure | | Sub-Measure | | | Measure Description |
| | | | | Rock Riffle Areas | Man made rapids or rocked areas in the stream flow as an effective means of stabilizing the streambed in channelized reaches. The riffle areas step the water down through the channel to reduce the velocity and erosive power of the water. The riffles also provide spawning and nursery habitats for fish, while increasing the oxygen content of the water. |
| | | | | Dam Removal—Tributaries | Removal of dams from UMR tributary streams. |
| | | | | Bank Revegetation | Stabilization of stream banks through the recontour and planting with appropriate vegetation (typically water tolerant with an extensive root system). |
| | | | | Wind Breaks | The placement of islands, tree rows and similar devices as a means of halting wind-induced wave erosion along shoreline areas. |
| | | | | Grade Control Weirs | Placement of a series of low water dams along sections of eroding stream channels. The weirs help reduce stream velocities and bank erosion by stair-stepping water down to a lower base elevation. |
| | | | | Bank Revegetation | Stabilization of stream banks through the recontour and planting with appropriate vegetation (typically water tolerant with an extensive root system). |
| | | d | Encourage Existing Watershed Management Programs | | UMRCP report verbiage supportive of the ongoing watershed management efforts of other agencies/NGO organizations. |
| | | e | UMRS Watershed Nutrients Program Standardization | | This measure would build further upon the recent database work conducted by the Upper Midwest Science Center (UMSC) under contract with the USEPA. The measure would provide additional funding via the USEPA to ensure the establishment, refinement and operation of a long-term framework for monitoring, research and modeling of UMRS nutrients loading. |
| | | f | Support for the Continuation of Gulf WNTF Program | | To lessen the uncertainties regarding the nature of Gulf hypoxia and its potential linkage to Mississippi River nutrients loading, this measure supports the continued involvement of the WNTF. Table 10 provides a list of monitoring parameters suggested by the WNTF for use in assessing the hypoxia program. |
| | | g | Support for Existing Point Source Pollution Control Programs | | This measure recommends continued funding support for federal and state programs involved in the upgrade of wastewater treatment facilities, and permit process improvements including: developing general permits for minor facilities, computerized permit tracking, enforcing fixed permit review/action deadlines, aggressive targets for permit compliance inspections and penalties for non-compliance. |
| | | h | Support for Existing Non-Point Source Pollution Control Programs | | This measure recommends continued funding support for the planning, implementation, monitoring and evaluation of existing watershed programs targeting NPS pollution. This includes funding to support state-level efforts involving sub-basin committee meetings, baseline and monitoring data collection, DSS and IMP process, grants program, and implementation of Best Management Practices (BMPs). The BMPs include such measures as fall no-till farming, grassed waterways, water detention basins, and modified cropping systems, fertilizer application controls, and drainage tile modifications. |

| ATTACHMENT C, TABLE 1. ECOSYSTEM RESTORATION MEASURES DESCRIPTION (Continued) | | | | | |
|---|---|---|---|---|---|
| Measure | | Sub-Measure | | | Measure Description |
| | | i | Construction Site Best Management Practices | | The use of silt screens, straw bales and other erosion control practices at construction site locations. |
| | | j | EMP Modification to Include Nutrients Farming Pilot Projects | | This measure proposes several demonstration projects to further assess the merits of nitrogen farming within the UMRS as a partial solution to the Gulf of Mexico hypoxia problem. It would utilize restored floodplain wetlands to help remove nitrogen. It would also employ a mechanism for the buying and selling of nitrogen credits as a contribution towards meeting regional regulatory nutrients compliance standards. As a short-term goal this measure recommends the Corps and the NGOs work jointly to test the feasibility of the nutrients farming concept using the planning, design, construction and monitoring framework of the existing UMRS—EMP. The sources of the lands are those resulting from any UMRCP FDR plans requiring hydrologic mitigation. If pilot projects demonstrate the measures feasibility, if additional hydrologic mitigation lands are available, this measure could be expanded via the adaptive management approach. |
| 14 | OTHER--ENVIRONMENTAL MANAGEMENT SYSTEM | a | Integrated River Management | | The history of master planning efforts on the UMRS is one of “stop and go” efforts. There is a need for a continuous planning process. This measure proposes to create an institutional framework similar to that developed for the EMP to this broader playing field. Implemented under a Continuing Authority, the Master Plan would be a “living document”, i.e. it would periodically updated to accommodate prevailing public and agency perceptions on river needs, and to assimilate newly gained knowledge about resources. A scaling/weighting methodology could be used to quantify stakeholder perspectives on the resource base and to give them ownership in the overall plan. Stakeholders could be defined to include: general public, NGOs, state agencies, other federal agencies, the Corps Districts, etc. The master planning could take place at the floodplain level or at a river wide level. |
| | | b | Adaptive Management | | Adaptive management is a dynamic process by which restoration measures are put in place, subsequently monitored for performance, and then modified (if needed) to help better achieve the project objective. |
| | | c | Site-Specific FDR/EIS Studies | | The UMRCP feasibility study is tiered, i.e. it starts first as a systemic or reach-based study, and then subsequently moves to a more site-specific (D&LD) level of analysis. Support studies (including EIS documentation) are also tiered to reflect this changing level of study focus. |
| | | d | Environmental Demonstration Project Studies (e.g. Nutrients Farming) | | Newly developed measures for addressing the stated integrated river management master plan objectives need to be tested prior to a broad system-wide application. Demonstrator (or sample) projects would help to phase-in new design concepts on the floodplain system. |
| | | e | Modification of Environmental Management Program | | This measure would propose to increase funding, include NGOs as sponsors, inclusion of D&LDs as sponsors, and the transfer of land acquisition credits between projects. |

| ATTACHMENT C, TABLE 1. ECOSYSTEM RESTORATION MEASURES DESCRIPTION (Continued) | | | | | |
|---|---|---|---|---|---|
| Measure | | Sub-Measure | | | Measure Description |
| | | f | Environmental Pool Management Planning | | This planning effort would adjust the current water control procedures for a given navigation pool to better mimic the river's natural "flood pulse effect", especially at lower river stages. The measure could require some modification of the levee system, and could require easements at certain locations to make possible the implementation of an optimized EPM plan. |
| | | g | Second Generation HNA Planning Study | | The original HNA analysis was based on habitat acreages. There is a need for systemic habitat units-based HNA assessment that focuses on habitat guilds. |
| | | h | IWR NED/ER Planning Methods Study | | The Corps lacks an acceptable methodology for combining NED and ER study inputs into a well-defined decision process for project justification. This measure proposes to enlist the service's of IWR in developing such a procedure for future Corps use. |

# CHAPTER 1—ATTACHMENT D

## SCREENING OF FDR MEASURES TO ADVANCE ENVIRONMENTAL SUSTAINABILITY

# ATTACHMENT D, TABLE 1. FDR MEASURE DESCRIPTIONS

**STRUCTURAL FLOOD DAMAGE REDUCTION MEASURES**

| Measure | | Description | Measure | | Description |
|---|---|---|---|---|---|
| S-1 | Flow Diversion | Movement of floodwater from one area to another by means of an alternate route. | S-9 | Vegetation Management | The increasing or decreasing of the roughness of the floodplain by means of the control of vegetation, trees vs. grass. |
| S-2 | New Flood Control Reservoirs | An area that can supply temporary storage of water for a given time with flood control storage and regulated outflows. | S-10 | Channel Straightening | Realignment of the channel by removing the channel sinuosity. |
| S-3 | Dry Detention Basins | An area that can supply temporary storage of water for a given time, the detention area is normally dry, and the outflows are unregulated. | S-11 | Modifying/Reducing Constrictions | Improving the conveyance of the system by removing the constrictions caused by bridges and levees. |
| S-4 | Watershed Small Ponds and Detentions | Small (<5 acres) upland water impoundments. | S-12 | Levee and Floodwall Raising | Increasing the effective height of the levee protection by permanent structural or floodfighting methods. |
| S-5 | Increased Channel Capacity | Increasing the channel capacity by dredging, structural means, training dikes or bendway weirs. | S-13 | Realignment of Levee/ Structures | The adjustment of the levee alignment, which can effect the conveyance of the flood plain. |
| S-6 | Timed Use of Off-Channel Storage | Using the storage component of a levee area to offset the impending peak of a flood, timing is critical. | S-14 | Controlled Failure Levees/Structures | Set a controlling weir elevation that a levee will overtop usually at the downstream end of a levee system. |
| S-7 | Levee Setbacks | Relocating the levee a specific distance from the existing levee alignment landside. | S-15 | Low Profile Berms to Protect Environmentally Sensitive Areas) | An area protected by a low frequency (example a 2-year) embankment to protect environmentally sensitive areas from unfavorable flooding. |
| S-8 | Levee Removal | The removal of all or portions of the earthen levee footprint from the floodplain to allow conveyance and storage. | S-16 | Improved Interior Drainage/Pumping Capacity | Improving the interior drainage of a levee district by reducing the flooding that occurs during exterior high water stages. |

## ATTACHMENT D TABLE 1. FDR MEASURE DESCRIPTIONS (Continued)

**NON-STRUCTURAL FLOOD DAMAGE REDUCTION MEASURES**

| Measure | | Description | Measure | | Description |
|---|---|---|---|---|---|
| N-1 | Elevation of Foundation Walls | This type of structure elevation change involves jacking up the existing walls, extending the foundation vertically using materials such as masonry block or poured concrete, and then setting the building down on the extended walls. | N-8 | Closures | Closures are provided for sidewalks, driveways, and other openings in floodwalls and levees and prevent water from entering. Closures can be permanent or temporary. Closures can only be used if combined with a flood warning system. |
| N-2 | Elevation on Piers | Piers are vertical structural members that are supported entirely by reinforced concrete footings. Piers are used in shallow depth flooding conditions with low velocity flow, and are constructed of either masonry block or poured-in-place concrete. | N-9 | Dry Flood Proofing | Dry flood proofing involves sealing building walls with waterproofing compounds, impermeable sheeting, or other materials and using shields for covering and protecting openings from floodwaters. It should be used only on buildings of concrete block or brick veneer on a wood frame. |
| N-3 | Elevation on Posts or Columns | When flooding is characterized by moderate depths and velocities, elevation on columns (or posts) is a frequently used flood proofing method. Posts are made of wood, steel or pre-cast reinforced concrete. | N-10 | Wet Flood Proofing | Wet flood proofing allows a structure to flood inside, while ensuring that there is minimal damage to the building and contents. Under this approach, vulnerable items should be relocated or waterproofed. This measure must be combined with a flood warning system. |
| N-4 | Elevation on Piles | Where high-velocity flooding can result in scouring, piles provide the best type of foundation. Piles are more slender than posts and are mechanically driven deeper into the ground. Because of this, piles are less susceptible to the effects of high-velocity flood waters and scouring. Piles are generally made of wood. | N-11 | Flood Warning and Response | Flood warning and preparedness systems can improve a community's capability for accurate and timely forecasts of damaging floods. The systems incorporate: monitoring, forecasts, warnings, damage prevention actions, evacuation, and continual management. |
| N-5 | Relocations/Evacuations | This method involves moving the building to another location away from flood hazards. It is used where flood hazards render continued occupation unsafe. Relocation could also include demolishing an existing structure and rebuilding in a new location. | N-12 | Flood Plain Regulations | Flood Plain Regulations are intended to control the level of structural development within a community's flood plain. They can limit future growth of flood damage by restricting development or allowing only development of flood proofed structures. The National Flood Insurance Program (NFIP) requires communities to adopt rules that regulate the level of future development in the floodplain. |
| N-6 | Small Levees | Levees are constructed of compacted earthen fill, and are usually built parallel to the river and extend to high ground when available. | N-13 | Reduce Damage Susceptibility via Alternative Agriculture/Flood Tolerant Crops | Crop damages are reduced by using crop plantings more tolerant to flood conditions. |
| N-7 | Small Floodwalls | Floodwalls like levees keep floodwaters away from the building. However, floodwalls are constructed of stronger materials, are thinner, take less space, and generally require less maintenance than levees. | N-14 | Reduce Future Damage Susceptibility via Acquisition/Buyout | Flood prone lands are acquired via easements or fee title acquisition. |

| ATTACHMENT D, TABLE 2. ENVIRONMENTAL RATING CRITERIA | |
|---|---|
| **Criterion** | **Description** |
| Compatibility with Ecosystem Restoration Measures | Extent to which measure affords opportunities compatible with the inclusion of various supplemental ecosystem restoration measures |
| Potential Contribution to Aquatic Ecosystem Sustainability | Extent to which measure could be used to help achieve UMRS aquatic habitat sustainability goal. Considerations include potential for: restoring backwater depth, increasing river/backwater connectivity, increasing habitat diversity, restoring hydrologic variability to backwater habitats, and decreasing conversion of aquatic to terrestrial habitat. |
| Potential Contribution to Terrestrial Ecosystem Sustainability | Extent to which measure could be used to help achieve UMRS terrestrial habitat sustainability goal by improving terrestrial habitat continuity, improve habitat diversity, and reduce landuse conversion of native terrestrial habitat types to urban/farm use. |
| Potential Contribution to Water Quality Improvement by Removing Nutrients | Extent to which measure could reduce UMRS nutrients loading to the river system. |
| Potential Contribution to Watershed Sediments Reduction | Extent to which measure could help reduce the transport of sediment to floodplain native habitat areas by: retaining sediments in the uplands, or restricting the lateral movement of sediments from the river. |
| Potential for Cost-Effectiveness | Extent to which the measure would be a relatively cost effective means of alleviating the specified environmental opportunities. |
| Potential Implementation Constraints | Extent to which the measure is implementable at this time without extensive new data collections or institutional requirements |
| Potential Public/Agency Support | Extent to which the public/agencies would likely support such a measure. |

## ATTACHMENT D, TABLE 3. SCREENING OF FDR MEASURES TO ADVANCE ENVIRONMENTAL SUSTAINABILITY

| FDR MEASURES: | | Compatibility with Supplemental Ecosystem Restoration Measures (See Measures Code) | Contribution to Aquatic Ecosystem Sustainability | Contribution to Terrestrial Ecosystem Sustainability | Contribution to Water Quality Improvement by removing nutrients | Contribution to Watershed Sediments Reduction | Potential for Cost-effectiveness | Potential Implementation Constraints | Potential Public/Agency Support | Total Rating Points | Ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S-1 | Flow Diversion—Diversion Channels | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9 | 1 |
| | | S,T,U | No discernible improvements to aquatic habitat | No discernible improvements to terrestrial habitat | No discernible improvement to nutrients reduction | No discernible improvement to sediments reduction | Costs not applicable, since no worthwhile environmental benefits would accrue | Regulatory obstacles | | | |
| S-2a | Upland Detention—New Flood Control Reservoirs | 3 | 1 | 3 | 3 | 3 | 3 | 1 | 1 | 18 | 3 |
| | | A,B,C,D,E,F,K,L,M, U,V,W,X,Y,Z,AA,AB, AC,AE | Large gain in new lentic habitat, but a loss of old lotic habitat | Upland crop acres converted to native vegetation | Allows time for nutrients removal | Allows time for sediments removal | A no cost item if rely on natural succession processes for new habitat development | Regulatory and real estate obstacles | Affected landowners would likely object | | |
| S-2b | Upland Detention—Modified Regulation of Existing Reservoirs | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9 | 3 |
| | | P,AE | Assumes water regulation would target flood control and not fisheries management | Assumes water regulation would target flood control and not wildlife management | Assumes water regulation would target flood control and not nutrients removal | Assumes water regulation would target flood control and not sediments reduction | Costs not applicable, since no worthwhile environmental benefits would accrue | Regulatory and real estate obstacles | Affected landowners would likely object | | |

## ATTACHMENT D, TABLE 3. SCREENING OF FDR MEASURES TO ADVANCE ENVIRONMENTAL SUSTAINABILITY (Continued)

| FDR MEASURES: | | Compatibility with Supplemental Ecosystem Restoration Measures (See Measures Code) | Contribution to Aquatic Ecosystem Sustainability | Contribution to Terrestrial Ecosystem Sustainability | Contribution to Water Quality Improvement by removing nutrients | Contribution to Watershed Sediments Reduction | Potential for Cost-effectiveness | Potential Implementation Constraints | Potential Public/Agency Support | Total Rating Points | Ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S-3 | Dry Detention Basins | 3 | 1 | 2 | 1 | 2 | 3 | 1 | 1 | 14 | 2 |
| | | A,B,C,D,E,F,K,L,U | No long-term standing water habitat | Portions of surrounding cropland could be converted to native vegetation via natural succession | Assumes water regulation would target flood control and not nutrients removal | To a lesser aerial extent for reservoirs--these locations would allow time for sediments to drop from the water column. | Assumes costs would be allocated to FDR and not environmental account | Real estate obstacles | Real estate obstacles | | |
| S-4 | Watershed Small Ponds and Detentions | 2 | 1 | 2 | 1 | 2 | 3 | 3 | 3 | 17 | 3 |
| | | A,B,D,F,U,Z | Minor aquatic habitat benefits where semi-permanent ponding is employed | Buffer zone around detentions could provide a moderate contribution to native terrestrial vegetation | Assumes water regulation would target flood control and not nutrients removal | To a lesser aerial extent for reservoirs--these locations would allow time for sediments to drop from the water column. | Assumes costs would be allocated to FDR and not environmental account | Landowners would provide non-cropland areas for the sediment traps | Landowners have generally favored this type of program in the past | | |
| S-5 | Channel Modifications—Channel Geometry--Increased Channel Capacity | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1 |
| | | None | No discernible improvements to aquatic habitat | No discernible improvements to terrestrial habitat | No discernible improvement to nutrients reduction | No discernible improvement to sediments reduction | Costs not applicable, since no worthwhile environmental benefits would accrue | Regulatory and real estate obstacles | Downstream landowners would likely be concerned about increases in river stage | | |

**ATTACHMENT D, TABLE 3. SCREENING OF FDR MEASURES TO ADVANCE ENVIRONMENTAL SUSTAINABILITY (Continued)**

| FDR MEASURES: | | Compatibility with Supplemental Ecosystem Restoration Measures | Contribution to Aquatic Ecosystem Sustainability | Contribution to Terrestrial Ecosystem Sustainability | Contribution to Water Quality Improvement by removing nutrients | Contribution to Watershed Sediments Reduction | Potential for Cost-effectiveness | Potential Implementation Constraints | Potential Public/Agency Support | Total Rating Points | Ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S-6 | Flow Diversion--Timed (Behind Levee) Storage | 1 | 1 | 1 | 2 | 2 | 3 | 1 | 1 | 12 | 2 |
| | | None | Assumes crop production continues | Assumes crop production continues | Allows time for nutrients removal | Allows time for sediments removal | Assumes costs would be allocated to FDR and not environmental account | Regulatory and real estate obstacles | Affected landowners would likely object | | |
| S-7 | Channel Modifications—Overbank Conveyance Increase--Levee Set-backs | | None | 2 | 2 | 1 | 3 | 2 | 2 | 15 | 2 |
| | | U,AC | No discernible improvements to aquatic habitat | Potential exists for expansion of the riparian tree corridor in combination with vegetative management measure (measure 9) | An expanded vegetated floodway in combination with vegetative cover (e.g. measure 9) would allow for the removal of at least some nutrients from the system | An expanded floodway could allow for at least some deposition of sediments that otherwise would migrate downstream | Assumes costs would be allocated to FDR and not environmental account | Some regulatory and real estate obstacles | Likely a mixed reaction from landowners on the value of this modification. Agencies would generally support such an approach | | |

| ATTACHMENT D, TABLE 3. SCREENING OF FDR MEASURES TO ADVANCE ENVIRONMENTAL SUSTAINABILITY (Continued) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **FDR MEASURES:** | | **Compatibility with Supplemental Ecosystem Restoration Measures** | **Contribution to Aquatic Ecosystem Sustainability** | **Contribution to Terrestrial Ecosystem Sustainability** | **Contribution to Water Quality Improvement by removing nutrients** | **Contribution to Watershed Sediments Reduction** | **Potential for Cost-effectiveness** | **Potential Implementation Constraints** | **Potential Public/Agency Support** | **Total Rating Points** | **Ranking** |
| S-8 | Channel Modifications—Overbank Conveyance Increase—Remove Levee | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 16 | 2 |
| | | G,H,I,S,U,V,W,X, AA,AB,AC,AE | Potentially, a major increase in floodable vegetative habitat for fish reproduction | Assumes major portions of the area would convert to native terrestrial habitat types | An expanded vegetated floodway in combination with new vegetative cover would allow for the removal of at least some nutrients from the system | Allows time for sediments removal | Much of the cost would be allocated to FDR and not environmental account | Regulatory and real estate obstacles | Landowners would likely oppose the measure, but at least some agencies would be in favor of it | 16 | 2 |
| S-9 | Channel Modifications—Reduced Energy Loss via Vegetation Management | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 20 | 3 |
| | | G,H,U,V,W,X,Y, AB,AC,AE | Some increase in floodable vegetative habitat for fish reproduction | Some increase in terrestrial habitat via forest plantings or wet meadow habitat | Some increase in nutrients removal in newly created vegetative buffer areas | Vegetation would add a degree of resistance to water flows, thus allowing some sediment to drop out of the water column | Assumes costs would be allocated to FDR and not environmental account | Few obstacles evident. | No opposition likely | | |

| ATTACHMENT D, TABLE 3. SCREENING OF FDR MEASURES TO ADVANCE ENVIRONMENTAL SUSTAINABILITY (Continued) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **FDR MEASURES:** | | **Compatibility with Supplemental Ecosystem Restoration Measures** | **Contribution to Aquatic Ecosystem Sustainability** | **Contribution to Terrestrial Ecosystem Sustainability** | **Contribution to Water Quality Improvement by removing nutrients** | **Contribution to Watershed Sediments Reduction** | **Potential for Cost-effectiveness** | **Potential Implementation Constraints** | **Potential Public/Agency Support** | **Total Rating Points** | **Ranking** |
| S-10 | Channel Modification—Reduced Energy Loss via Channel Straightening | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1 |
| | | None | No discernible improvements to aquatic habitat | No discernible improvements to terrestrial habitat | No discernible improvement to nutrients reduction | Improved flows would expedite the movement of sediment in the downstream direction | Costs not applicable, since no worthwhile environmental benefits would accrue | Regulatory and real estate obstacles | Affected landowners would likely object | | |
| S-11 | Channel Modifications—Reduced Channel Geometry—Modifying/Reducing Constrictions (Bridges, Levees) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1 |
| | | | No discernible improvements to aquatic habitat | No discernible improvements to terrestrial habitat | No discernible improvement to nutrients reduction | No discernible improvement to sediments reduction | Costs not applicable, since no worthwhile environmental benefits would accrue | Regulatory and real estate obstacles | Downstream landowners would likely be concerned about increases in river stage | | |

| ATTACHMENT D, TABLE 3. SCREENING OF FDR MEASURES TO ADVANCE ENVIRONMENTAL SUSTAINABILITY (Continued) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **FDR MEASURES:** | | **Compatibility with Supplemental Ecosystem Restoration Measures** | **Contribution to Aquatic Ecosystem Sustainability** | **Contribution to Terrestrial Ecosystem Sustainability** | **Contribution to Water Quality Improvement by removing nutrients** | **Contribution to Watershed Sediments Reduction** | **Potential for Cost-effectiveness** | **Potential Implementation Constraints** | **Potential Public/Agency Support** | **Total Rating Points** | **Ranking** |
| S-12 | Levees/Floodwalls—Raising Levees/Strengthening | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 9 | |
| | | None | No improvements to aquatic habitat | No improvements to terrestrial habitat | No contributions to nutrients reduction | No contribution to sediments reduction | Costs not applicable, since no worthwhile environmental benefits would accrue | Regulatory and real estate obstacles | Reaction of regional landowners and agencies is likely to be mixed | | |
| S-13 | Channel Modifications—Overbank Conveyance Increase--Realignment of levees/structures | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 12 | 2 |
| | | U,AC | No improvements to aquatic habitat | No improvements to terrestrial habitat | No contributions to nutrients reduction | No contribution to sediments reduction | Costs not applicable, since no worthwhile environmental benefits would accrue | Regulatory and real estate obstacles | Individuals in protected area likely supportive, those upstream would likely oppose such a modification | | |
| S-14 | Levees/Floodwalls—Controlled Overtopping of Levees/Structures | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 19 | |
| | | U,W,Y,AB | Measure could be beneficial for fish reproduction if combined with a fish passage structure, fisheries easements and a delayed release of water back to the river | Measure could provide some short-term feeding habitat for migratory birds | Delayed release of water to river would allow time for at least some reduction nutrients | Slack water effect would allow for some sediment s to drop out of the water column | Assumes costs would be allocated to FDR and not environmental account | Not likely to be controversial if implemented on a willing seller basis | No opposition likely | | |

| ATTACHMENT D, TABLE 3. SCREENING OF FDR MEASURES TO ADVANCE ENVIRONMENTAL SUSTAINABILITY (Continued) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **FDR MEASURES:** | | **Compatibility with Supplemental Ecosystem Restoration Measures** | **Contribution to Aquatic Ecosystem Sustainability** | **Contribution to Terrestrial Ecosystem Sustainability** | **Contribution to Water Quality Improvement by removing nutrients** | **Contribution to Watershed Sediments Reduction** | **Potential for Cost-effectiveness** | **Potential Implementation Constraints** | **Potential Public/Agency Support** | **Total Rating Points** | **Ranking** |
| S-15 | Levees/Floodwalls—Low Profile Berms (Protection of environmentally sensitive areas) | 3 | 3 | 3 | 2 | 1 | 3 | 3 | 3 | 21 | |
| | | G,H,U,V,W,X, Y,Z,AB,AC,AE | In combination with various other water control structures, interior water levels could be managed to favor fisheries habitat management | In combination with various other water control structures, interior water levels could be managed to favor wetland wildlife species management | Floodable wetland management areas would help reduce nutrient levels | Assuming the area was previously flood unprotected, the placement of a low – profile levee would not reduce the river's sediment loads | Assumes costs would be allocated to FDR and not environmental account | If the lands are already in public ownership, the regulatory and real estate considerations should be minimal | Due to public land ownership and the low – profile nature of the measure—public opposition to the measure would likely be minor | | |
| S-16 | Levees/Floodwalls—Improved Interior Drainage/Pumping Capacity | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 12 | |
| | | None | No discernible improvements to aquatic habitat | No discernible improvements to terrestrial habitat | No discernible improvement to nutrients reduction | No discernible improvement to sediments reduction | Costs not applicable, since no worthwhile environmental benefits would accrue | Minimal regulatory obstacles. Affected lands are already owned by the affected farm operations. | Measure would not likely be controversial | | |

## ATTACHMENT D, TABLE 4. SCREENING OF FDR MEASURES TO ADVANCE ENVIRONMENTAL SUSTAINABILITY

| FDR MEASURES: | | Compatibility with Supplemental Ecosystem Restoration Measures (See Measures Code) | Contribution to Aquatic Ecosystem Sustainability | Contribution to Terrestrial Ecosystem Sustainability | Contribution to Water Quality Improvement by removing nutrients | Contribution to Watershed Sediments Reduction | Potential for Cost-effectiveness | Potential Implementation Constraints | Potential Public/Agency Support | Total Rating Points | Ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|
| N-1,2,3,4 | Elevation of Structures | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 2 | 12 | 2 |
| | | None | No discernible improvements to aquatic habitat | No discernible improvements to terrestrial habitat | No discernible improvement to nutrients reduction | No discernible improvement to sediments reduction | Can be accomplished at a very low cost | Minimal regulatory obstacles. | Measure would not likely be highly controversial | | |
| N-5 | Reduce Existing Damage Susceptibility via Relocations | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 11 | 1 |
| | | None | No discernible improvements to aquatic habitat | No discernible improvements to terrestrial habitat | No discernible improvement to nutrients reduction | No discernible improvement to sediments reduction | Costs not applicable, since no worthwhile environmental benefits would accrue | Minimal regulatory obstacles. Affected landowners would be justly compensated for the relocations | Measure would not likely be highly controversial | | |
| N-6,7,8 | Small Levees and/or Floodwalls (and closures) | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 11 | 1 |
| | | None | No discernible improvements to aquatic habitat | No discernible improvements to terrestrial habitat | No discernible improvement to nutrients reduction | No discernible improvement to sediments reduction | Moderate amount of cost to work of this type | Minimal regulatory obstacles | Measure would not likely be highly controversial | | |

| ATTACHMENT D, TABLE 4. SCREENING OF FDR MEASURES TO ADVANCE ENVIRONMENTAL SUSTAINABILITY (Continued) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **FDR MEASURES:** | | **Compatibility with Supplemental Ecosystem Restoration Measures (See Measures Code)** | **Contribution to Aquatic Ecosystem Sustainability** | **Contribution to Terrestrial Ecosystem Sustainability** | **Contribution to Water Quality Improvement by removing nutrients** | **Contribution to Watershed Sediments Reduction** | **Potential for Cost-effectiveness** | **Potential Implementation Constraints** | **Potential Public/Agency Support** | **Total Rating Points** | **Ranking** |
| N-9, 10 | Reduce Existing Damage Susceptibility via Floodproofing | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 12 | 2 |
| | | None | No discernible improvements to aquatic habitat | No discernible improvements to terrestrial habitat | No discernible improvement to nutrients reduction | No discernible improvement to sediments reduction | Costs not applicable, since no worthwhile environmental benefits would accrue | Minimal regulatory obstacles. Affected lands are already owned by the affected farm operations. | Measure would not likely be controversial | | |
| N-11 | Reduce Existing Damage Susceptibility via Improved Flood-Warning/Preparedness | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 12 | 2 |
| | | None | No discernible improvements to aquatic habitat | No discernible improvements to terrestrial habitat | No discernible improvement to nutrients reduction | No discernible improvement to sediments reduction | Costs not applicable, since no worthwhile environmental benefits would accrue | No regulatory obstacles | Measure would not likely be controversial | | |

| ATTACHMENT D, TABLE 4. SCREENING OF FDR MEASURES TO ADVANCE ENVIRONMENTAL SUSTAINABILITY (Continued) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **FDR MEASURES:** | | **Compatibility with Supplemental Ecosystem Restoration Measures (See Measures Code)** | **Contribution to Aquatic Ecosystem Sustainability** | **Contribution to Terrestrial Ecosystem Sustainability** | **Contribution to Water Quality Improvement by removing nutrients** | **Contribution to Watershed Sediments Reduction** | **Potential for Cost-effectiveness** | **Potential Implementation Constraints** | **Potential Public/Agency Support** | **Total Rating Points** | **Ranking** |
| N-12 | Reduce Future Damage Susceptibility via Land Use/Construction Regulation (floodplain management) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1 |
| | | None | No discernible improvements to aquatic habitat | No discernible improvements to terrestrial habitat | No discernible improvement to nutrients reduction | No discernible improvement to sediments reduction | Costs not applicable, since no worthwhile environmental benefits would accrue | Extensive and potentially difficult coordination could be required | Such changes could be highly controversial with the public | | |
| N-13 | Reduce Existing Damage Susceptibility via Alternative Agriculture/Flood Tolerant Crops | 2 | 1 | 2 | 2 | 1 | 3 | 3 | 3 | 17 | 3 |
| | | U,AC | No discernible improvements to aquatic habitat | Potentially combinable with measures 9, 13 or 14. Could improve utility of certain areas to migratory bird species | Provides some potential for the extraction of nutrients | No impact on existing sediments situation | Assumes costs would be allocated to FDR and not environmental account | No regulatory obstacles | Measure would not likely be controversial | | |

| ATTACHMENT D, TABLE 4. SCREENING OF FDR MEASURES TO ADVANCE ENVIRONMENTAL SUSTAINABILITY (Continued) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **FDR MEASURES:** | | **Compatibility with Supplemental Ecosystem Restoration Measures (See Measures Code)** | **Contribution to Aquatic Ecosystem Sustainability** | **Contribution to Terrestrial Ecosystem Sustainability** | **Contribution to Water Quality Improvement by removing nutrients** | **Contribution to Watershed Sediments Reduction** | **Potential for Cost-effectiveness** | **Potential Implementation Constraints** | **Potential Public/Agency Support** | **Total Rating Points** | **Ranking** |
| N-14 | Reduce Future Damage Susceptibility--Acquisition/Buy-outs | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 21 | 3 |
| | | U,V,W,X,Y,Z, AA,AB,AC,AE | Area could subsequently be managed in part for fisheries purposes | If subsequently managed as wetlands habitat, this measure could significantly contribute to wetlands wildlife species habitat conditions | If subsequently managed as wetlands habitat, this measure could contribute significantly to nutrients removal | If subsequently operated as managed wetland, rather than as cropland—the acquired areas could potentially be more frequently flooded, and thus more frequently participate in sediments production | Assumes costs would be allocated to FDR and not environmental account | Not likely to be highly controversial if implemented on a willing seller basis | Based on the 1993 flood experience, most agencies would likely be supportive of this approach | | |

**RATING CODE:** 1 = Measure provides little or no value in addressing the specified criterion
2 = Measure addresses the specified criterion to a moderate extent relative to other planning measures
3 = Measure addresses the specified criterion to a major extent, relative to other planning measures

**RANKING:**

| | | | | |
|---|---|---|---|---|
| 1 | Total Score | = | 8-11 | Points |
| 2 | " | = | 12-16 | " |
| 3 | " | = | 17-21 | " |

**SUPPLEMENTAL ENVIRONMENTAL RESTORATION MEASURES CODE:**

A. Conservation Farming
B. Terraces
C. Farm Ponds
D. Dry Detention Basins
E. Grade Control Weirs
F. Construction Site Best Management Practices
G. Nutrients Farming
H. Wetlands Restoration
I. Subterranean Drainage Reconfiguration
J. Fertilizer Application Controls
K. Bankline Revetment
L. Bank Revegetation
M. Restore Tributary Channels
N. Evacuation
O Aeration Systems
P. Barrier Islands
Q. Submerged Habitat Structures
R. Water Control Structures
S. Dredge Material Placement
T. Nesting Islands
U. Vegetation Plantings
V. Low Profile Berms
W. Water Control Structures—Gates
X. Water Control Structures—Pump Stations
Y Channel Creation/Modification
Z. Nesting Structures
AA. Fee Title Acquisition
AB. Conservation Easements—Fisheries
AC. Conservation Easements---Wildlife
AD. Conservation Easements—Habitat Incentives on Private Lands
AE. Conservation Easements—Tax Revenue Equalization
AF. Adaptive Management

UMRCP/floodplain/measures/ Environmental Screening Table 30 Dec 03

# CHAPTER 1—ATTACHMENT E

## ENVIRONMENTAL PLANNING PHILOSOPHY ON FDR SITUATIONAL AREAS

## ATTACHMENT E, TABLE 1. ENVIRONMENTAL PLANNING PHILOSOPHY ON FDR SITUATIONAL AREAS

| Existing Situational Area | River | Sample Locations | | | Environmental Team Philosophy |
|---|---|---|---|---|---|
| | | MVP | MVR | MVS | |
| Protected Urban Area | Mississippi | • Winona, MN (400 yr)<br>• La Crosse, WI (10yr) | • Hannibal, MO (200 yr)<br>• Keithsburg, IL (50 yr)<br>• Andalusia, IL (25 yr) | • N/A | • To protect the human environment (especially for health and safety reasons), urban levees should be raised to at least a 500 year level of protection.<br>• A levee raise in an existing urban area is not assumed to induce new development.<br>• No significant urban ecosystem restoration opportunities are assumed to exist. |
| | Illinois | • N/A | • East Peoria, IL (50 yr) | • Village of Pearl, IL (10 yr) | |
| Unprotected Urban Area | Mississippi | • St. Paul Park, MN<br>• Prescott, WN<br>• Harper's Ferry, IA | • Princeton, IA<br>• Moline, IL<br>• Alexandria, MO | • Kimmswick, MO<br>• Louisiana, MO | • To protect the human environment (especially for health and safety). unprotected urban areas should be protected to the 500 year level.<br>• Induced development impacts should be avoided by acquiring only the minimal land interest needed to accomplish urban protection (e.g. a ring levee could be placed around an unprotected urban area, rather than enclosing additional undeveloped lands into the protection system).<br>• No significant urban ecosystem restoration opportunities are assumed to exist. |
| | Illinois | • N/A | • Ottawa, IL | • Hardin, IL<br>• Chambersburg, IL | |
| Protected Agricultural Area | Mississippi | • N/A | • Henderson #3, IL (25 yr)<br>• South River, MO (50 yr) | • Harrisonville, IL (50 yr)<br>• Boise Brule, MO (70 yr)<br>• Elsberry D&LD, MO (15 yr) | • Minimal ag land protection up to the 50 year level may be desirable. This provides substantial FDR for crops production, while not inducing adverse effects (both hydraulic or induced secondary development effects) within the 100-year floodplain.<br>• Some degree of conversion of existing ag ground to native habitat types may be desirable from a federal perspective. Conservation easement programs or buyouts could be potential options for adjusting landuse.<br>• Induced development impacts could be avoided by limiting the 500-year level of protection to river bridge approaches. It would be environmentally desirable to not have D&LD levee raises exceed the 50-year protection level.<br>• Habitat incentives should not be limited to Corps programs alone. |
| | Illinois | • N/A | • Spring Lake, IL (200 yr)<br>• Big Lake, IL (25 yr)<br>• Keystone, IL (10 yr) | • Nutwood, IL. (10 yr)<br>• Scott County, IL. (20 yr)<br>• Bluffdale Farms, IL (5 yr) | |
| Unprotected Agricultural Area | Mississippi | • N/A | • N/A | • N/A | • Consistent with the overall approach to the UMRCP—no levee protection is proposed for presently unprotected agricultural areas. |
| | Illinois | • N/A | • N/A | • N/A | |

## ATTACHMENT E, TABLE 1. ENVIRONMENTAL PLANNING PHILOSOPHY ON FDR SITUATIONAL AREAS (Continued)

| Existing Situational Area | River | Sample Locations | | | Environmental Team Philosophy |
|---|---|---|---|---|---|
| | | MVP | MVR | MVS | |
| Protected Mixed Urban/Agricultural Area | Mississippi | • Cochrane, WI (50 yr) | • Canton, MO (200 yr) | • Marstan-Portuchek Private Assoc. No. 1, MO (200 yr) | • To protect the human environment, the urban portion of urban/ag-leveed areas should be protected to the 500 yr level.<br>• Minimal ag land protection up to the 50 year level may be desirable. This provides substantial FDR for crops production, while not inducing adverse impacts (both hydraulic and induced secondary development effects) to the 100 year level floodplain.<br>• Induced development impacts could be avoided by limiting the 500 year level of protection to the urban and interstate highway portion of the D&LDs (e.g. a ring levee placed around existing village, and instead of raising an entire D&LD levee to protect an approach to an interstate highway crossing—the road is simply raised to the 500 year protection level). As a further safeguard, any D&LD levee raise should not exceed the 50 year level of protection.<br>• Habitat incentives should not be limited to Corps programs alone. |
| | Illinois | • N/A | • Pekin-LaMarsh (50 yr) | • N/A | |
| Fish and Wildlife Management Area | Mississippi | • N/A | • Spring Lake (<10 yr)<br>• Bay Island | • Ted Shanks CA, MO (20 yr)<br>• Batchtown WMA, IL (<5yr)<br>• Union County CA, (>10 yr) | • The objective is "no net adverse impacts" from water level induced changes resulting from the installation of FDR measures. However, it is probable that only a very few high levee refuges (like Banned Marsh with a 100 yr levee), would experience induced rises of the sort that would require mitigation. |
| | Illinois | • N/A | • Lake Chautauqua (<10 yr)<br>• Rice Lake (<10 yr) | • Meredosia Refuge, IL (>10 yr)<br>• Stump Lake, IL (<5 yr) | |

# CHAPTER 1—ATTACHMENT F

# ENVIRONMENTAL PRIORITIZATION METHODOLOGY

## CHAPTER 1—ATTACHMENT F

## ENVIRONMENTAL PRIORITIZATION OF LEVEED AREAS

**Methodology.** The UMRCP study made a general prioritization of the biodiversity potential of the various floodplain leveed agricultural areas using the navigation study GIS data base, an extraction of flood flow frequency model data, and a scaling-weighting assessment tool. The procedure followed the following steps:

1. Six factors were identified by the environmental team (ET) as being generally reflective of a site's biodiversity (**Table 1**). These factors were: (1) within pool location (upper, middle or lower pool location), (2) urban development (percentage of site in urban usage), (3) agricultural development (total acres), (4) tributary feeders (total number entering or immediately adjacent to the site), (5) landowners (total number within the leveed area), and (6) surface diversity (a composite of several sub-factors). The surface diversity sub-factors include: (a) floodplain below bank elevation (percentage of floodplain), (b) cross-sectional area below bank elevation (square feet), and (c) control points below bank elevation (standard deviation).

2. The various factors and sub-factors were assigned weights by the ET using the ranked pair-wise comparison technique described in **Tables 1 & 2**. The ET's rationale for ranking the factors and sub-factors in relative importance from top to bottom is presented in **Tables 3 & 4**.

3. **Table 5** reflects the rating scale applied by the ET to place the raw data observations for each factor and sub-factor into one of three potential categories using a 1-3 rating scale. The category descriptions essentially breakup the populations of data into 3 compartments of an equal number of observations.

4. **Table 6** catalogs the raw data for the various agricultural districts. Note that incomplete data exists for 16 of the 106 leveed areas.

5. **Table 7** shows the scaled ratings assigned to each factor/sub-factor by leveed area.

6. **Table 8** reflects the product of the scaled ratings times the **Tables 1 & 2** factor/sub-factor weights.

**Results.** Table 8 also provides a total environmental score for each D&LD, and then indicates a site's relative ranking on a 1-3 scale, with a higher number indicating greater environmental value to a given site location.

# ATTACHMENT F, TABLE 1. ASSIGNMENT OF ENVIRONMENTAL PRIORITIZATION WEIGHTS BASED ON THE RANKED PAIRWISE COMPARISON TECHNIQUE

| FACTOR | | ASSIGNMENT OF IMPORTANCE VALUES | | | | | | | | | SUM | FACTOR WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | Within Pool Location (U, M, L Pool) | 1 1 1 0 0 1 | | | | | | | | | 4.0 | 0.22 |
| B | Urban Development (% Site) | 0 | 0 0 0 0 1 | | | | | | | | 1.0 | 0.06 |
| C | Agricultural Development (Total Acres) | 0 | 1 | 0 0 0 1 | | | | | | | 2.0 | 0.11 |
| D | Tributary Feeders (Total Number) | 0 | 1 | 1 | 0 0 1 | | | | | | 3.0 | 0.17 |
| E | Landowners (Total Number) | 1 | 1 | 1 | 1 | | | | | | 4.0 | 0.22 |
| F | Surface Diversity | 1 | 1 | 1 | 1 | | | | | | 4.0 | 0.22 |
| H | Dummy Factor | 0 | 0 | 0 | 0 | | | | | | 0.0 | 0.00 |
| | | | | | | | | | | GRAND TOTAL | 18.0 | 1.00 |

Procedure:

1. Compare Factor “A” with Factor “B.” Assign a value of 1.0 to that factor perceived to be the more important and assign a value of 0.0 to the least important factor. If the two parameters are believed to have the same relative significance, assign a value of 0.5 to each.
2. Now compare Factor “A” with Factor “C”, then “A” with “D” and so on down the list.
3. Then compare Factor “B” with all the other factors (don’t compare “B” with Factor “A” – this has already been done).
4. Continue this comparative process with each of the remaining factors.
5. Determine totals for each factor and a grand total for all comparisons.
6. Divide the total score for a given factor by the grand total for that factor’s weight.
7. State the major rationale used in assigning the relative importance values.

NOTE: The final comparison with a dummy factor assures that no real factor has a weight value of 0.0.

UMRCP/Floodplain/Envir Prioritiz…/Parameter Weighting…/Parameter Weightings Form/Envir Team Combined Envir Para Weights 10 Nov 03

## ATTACHMENT F, TABLE 2. ASSIGNMENT OF SURFACE DIVERSITY WEIGHTS BASED ON THE RANKED PAIRWISE COMPARISON TECHNIQUE

| FACTOR | | ASSIGNMENT OF IMPORTANCE VALUES | | | | | | | | | SUM | FACTOR WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F-1 | Floodplain Below Bank Elevation (% Floodplain) | 1 1 1 | | | | | | | | | 3.0 | 0.50 |
| F-2 | Cross-sectional Area Below Bank Elevation (Sq Ft) | 0 | 1 1 | | | | | | | | 2.0 | 0.33 |
| F-3 | Control Points Below Bank Elevation (Total Number) | 0 | 0 | 1 | | | | | | | 1.0 | 0.17 |
| F-4 | Dummy Factor | 0 | 0 | 0 | | | | | | | | |
| | | | | | | | | | | GRAND TOTAL | 6.0 | 1.00 |

Procedure:

1. Compare Factor "A" with Factor "B." Assign a value of 1.0 to that factor perceived to be the more important and assign a value of 0.0 to the least important factor. If the two parameters are believed to have the same relative significance, assign a value of 0.5 to each.
2. Now compare Factor "A" with Factor "C", then "A" with "D" and so on down the list.
3. Then compare Factor "B" with all the other factors (don't compare "B" with Factor "A" – this has already been done).
4. Continue this comparative process with each of the remaining factors.
5. Determine totals for each factor and a grand total for all comparisons.
6. Divide the total score for a given factor by the grand total for that factor's weight.
7. State the major rationale used in assigning the relative importance values.

NOTE: The final comparison with a dummy factor assures that no real factor has a weight value of 0.0.

UMRCP/Floodplain/Envir Prioritiz…/Parameter Weighting…/Parameter Weightings Form/Envir Team Combined Envir Para Weights 10 Nov 03

| ATTACHMENT F, TABLE 3. RATIONALE FOR OVERALL RANKING OF ENVIRONMENTAL PRIORITIZATION FACTORS | | |
|---|---|---|
| **Environmental Team Designated Rank Order of Factor Importance**<br><br>(From Most Environmentally Sensitive to Least Sensitive) | | **Rationale for Ranking** |
| 1 | Surface Diversity (Scaled value based on three-sub parameters) | Good indicator of potential habitat diversity, connectivity, and storage. |
| 2 | Landowners (Total Number) | Good indicator of the degree of difficulty likely for acquiring lands from willing sellers for any hydrologic mitigation. |
| 3 | Within Pool Location (Upper, Middle, Lower) | Important consideration for connectivity, and ability to efficiently move water onto and off of the site for management purposes. |
| 4 | Tributary Feeders (Total Number) | Confluence areas are valuable habitat that is often heavily impacted by channelization. Leveed areas with many feeders could also become valuable for water storage, nutrients denitrification, and sediments storage. |
| 5 | Agricultural Development (Total Acres) | Because of the economy of scale, the larger agricultural sites (used as FDR mitigation to increase storage/water conveyance) would be the most cost-efficient sites for subsequent fish and wildlife management. |
| 6 | Urban Development (Percent Site) | Urban/disturbed areas would likely be avoided. May be most difficult to restore. Areas void of development would receive higher consideration. |

| ATTACHMENT F, TABLE 4. RATIONALE FOR OVERALL RANKING OF ENVIRONMENTAL PRIORITIZATION FACTORS ( | | |
|---|---|---|
| **Environmental Team Designated Rank Order of Factor Importance**<br><br>(From Most Environmentally Sensitive to Least Sensitive) | | **Rationale for Ranking** |
| 1 | Percent fFloodplain below 2-year flood event elevation* | Provides a measure of the expansiveness of lower elevation areas for potential wetlands development. |
| 2 | Control points below 2-year flood event elevation | Provides a direct measure of surface irregularity. |
| 3 | Cross-sectional area below bank elevation | Provides a general indication of depth diversity at a site. |
| * Elevation of 2-year flood event was used to approximate bank-overtopping elevation. | | |

| ATTACHMENT F, TABLE 5. RATING SCALE FOR SITE ENVIRONMENTAL PRIORITIZATION FACTORS | | | | | | |
|---|---|---|---|---|---|---|
| Factor | | Sub-Factor | | Scaled Rating Assignment | | |
| | | | | 3 | 2 | 1 |
| A | Within Pool Location (U,M,L Pool) | | | Lower pool | Middle pool, or immediately below a dam | Upper pool |
| B | Urban Development (% Site) | | | Site < or = 1% developed | Site > 1 , but < 5 % developed | Site > or = 5% developed |
| C | Agricultural Development (Total Acres) | | | >8,900 Acres | >2,500 Acres but < or = 8,900 Acres | <2,500 Acres |
| D | Tributary Feeders (Total Number) | | | >2 Tributaries | 1-2 Tributaries | No Tributaries |
| E | Landowners (Total Number) | | | <39 Landowners | <119 but > or = 39 Landowners | > or = 119 Landowners |
| F | Surface Diversity | F-1 | Floodplain Below Bank Elevation (% Floodplain) | >93% | >74% but < or = 93% | <74% |
| | | F-2 | Cross-sectional Area Below Bank Elevation (Sq Ft) | > 109,000 Sq Ft | >66,000 Sq Ft, but < or = 109,000 Sq Ft | < or = 66,000 Sq Ft |
| | | F-3 | Control Points Below Bank Elevation (SD) | > 2.9 | >1.9, but < or = 2.9 | < 1.9 |
| Final Ranking | | | | >2.10 | >1.85 but < or = 2.10 | < or = 1.85 |
| Umrcp/floodplain/envir prioritization levee/parameter weightings envir team/rating scale for envir prioritiz 2 Feb 04 | | | | | | |

**ATTACHMENT F, TABLE 6. ENVIRONMENTAL PRIORITIZATION—RAW DATA**

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | RAW DATA | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within in Pool Location (U,M,L Pool) | Urban Development (%Site) | Agricultural Development (Total Acres) | Tributary Feeders (Total Number) | Landowners (Total Number) | Floodplain Below Bank Elevation (%) | X-Sectional Area Below Bank Elev. (Sq Ft) | Contour Point Elevations (SD) |
| **Rock Island** | | | | | | | | | | | | | |
| **Miss.** | | | | | | | | | | | | | |
| Rock Island | Meredosia | IL | Federal | Ag | 511.5 | M | 2 | 8,899 | 0 | 1,041 | NX | NX | NX |
| Rock Island | Drury | IL | Federal | Ag | 455.2 | U | 1 | 4,463 | 5 | 74 | 93% | 45,411 | 3.0 |
| Rock Island | Bay Island | IL | Federal | Ag | 442.6 | L | 1 | 17,076 | 5 | 98 | 99% | 130,790 | 3.9 |
| Rock Island | Iowa River-Flint CR Upper | IA | Federal | Ag | 427.9 | M | 3 | 39,883 | 1 | 78 | 62% | 211,796 | 2.9 |
| Rock Island | Iowa River-Flint CR Middle | IA | Federal | Ag | 416.4 | L | | | 0 | 103 | 87% | 235,907 | 3.9 |
| Rock Island | Henderson #1 | IL | Federal | Ag | 407.3 | U | 4 | 6,071 | 1 | 318 | 84% | 66,582 | 2.8 |
| Rock Island | Iowa River-Flint CR Lower | IA | Federal | Ag | 408.1 | U | | | 0 | 215 | 89% | 102,712 | 3.8 |
| Rock Island | Henderson #2 | IL | Federal | Ag | 402.4 | U | 3 | 7,188 | 1 | 22 | 72% | 121,796 | 3.3 |
| Rock Island | Green Bay | IA | Federal | Ag | 391.0 | M | 0 | 52 | 1 | 88 | 53% | 202,052 | 4.0 |

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | RAW DATA | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within in Pool Location (U,M,L Pool) | Urban Development (%Site) | Agricultural Development (Total Acres) | Tributary Feeders (Total Number) | Landowners (Total Number) | Floodplain Below Bank Elevation (%) | X-Sectional Area Below Bank Elev. (Sq Ft) | Contour Point Elevations (SD) |
| Rock Island | Des Moines /Mississippi | IA | Federal | Ag | 359.0 | U | 3 | 7,544 | 4 | 215 | 39% | 44,666 | 0.7 |
| Rock Island | Hunt-Lima | IL | Federal | Ag | 351.7 | M | 1 | 29,294 | 2 | 116 | 97% | 160,475 | 3.6 |
| Rock Island | Gregory | IA | Federal | Ag | 351.3 | M | 0 | 7,183 | 5 | 14 | 83% | 130,801 | 2.2 |
| Rock Island | Indian Grave Upper | IL | Federal | Ag | 338.8 | U | 1 | 18,093 | 5 | 42 | 92% | 108,541 | 3.0 |
| Rock Island | Indian Grave Lower | IL | Federal | Ag | 332.9 | U | | | 4 | 36 | 99% | 99,309 | 2.9 |
| Rock Island | Union Township | IL | Federal | Ag | 333.3 | U | 4 | 2,784 | 2 | 47 | 81% | 206,368 | 2.8 |
| Rock Island | Fabius | MO | Federal | Ag | 327.8 | M | 2 | 13,302 | 2 | 288 | 65% | 210,765 | 3.1 |
| Rock Island | Marion County | MO | Federal | Ag | 322.4 | M | 0 | 3,800 | 2 | 85 | 85% | 101,030 | 1.8 |
| Rock Island | South River | MO | Federal | Ag | 315.7 | M | 3 | 8,652 | 4 | 40 | 94% | 150,194 | 2.4 |
| Rock Island | Sny Island Reach I | IL | Federal | Ag | 307.6 | L | 1 | 39,663 | 12 | 62 | 97% | 89,285 | 2.2 |
| Rock Island | Sny Island Reach II | IL | Federal | Ag | 292.5 | U | 1 | 15,912 | 6 | 84 | 91% | 108,231 | 2.3 |
| Rock Island | Sny Island Reach III | IL | Federal | Ag | 282.3 | L | 1 | 35,711 | 13 | 127 | 97% | 204,812 | 2.3 |
| Rock Island | Sny Island Reach IV | IL | Federal | Ag | 268.8 | U | 0 | 9,586 | 11 | 74 | 94% | 105,726 | 2.1 |
| Rock Island | Green Island | IA | Non-Fed. | Ag | 547.3 | U | 1 | 1,157 | 0 | 34 | 95% | 148,068 | 1.3 |
| Rock Island | Muscatine-Louisa Co. | IA | Non-Fed. | Ag | 448.5 | M | | | | 142 | | | |

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | RAW DATA | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within in Pool Location (U,M,L Pool) | Urban Development (%Site) | Agricultural Development (Total Acres) | Tributary Feeders (Total Number) | Landowners (Total Number) | Floodplain Below Bank Elevation (%) | X-Sectional Area Below Bank Elev. (Sq Ft) | Contour Point Elevations (SD) |
| Rock Island | Henderson #3 | IL | Non-Fed. | Ag | 413.2 | L | 1 | 2,182 | 3 | 16 | 69% | 65,918 | 3.1 |
| Rock Island | Mississippi & Fox Upper | IA | Non-Fed. | Ag | 357.8 | U | 1 | 7,800 | 2 | ? | 98% | 53,697 | 3.5 |
| Rock Island | Mississippi & Fox Lower | IA | Non-Fed. | Ag | 356.2 | M | | | 1 | ? | 87% | 62,751 | 5.8 |
| Rock Island | Reiff, Nick | 0 | Non-Fed. | Ag | 320.0 | U | | | | ? | 10% | 32,615 | 0.5 |
| **ILLINOIS WATERWAY** | | | | | | | | | | | | | |
| Rock Island | Pekin-LaMarsh | IL | Federal | Ag | 152.4 | U | 10 | 2,046 | 1 | 31+ | 96% | 105,230 | 3.3 |
| Rock Island | Spring Lake | IL | Federal | Ag | 141.0 | U | 1 | 10,645 | 1 | 185 | 96% | 122,721 | 2.7 |
| Rock Island | East Liverpool | IL | Federal | Ag | 130.1 | M | 0 | 2,770 | 2 | 119 | 100% | 104,828 | 0.8 |
| Rock Island | Lacey, Langellier, W. Matanzas, Kerton Valley DLD | IL | Federal | Ag | 115.6 | M | 1 | 10,248 | 1 | 87 | 71% | 94,334 | 3.3 |
| Rock Island | Big Lake | IL | Federal | Ag | 105.7 | L | 1 | 3,751 | 4 | 18 | 93% | 78,074 | 4.3 |
| Rock Island | Kelly lake | IL | Federal | Ag | 101.7 | L | 1 | 927 | 3 | 13 | 100% | 40,315 | 3.9 |
| Rock Island | Hager Slough | IL | Non-Fed. | Ag | 92.0 | L | 1 | 5,693 | 1 | 6 | 70% | 63,211 | 2.6 |
| Rock Island | Coal Creek | IL | Federal | Ag | 88.5 | L | 1 | 5,757 | 3 | 17 | 100% | 133,508 | 2.4 |
| Rock Island | Lost Creek | IL | Federal | Ag | 89.7 | L | 8 | 2,754 | 1 | 25 | 100% | 15,114 | 1.6 |
| Rock Island | South Beardstown | IL | Federal | Ag | 84.2 | L | 4 | 7,175 | 0 | 124 | 95% | 122,392 | 3.3 |
| Rock Island | Crane Creek | IL | Federal | Ag | 84.2 | L | 1 | 3,985 | 3 | 21 | 98% | 103,833 | 4.2 |

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | RAW DATA | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within in Pool Location (U,M,L Pool) | Urban Development (%Site) | Agricultural Development (Total Acres) | Tributary Feeders (Total Number) | Landowners (Total Number) | Floodplain Below Bank Elevation (%) | X-Sectional Area Below Bank Elev. (Sq Ft) | Contour Point Elevations (SD) |
| Rock Island | Seahorn | IL | Federal | Ag | 111.5 | M | 2 | 1,463 | 4 | 1 | 45% | 12,638 | 1.7 |
| Rock Island | Butler | IL | Non-Fed. | Ag | 0.0 | ? | | | | ? | | | |
| Rock Island | Herman Levee | IL | Non-Fed. | Ag | 178.0 | L | 1 | 130 | 0 | ? | NX | NX | NX |
| Rock Island | Hollerich | IL | Non-Fed. | Ag | 217.5 | U | | | | ? | NX | NX | NX |
| Rock Island | Keystone | IL | Non-Fed. | Ag | 157.5 | U | 40 | 0 | 0 | ? | 47% | 19,609 | 1.9 |
| Rock Island | Tersellic | IL | Non-Fed. | Ag | 225.9 | ? | | | | ? | NX | NX | NX |
| Rock Island | Hennepin | IL | Federal | Ag-Cons | 204.9 | M | 1 | 2,505 | 2 | 707 | 100% | 106,600 | 3.4 |
| Rock Island | Banner Special | IL | Federal | Ag-Cons | 141.9 | U | 1 | 349 | 4 | 7 | 90% | 74,035 | 2.9 |
| Rock Island | Thompson | IL | Federal | Ag-Cons | 123.4 | M | 2 | 5,190 | 2 | 571 | 99% | 165,693 | 4.2 |
| **St. Louis** | | | | | | | | | | | | | |
| **Miss.** | | | | | | | | | | | | | |
| St. Louis | Columbia | IL | Federal | Ag | 160.9 | U | 2 | 12,640 | 3 | 189 | 72% | 99,088 | 2.2 |
| St. Louis | "Harr,Str,Ft. Ch" | IL | Federal | Ag | 0.0 | | | | | | | | |
| St. Louis | Harrisonville | IL | Federal | Ag | 142.9 | U | 2 | 24,068 | 11 | 379 | 68% | 71,107 | 2.6 |
| St. Louis | Stringtown | IL | Federal | Ag | 139.5 | U | 1 | 2,570 | 0 | 37 | 52% | 57,578 | 1.1 |

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | RAW DATA | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within in Pool Location (U,M,L Pool) | Urban Development (%Site) | Agricultural Development (Total Acres) | Tributary Feeders (Total Number) | Landowners (Total Number) | Floodplain Below Bank Elevation (%) | X-Sectional Area Below Bank Elev . (Sq Ft) | Contour Point Elevations (SD) |
| St. Louis | Fort Chartres & Ivy Landing | IL | Federal | Ag | 134.0 | U | 2 | 13,283 | 7 | 205 | 55% | 69,415 | 2.3 |
| St. Louis | Prairie Du Rocher & Modoc | IL | Federal | Ag | 124.5 | U | 2 | 14,449 | 5 | 287 | 57% | 69,322 | 2.1 |
| St. Louis | Kaskaskia Island | MO | Federal | Ag | 113.4 | U | 1 | 8,755 | 0 | 160 | 91% | 260,405 | 2.7 |
| St. Louis | Bois Brule | MO | Federal | Ag | 103.2 | U | 2 | 24,710 | 2 | 534 | 98% | 132,315 | 2.6 |
| St. Louis | Degognia & Fountain Bluff | IL | Federal | Ag | 91.8 | U | 3 | 32,764 | 7 | 702 | 76% | 138,596 | 2.3 |
| St. Louis | Grand Tower | IL | Federal | Ag | 78.9 | U | 3 | 7,196 | 0 | 485 | 56% | 77,239 | 1.1 |
| St. Louis | "The Big 5" | IL | Federal | Ag | 0.0 | | | | | | | | |
| St. Louis | Miller Pond | IL | Federal | Ag | 70.7 | U | 1 | 3,465 | 5 | 54 | 75% | 17,830 | 1.3 |
| St. Louis | Preston | IL | Federal | Ag | 70.7 | U | 2 | 11,454 | 1 | 203 | 78% | 70,156 | 2.8 |
| St. Louis | Clear Creek | IL | Federal | Ag | 61.0 | U | 2 | 10,387 | 3 | 225 | 97% | 126,700 | 2.8 |
| St. Louis | E. Cape Girardeau & Clear Creek | IL | Federal | Ag | 51.5 | U | 3 | 7,364 | 0 | 195 | 98% | 251,628 | 3.5 |
| St. Louis | N. Alexander Co. | IL | Federal | Ag | 51.5 | U | 2 | 1,370 | 1 | 90 | 100% | 128,318 | 4.1 |
| St. Louis | Riverland | MO | Non-Fed. | Ag | 289.6 | M | 0 | 1,501 | NA | NA | NA | NA | NA |
| St. Louis | Kissinger Levee District | MO | Non-Fed. | Ag | 266.4 | U | 0 | 2,148 | 1 | 64 | 69% | 35,027 | 1.2 |
| St. Louis | Elsberry Drainage District | MO | Non-Fed. | Ag | 255.9 | M | 1 | 16,254 | 13 | 641 | 80% | 83,623 | 1.7 |

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | RAW DATA | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within in Pool Location (U,M,L Pool) | Urban Development (%Site) | Agricultural Development (Total Acres) | Tributary Feeders (Total Number) | Landowners (Total Number) | Floodplain Below Bank Elevation (%) | X-Sectional Area Below Bank Elev. (Sq Ft) | Contour Point Elevations (SD) |
| St. Louis | Kings Lake Drainage District | MO | Non-Fed. | Ag | 249.0 | L | 1 | 1,108 | 0 | 75 | 86% | 110,426 | 1.8 |
| St. Louis | Sandy Creek Drainage District | MO | Non-Fed. | Ag | 245.7 | L | 2 | 806 | 1 | 26 | 21% | 35,421 | 0.9 |
| St. Louis | Foley Drainage District | MO | Non-Fed. | Ag | 245.0 | L | 8 | 947 | 2 | 134 | 30% | 13,356 | 0.2 |
| St. Louis | Cap Au Gris D&LD | MO | Non-Fed. | Ag | 241.2 | U | 5 | 3,895 | 2 | 87 | 85% | 34,808 | 1.5 |
| St. Louis | Winfield D&LD | MO | Non-Fed. | Ag | 238.9 | U | 3 | 1,480 | 3 | 42 | 90% | 81,821 | 1.8 |
| St. Louis | Brevator D&LD | MO | Non-Fed. | Ag | 238.1 | U | 4 | 1,744 | 2 | 46 | 73% | 16,107 | 0.8 |
| St. Louis | St. Peters Drainage Association No. 1 | MO | Non-Fed. | Ag | 229.8 | U | | | 3 | 63 | 74% | 22,808 | 7.0 |
| St. Louis | Consolidated North County Levee District | MO | Non-Fed. | Ag | 206.3 | L | 5 | 15,280 | 0 | 74 | 43% | 77,707 | 1.3 |
| St. Louis | Columbia Bottoms Levee | MO | Non-Fed. | Ag | 194.2 | M | 2 | 4,030 | 2 | 215 | 46% | 60,646 | 1.2 |
| St. Louis | Chouteau Island D&LD | IL | Non-Fed. | Ag | 191.2 | M | 12 | 914 | 0 | 24 | 19% | 8,181 | 1.4 |
| St. Louis | Gabaret/Cabrolet Island D&LD | IL | Non-Fed. | Ag | 187.3 | L | 0 | 673 | 0 | 20 | 34% | 24,629 | 1.2 |
| St. Louis | Miller City/Len Small | IL | Non-Fed. | Ag | 23.6 | U | NA | NA | NA | NA | NA | NA | NA |
| St. Louis | Petus-Burns-Prewitt-Jeager Private Levee | MO | Private | Ag | 271.6 | U | 2 | 420 | 1 | 10 | 31% | 30,677 | 10.6 |
| St. Louis | Clarksville Levees | MO | Private | Ag | 269.0 | U | 0 | 1,675 | 3 | 21 | 66% | 90,557 | 7.6 |
| St. Louis | Annada | MO | Private | Ag | 262.2 | M | 1 | 1,554 | 3 | 84 | 15% | 37,876 | 0.9 |
| St. Louis | Busch-Goose Pasture Farms | MO | Private | Ag | 264.1 | U | 0 | 341 | 1 | 9 | 65% | 28,977 | 1.2 |

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | RAW DATA | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within in Pool Location (U,M,L Pool) | Urban Development (%Site) | Agricultural Development (Total Acres) | Tributary Feeders (Total Number) | Landowners (Total Number) | Floodplain Below Bank Elevation (%) | X-Sectional Area Below Bank Elev . (Sq Ft) | Contour Point Elevations (SD) |
| St. Louis | Cannon Wildlife Refuge Levee | MO | Private | Ag | 262.2 | M | | | 1 | 12 | 86% | 84,664 | 1.1 |
| St. Louis | Schramm Private Levee | MO | Private | Ag | 237.3 | U | 0 | 210 | | 10 | NA | NA | NA |
| St. Louis | Old Monroe Private Levee | MO | Private | Ag | 236.8 | U | 7 | 700 | 0 | 39 | 49% | 25,028 | 1.0 |
| St. Louis | Marstan-Portuchek Private Levee | MO | Private | Ag | 236.1 | U | 44 | 7u | 2 | 40 | 38% | 20,818 | 0.4 |
| St. Louis | Heitman Private Levee | MO | Private | Ag | 236.4 | U | 1 | 182 | 1 | 22 | NA | NA | NA |
| St. Louis | Ste. Genevieve Levee District No. 2 | MO | Private | Ag | 119.5 | U | 0 | 7,178 | 3 | 175 | 95% | 91,620 | 1.6 |
| **Illinois River** | | | | | | | | | | | | | |
| St. Louis | Nutwood | IL | Federal | Ag | 19.4 | L | 1 | 9,887 | 9 | 294 | 100% | 70,865 | 2.4 |
| St. Louis | Eldred - Spankey DL | IL | Federal | Ag | 28.1 | M | 1 | 9,822 | 4 | 65 | 100% | 76,665 | 2.7 |
| St. Louis | Schaefer - Farrow | IL | Private | Ag | 32.6 | M | 5 | 715 | 3 | 2 | 100% | 16,984 | 1.0 |
| St. Louis | Bluffdale Farms | IL | Non-Federal | Ag | 32.3 | M | 0 | 609 | 1 | 12 | 56% | 6,821 | 1.7 |
| St. Louis | Keach | IL | Federal | Ag | 35.3 | M | 1 | 8,680 | 5 | 34 | 83% | 91,783 | 3.4 |
| St. Louis | Hartwell | IL | Federal | Ag | 40.7 | M | 0 | 8,922 | 6 | 36 | 98% | 131,278 | 2.9 |
| St. Louis | Hillview | IL | Federal | Ag | 46.6 | M | 0 | 12,580 | 8 | 66 | *90%* | *148,000* | *2.4* |
| St. Louis | Big Swan | IL | Federal | Ag | 53.6 | U | 1 | 12,937 | 8 | 117 | *90%* | *164,000* | *2.4* |

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | RAW DATA | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within in Pool Location (U,M,L Pool) | Development (%Site) | Agricultural Development (Total Acres) | Tributary Feeders (Total Number) | Landowners (Total Number) | Floodplain Below Bank Elevation (%) | X-Sectional Area Below Bank Elev. (Sq Ft) | Contour Point Elevations (SD) |
| St. Louis | Walnut Creek | IL | Non-Federal | Ag | 56.3 | U | | | 5 | 16 | | | |
| St. Louis | Scott County | IL | Federal | Ag | 59.3 | U | 1 | 10,309 | 7 | 155 | *90%* | *164,000* | *2.4* |
| St. Louis | Valley City | IL | Federal | Ag | 65.1 | U | 0 | 4,218 | 5 | 73 | *98%* | *98,000* | *2.4* |
| St. Louis | Robertson | IL | Private | Ag | 63.3 | U | 1 | 721 | 1 | 15 | *85%* | *49,300* | *3.0* |
| St. Louis | Mauvaise Terre | IL | Federal | Ag | 64.8 | U | 3 | 4,986 | 3 | 271 | *85%* | *125,000* | *3.0* |
| St. Louis | Oakes | IL | Private | Ag | 66.3 | U | 0 | 583 | 1 | 12 | *85%* | *65,000* | *3.0* |
| St. Louis | Smith Lake | IL | Private | Ag | 67.2 | U | | | | 16 | *85%* | *80,000* | *3.0* |
| St. Louis | Coon Run | IL | Federal | Ag | 68.9 | U | 0 | 2,248 | 4 | 42 | *85%* | *65,000* | *3.0* |
| St. Louis | Meredosia & Willow Cr | IL | Federal | Ag | 69.5 | U | 6 | 13,029 | 6 | 220 | 95% | 122,392 | 3.3 |
| St. Louis | McGee Creek | IL | Federal | Ag | 69.2 | U | 1 | 11,543 | 11 | 200 | 95% | 122,392 | 3.3 |

**ATTACHMENT F, TABLE 7. ENVIRONMENTAL PRIORITIZATION—SCALED VALUES**

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | SCALED VALUES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within Pool Location | Urban Development | Agricultural Development | Tributary Feeders | Landowners | Floodplain below Bank Elevation | X-Sectional Area Below Bank Elev. | Contour Point Elevations |
| **Rock Island** | | | | | | | | | | | | | |
| **Miss.** | | | | | | | | | | | | | |
| Rock Island | Meredosia | IL | Federal | Ag | 511.5 | 2 | 2 | 2 | 1 | 1 | NX | NX | NX |
| Rock Island | Drury | IL | Federal | Ag | 455.2 | 1 | 3 | 2 | 3 | 2 | 2 | 1 | 3 |
| Rock Island | Bay Island | IL | Federal | Ag | 442.6 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| Rock Island | Iowa River-Flint CR Upper | IA | Federal | Ag | 427.9 | 2 | 2 | 3 | 2 | 2 | 1 | 3 | 3 |
| Rock Island | Iowa River-Flint CR Middle | IA | Federal | Ag | 416.4 | 3 | | | 1 | 2 | 2 | 3 | 3 |
| Rock Island | Henderson #1 | IL | Federal | Ag | 407.3 | 1 | 2 | 2 | 2 | 1 | 2 | 2 | 2 |
| Rock Island | Iowa River-Flint CR Lower | IA | Federal | Ag | 408.1 | 1 | | | 1 | 1 | 2 | 3 | 3 |
| Rock Island | Henderson #2 | IL | Federal | Ag | 402.4 | 1 | 2 | 2 | 2 | 3 | 1 | 3 | 3 |
| Rock Island | Green Bay | IA | Federal | Ag | 391.0 | 2 | 3 | 1 | 2 | 2 | 1 | 3 | 3 |
| Rock Island | Des Moines /Mississippi | IA | Federal | Ag | 359.0 | 1 | 2 | 2 | 3 | 1 | 1 | 1 | 1 |
| Rock Island | Hunt-Lima | IL | Federal | Ag | 351.7 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 |

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | SCALED VALUES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within Pool Location | Urban Development | Agricultural Development | Tributary Feeders | Landowners | Floodplain below Bank Elevation | X-Sectional Area Below Bank Elev. | Contour Point Elevations |
| Rock Island | Gregory | IA | Federal | Ag | 351.3 | 2 | 3 | 2 | 3 | 3 | 2 | 3 | 2 |
| Rock Island | Indian Grave Upper | IL | Federal | Ag | 338.8 | 1 | 3 | 3 | 3 | 2 | 2 | 2 | 3 |
| Rock Island | Indian Grave Lower | IL | Federal | Ag | 332.9 | 1 | | | 3 | 3 | 3 | 1 | 3 |
| Rock Island | Union Township | IL | Federal | Ag | 333.3 | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 2 |
| Rock Island | Fabius | MO | Federal | Ag | 327.8 | 2 | 2 | 3 | 2 | 1 | 1 | 3 | 3 |
| Rock Island | Marion County | MO | Federal | Ag | 322.4 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 1 |
| Rock Island | South River | MO | Federal | Ag | 315.7 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 2 |
| Rock Island | Sny Island Reach I | IL | Federal | Ag | 307.6 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 |
| Rock Island | Sny Island Reach II | IL | Federal | Ag | 292.5 | 1 | 3 | 3 | 3 | 2 | 2 | 2 | 2 |
| Rock Island | Sny Island Reach III | IL | Federal | Ag | 282.3 | 3 | 3 | 3 | 3 | 1 | 3 | 3 | 2 |
| Rock Island | Sny Island Reach IV | IL | Federal | Ag | 268.8 | 1 | 3 | 3 | 3 | 2 | 3 | 2 | 2 |
| Rock Island | Green Island | IA | Non-Fed. | Ag | 547.3 | 1 | 3 | 1 | 1 | 3 | 3 | 3 | 1 |
| Rock Island | Muscatine-Louisa Co. | IA | Non-Fed. | Ag | 448.5 | 2 | | | | 1 | | | 2 |
| Rock Island | Henderson #3 | IL | Non-Fed. | Ag | 413.2 | 3 | 3 | 1 | 3 | 3 | 1 | 1 | 3 |

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | SCALED VALUES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within Pool Location | Urban Development | Agricultural Development | Tributary Feeders | Landowners | Floodplain lBelow Bank Elevation | X-Sectional Area Below Bank Elev. | Contour Point Elevations |
| Rock Island | Mississippi & Fox Upper | IA | Non-Fed. | Ag | 357.8 | 1 | 3 | 2 | 2 | | 3 | 1 | 3 |
| Rock Island | Mississippi & Fox Lower | IA | Non-Fed. | Ag | 356.2 | 2 | | | 2 | | 2 | 1 | 3 |
| Rock Island | Reiff, Nick | 0 | Non-Fed. | Ag | 320.0 | 1 | | | | | 1 | 1 | 1 |
| **ILLINOIS WATERWAY** | | | | | | | | | | | | | |
| Rock Island | Pekin-LaMarsh | IL | Federal | Ag | 152.4 | 1 | 1 | 1 | 2 | 1 | 3 | 2 | 3 |
| Rock Island | Spring Lake | IL | Federal | Ag | 141.0 | 1 | 3 | 3 | 2 | 1 | 3 | 3 | 2 |
| Rock Island | East Liverpool | IL | Federal | Ag | 130.1 | 2 | 3 | 2 | 2 | 2 | 3 | 2 | 1 |
| Rock Island | Lacey, Langellier, W. Matanzas, Kerton Valley DLD | IL | Federal | Ag | 115.6 | 2 | 3 | 3 | 2 | 2 | 1 | 2 | 3 |
| Rock Island | Big Lake | IL | Federal | Ag | 105.7 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 3 |
| Rock Island | Kelly lake | IL | Federal | Ag | 101.7 | 3 | 3 | 1 | 3 | 3 | 3 | 1 | 3 |
| Rock Island | Hager Slough | IL | Non-Fed. | Ag | 92.0 | 3 | 3 | 2 | 2 | 3 | 1 | 1 | 2 |
| Rock Island | Coal Creek | IL | Federal | Ag | 88.5 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 |
| Rock Island | Lost Creek | IL | Federal | Ag | 89.7 | 3 | 1 | 2 | 2 | 3 | 3 | 1 | 1 |
| Rock Island | South Beardstown | IL | Federal | Ag | 84.2 | 3 | 2 | 2 | 1 | 1 | 3 | 3 | 3 |
| Rock Island | Crane Creek | IL | Federal | Ag | 84.2 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 |

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | SCALED VALUES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within Pool Location | Urban Development | Agricultural Development | Tributary Feeders | Landowners | Floodplain lBelow Bank Elevation | X-Sectional Area Below Bank Elev. | Contour Point Elevations |
| Rock Island | Seahorn | IL | Federal | Ag | 111.5 | 2 | 2 | 1 | 3 | 3 | 1 | 1 | 1 |
| Rock Island | Butler | IL | Non-Fed. | Ag | 0.0 | | | | | | | | |
| Rock Island | Herman Levee | IL | Non-Fed. | Ag | 178.0 | 3 | 3 | 1 | 1 | NX | NX | NX | NX |
| Rock Island | Hollerich | IL | Non-Fed. | Ag | 217.5 | 1 | | NX | NX | NX | NX | NX | NX |
| Rock Island | Keystone | IL | Non-Fed. | Ag | 157.5 | 1 | 1 | 1 | 1 | | 1 | 1 | 2 |
| Rock Island | Tersellic | IL | Non-Fed. | Ag | 225.9 | | | | | | | | |
| Rock Island | Hennepin | IL | Federal | Ag-Cons | 204.9 | 2 | 3 | 2 | 2 | 1 | 3 | 2 | 3 |
| Rock Island | Banner Special | IL | Federal | Ag-Cons | 141.9 | 1 | 3 | 1 | 3 | 3 | 2 | 2 | 3 |
| Rock Island | Thompson | IL | Federal | Ag-Cons | 123.4 | 2 | 2 | 2 | 2 | 1 | 3 | 3 | 3 |
| **St. Louis** | | | | | | | | | | | | | |
| **Miss.** | | | | | | | | | | | | | |
| St. Louis | Columbia | IL | Federal | Ag | 160.9 | 1 | 2 | 3 | 3 | 1 | 1 | 2 | 2 |
| St. Louis | "Harr,Str,Ft. Ch" | IL | Federal | Ag | 0.0 | | | | | | | | |
| St. Louis | Harrisonville | IL | Federal | Ag | 142.9 | 1 | 2 | 3 | 3 | 1 | 1 | 2 | 2 |
| St. Louis | Stringtown | IL | Federal | Ag | 139.5 | 1 | 3 | 2 | 1 | 3 | 1 | 2 | 1 |
| St. Louis | Fort Chartres & Ivy Landing | IL | Federal | Ag | 134.0 | 1 | 2 | 3 | 3 | 1 | 1 | 2 | 2 |

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | SCALED VALUES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within Pool Location | Urban Development | Agricultural Development | Tributary Feeders | Landowners | Floodplain below Bank Elevation | X-Sectional Area Below Bank Elev. | Contour Point Elevations |
| St. Louis | Prairie Du Rocher & Modoc | IL | Federal | Ag | 124.5 | 1 | 2 | 3 | 3 | 1 | 1 | 2 | 2 |
| St. Louis | Kaskaskia Island | MO | Federal | Ag | 113.4 | 1 | 3 | 2 | 1 | 1 | 2 | 3 | 2 |
| St. Louis | Bois Brule | MO | Federal | Ag | 103.2 | 1 | 2 | 3 | 2 | 1 | 3 | 3 | 2 |
| St. Louis | Degognia & Fountain Bluff | IL | Federal | Ag | 91.8 | 1 | 2 | 3 | 3 | 1 | 2 | 3 | 2 |
| St. Louis | Grand Tower | IL | Federal | Ag | 78.9 | 1 | 2 | 2 | 1 | 1 | 1 | 2 | 1 |
| St. Louis | "The Big 5" | IL | Federal | Ag | 0.0 | | | | | | | | |
| St. Louis | Miller Pond | IL | Federal | Ag | 70.7 | 1 | 3 | 2 | 3 | 2 | 2 | 1 | 1 |
| St. Louis | Preston | IL | Federal | Ag | 70.7 | 1 | 2 | 3 | 2 | 1 | 2 | 2 | 2 |
| St. Louis | Clear Creek | IL | Federal | Ag | 61.0 | 1 | 2 | 3 | 3 | 1 | 3 | 3 | 2 |
| St. Louis | E. Cape Girardeau & Clear Creek | IL | Federal | Ag | 51.5 | 1 | 2 | 2 | 1 | 1 | 3 | 3 | 3 |
| St. Louis | N. Alexander Co. | IL | Federal | Ag | 51.5 | 1 | 2 | 1 | 2 | 2 | 3 | 3 | 3 |
| St. Louis | Riverland | MO | Non-Fed. | Ag | 289.6 | 2 | 3 | 1 | NA | NA | NA | NA | NA |
| St. Louis | Kissinger Levee District | MO | Non-Fed. | Ag | 266.4 | 1 | 3 | 1 | 2 | 2 | 1 | 1 | 1 |
| St. Louis | Elsberry Drainage District | MO | Non-Fed. | Ag | 255.9 | 2 | 3 | 3 | 3 | 1 | 2 | 2 | 1 |
| St. Louis | Kings Lake Drainage District | MO | Non-Fed. | Ag | 249.0 | 3 | 3 | 1 | 1 | 2 | 2 | 3 | 1 |

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | SCALED VALUES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within Pool Location | Urban Development | Agricultural Development | Tributary Feeders | Landowners | Floodplain below Bank Elevation | X-Sectional Area Below Bank Elev. | Contour Point Elevations |
| St. Louis | Sandy Creek Drainage District | MO | Non-Fed. | Ag | 245.7 | 3 | 2 | 1 | 2 | 3 | 1 | 1 | 1 |
| St. Louis | Foley Drainage District | MO | Non-Fed. | Ag | 245.0 | 3 | 1 | 1 | 2 | 1 | 1 | 1 | 1 |
| St. Louis | Cap Au Gris D&LD | MO | Non-Fed. | Ag | 241.2 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 1 |
| St. Louis | Winfield D&LD | MO | Non-Fed. | Ag | 238.9 | 1 | 2 | 1 | 3 | 2 | 2 | 2 | 1 |
| St. Louis | Brevator D&LD | MO | Non-Fed. | Ag | 238.1 | 1 | 2 | 1 | 2 | 2 | 1 | 1 | 1 |
| St. Louis | St. Peters Drainage Association No. 1 | MO | Non-Fed. | Ag | 229.8 | 1 | | | 3 | 2 | 1 | 1 | 3 |
| St. Louis | Consolidated North County Levee District | MO | Non-Fed. | Ag | 206.3 | 3 | 1 | 3 | 1 | 2 | 1 | 2 | 1 |
| St. Louis | Columbia Bottoms Levee | MO | Non-Fed. | Ag | 194.2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 |
| St. Louis | Chouteau Island D&LD | IL | Non-Fed. | Ag | 191.2 | 2 | 1 | 1 | 1 | 3 | 1 | 1 | 1 |
| St. Louis | Gabaret/Cabrolet Island D&LD | IL | Non-Fed. | Ag | 187.3 | 3 | 3 | 1 | 1 | 3 | 1 | 1 | 1 |
| St. Louis | Miller City/Len Small | IL | Non-Fed. | Ag | 23.6 | 1 | NA | NA | NA | 3 | NA | NA | NA |
| St. Louis | Petus-Burns-Prewitt-Jeager Private Levee | MO | Private | Ag | 271.6 | 1 | 2 | 1 | 2 | 3 | 1 | 1 | 3 |
| St. Louis | Clarksville Levees | MO | Private | Ag | 269.0 | 1 | 3 | 1 | 3 | 3 | 1 | 2 | 3 |
| St. Louis | Annada | MO | Private | Ag | 262.2 | 2 | 3 | 1 | 3 | 2 | 1 | 1 | 1 |
| St. Louis | Busch-Goose Pasture Farms | MO | Private | Ag | 264.1 | 1 | 3 | 1 | 2 | 3 | 1 | 1 | 1 |
| St. Louis | Cannon Wildlife Refuge Levee | MO | Private | Ag | 262.2 | 2 | | | 2 | 3 | 2 | 2 | 1 |

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | SCALED VALUES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within Pool Location | Urban Development | Agricultural Development | Tributary Feeders | Landowners | Floodplain below Bank Elevation | X-Sectional Area Below Bank Elev. | Contour Point Elevations |
| St. Louis | Schramm Private Levee | MO | Private | Ag | 237.3 | 1 | 3 | 1 | NA | 3 | NA | NA | NA |
| St. Louis | Old Monroe Private Levee | MO | Private | Ag | 236.8 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 |
| St. Louis | Marstan-Portuchek Private Levee | MO | Private | Ag | 236.1 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 |
| St. Louis | Heitman Private Levee | MO | Private | Ag | 236.4 | 1 | 3 | 1 | 2 | 3 | NA | NA | NA |
| St. Louis | Ste. Genevieve Levee District No. 2 | MO | Private | Ag | 119.5 | 1 | 3 | 2 | 3 | 1 | 3 | 2 | 1 |
| **Illinois River** | | | | | | | | | | | | | |
| St. Louis | Nutwood | IL | Federal | Ag | 19.4 | 3 | 3 | 3 | 3 | 1 | 3 | 2 | 2 |
| St. Louis | Eldred - Spankey DL | IL | Federal | Ag | 28.1 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 2 |
| St. Louis | Schaefer - Farrow | IL | Private | Ag | 32.6 | 2 | 1 | 1 | 3 | 3 | 3 | 1 | 1 |
| St. Louis | Bluffdale Farms | IL | Non-Federal | Ag | 32.3 | 2 | 3 | 1 | 2 | 3 | 1 | 1 | 1 |
| St. Louis | Keach | IL | Federal | Ag | 35.3 | 2 | 3 | 2 | 3 | 3 | 2 | 2 | 3 |
| St. Louis | Hartwell | IL | Federal | Ag | 40.7 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| St. Louis | Hillview | IL | Federal | Ag | 46.6 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 |
| St. Louis | Big Swan | IL | Federal | Ag | 53.6 | 1 | 3 | 3 | 3 | 2 | 2 | 3 | 2 |
| St. Louis | Walnut Creek | IL | Non-Federal | Ag | 56.3 | 1 | NA | NA | 3 | 3 | NA | NA | NA |

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | SCALED VALUES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within Pool Location | Urban Development | Agricultural Development | Tributary Feeders | Landowners | Floodplain below Bank Elevation | X-Sectional Area Below Bank Elev. | Contour Point Elevations |
| St. Louis | Scott County | IL | Federal | Ag | 59.3 | 1 | 3 | 3 | 3 | 1 | 2 | 3 | 2 |
| St. Louis | Valley City | IL | Federal | Ag | 65.1 | 1 | 3 | 2 | 3 | 2 | 3 | 2 | 2 |
| St. Louis | Robertson | IL | Private | Ag | 63.3 | 1 | 3 | 1 | 2 | 3 | 2 | 1 | 3 |
| St. Louis | Mauvaise Terre | IL | Federal | Ag | 64.8 | 1 | 2 | 2 | 3 | 1 | 2 | 3 | 3 |
| St. Louis | Oakes | IL | Private | Ag | 66.3 | 1 | 3 | 1 | 2 | 3 | 2 | 1 | 3 |
| St. Louis | Smith Lake | IL | Private | Ag | 67.2 | 1 | | | | 3 | 2 | 2 | 3 |
| St. Louis | Coon Run | IL | Federal | Ag | 68.9 | 1 | 3 | 1 | 3 | 2 | 2 | 1 | 3 |
| St. Louis | Meredosia & Willow Cr | IL | Federal | Ag | 69.5 | 1 | 1 | 3 | 3 | 1 | 3 | 3 | 3 |
| St. Louis | McGee Creek | IL | Federal | Ag | 69.2 | 1 | 3 | 3 | 3 | 1 | 3 | 3 | 3 |

**ATTACHMENT F, TABLE 8. ENVIRONMENTAL PRIORITIZATION—WEIGHTED VALUES**

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | WEIGHTED VALUES | | | | | | | | **TOTAL ENVIRONMENTAL SCORE** | **ENVIRONMENTAL RANKING** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within Pool Location | Urban Development | Agricultural Development | Tributary Feeders | Landowners | Floodplain below Bank Elevation | X-Sectional Area Below Bank Elev. | Contour Point Elevations | | |
| | | | | | | 0.22 | 0.06 | 0.11 | 0.17 | 0.22 | 0.11 | 0.07 | 0.04 | | |
| **Rock Island Miss. R.** | | | | | | | | | | | | | | | |
| Rock Island | Meredosia | IL | Federal | Ag | 511.5 | 0.44 | 0.12 | 0.22 | 0.17 | 0.22 | NX | NX | NX | NX | NX |
| Rock Island | Drury | IL | Federal | Ag | 455.2 | 0.22 | 0.18 | 0.22 | 0.51 | 0.44 | 0.22 | 0.07 | 0.12 | 1.98 | 2 |
| Rock Island | Bay Island | IL | Federal | Ag | 442.6 | 0.66 | 0.18 | 0.33 | 0.51 | 0.44 | 0.33 | 0.21 | 0.12 | 2.78 | 3 |
| Rock Island | Iowa River-Flint CR Upper | IA | Federal | Ag | 427.9 | 0.44 | 0.12 | 0.33 | 0.34 | 0.44 | 0,11 | 0.21 | 0.12 | 2.11 | 3 |
| Rock Island | Iowa River-Flint CR Middle | IA | Federal | Ag | 416.4 | 0.66 | | | 0.17 | 0.44 | 0.22 | 0.21 | 0.12 | | |
| Rock Island | Henderson #1 | IL | Federal | Ag | 407.3 | 0.22 | 0.12 | 0.22 | 0.34 | 0.22 | 0.22 | 0.14 | 0.08 | 1.56 | 1 |
| Rock Island | Iowa River-Flint CR Lower | IA | Federal | Ag | 408.1 | 0.22 | | | 0.17 | 0.22 | 0.22 | 0.21 | 0.12 | | |
| Rock Island | Henderson #2 | IL | Federal | Ag | 402.4 | 0.22 | 0.12 | 0.22 | 0.34 | 0.66 | 0,11 | 0.21 | 0.12 | 2 | 2 |
| Rock Island | Green Bay | IA | Federal | Ag | 391.0 | 0.44 | 0.18 | 0.11 | 0.34 | 0.44 | 0,11 | 0.21 | 0.12 | 1.95 | 2 |

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | WEIGHTED VALUES | | | | | | | | TOTAL ENVIRONMENTAL SCORE | ENVIRONMENTAL RANKING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within Pool Location | Urban Development | Agricultural Development | Tributary Feeders | Landowners | Floodplain below Bank Elevation | X-Sectional Area Below Bank Elev. | Contour Point Elevations | | |
| Rock Island | Des Moines /Mississippi | IA | Federal | Ag | 359.0 | 0.22 | 0.12 | 0.22 | 0.51 | 0.22 | 0,11 | 0.07 | 0.04 | 1.51 | 1 |
| Rock Island | Hunt-Lima | IL | Federal | Ag | 351.7 | 0.44 | 0.18 | 0.33 | 0.34 | 0.44 | 0.33 | 0.21 | 0.12 | 2.39 | 3 |
| Rock Island | Gregory | IA | Federal | Ag | 351.3 | 0.44 | 0.18 | 0.22 | 0.51 | 0.66 | 0.22 | 0.21 | 0.08 | 2.52 | 3 |
| Rock Island | Indian Grave Upper | IL | Federal | Ag | 338.8 | 0.22 | 0.18 | 0.33 | 0.51 | 0.44 | 0.22 | 0.14 | 0.12 | 2.16 | 3 |
| Rock Island | Indian Grave Lower | IL | Federal | Ag | 332.9 | 0.22 | | | 0.51 | 0.66 | 0.33 | 0.07 | 0.12 | | |
| Rock Island | Union Township | IL | Federal | Ag | 333.3 | 0.22 | 0.12 | 0.22 | 0.34 | 0.44 | 0.22 | 0.21 | 0.08 | 1.85 | 1 |
| Rock Island | Fabius | MO | Federal | Ag | 327.8 | 0.44 | 0.12 | 0.33 | 0.34 | 0.22 | 0,11 | 0.21 | 0.12 | 1.89 | 2 |
| Rock Island | Marion County | MO | Federal | Ag | 322.4 | 0.44 | 0.18 | 0.22 | 0.34 | 0.44 | 0.22 | 0.14 | 0.04 | 1.58 | 1 |
| Rock Island | South River | MO | Federal | Ag | 315.7 | 0.44 | 0.12 | 0.22 | 0.51 | 0.44 | 0.33 | 0.21 | 0.08 | 2.35 | 3 |
| Rock Island | Sny Island Reach I | IL | Federal | Ag | 307.6 | 0.66 | 0.18 | 0.33 | 0.51 | 0.44 | 0.33 | 0.14 | 0.08 | 2.67 | 3 |
| Rock Island | Sny Island Reach II | IL | Federal | Ag | 292.5 | 0.22 | 0.18 | 0.33 | 0.51 | 0.44 | 0.22 | 0.14 | 0.08 | 2.12 | 3 |
| Rock Island | Sny Island Reach III | IL | Federal | Ag | 282.3 | 0.66 | 0.18 | 0.33 | 0.51 | 0.22 | 0.33 | 0.21 | 0.08 | 2.52 | 3 |
| Rock Island | Sny Island Reach IV | IL | Federal | Ag | 268.8 | 0.22 | 0.18 | 0.33 | 0.51 | 0.44 | 0.33 | 0.14 | 0.08 | 2.23 | 3 |

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | WEIGHTED VALUES | | | | | | | | **TOTAL ENVIRONMENTAL SCORE** | **ENVIRONMENTAL RANKING** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within Pool Location | Urban Development | Agricultural Development | Tributary Feeders | Landowners | Floodplain below Bank Elevation | X-Sectional Area Below Bank Elev. | Contour Point Elevations | | |
| Rock Island | Green Island | IA | Non-Fed. | Ag | 547.3 | 0.22 | 0.18 | 0.11 | 0.17 | 0.66 | 0.33 | 0.21 | 0.04 | 1.92 | 2 |
| Rock Island | Muscatine-Louisa Co. | IA | Non-Fed. | Ag | 448.5 | 0.44 | | | | 0.22 | | | 0.08 | | |
| Rock Island | Henderson #3 | IL | Non-Fed. | Ag | 413.2 | 0.66 | 0.18 | 0.11 | 0.51 | 0.66 | 0,11 | 0.07 | 0.12 | 2.42 | 3 |
| Rock Island | Mississippi & Fox Upper | IA | Non-Fed. | Ag | 357.8 | 0.22 | 0.18 | 0.22 | 0.51 | | 0.33 | 0.07 | 0.12 | | |
| Rock Island | Mississippi & Fox Lower | IA | Non-Fed. | Ag | 356.2 | 0.44 | | | 0.34 | | 0.22 | 0.07 | 0.12 | | |
| Rock Island | Reiff, Nick | 0 | Non-Fed. | Ag | **320.0** | 0.22 | | | | | 0,11 | 0.07 | 0.04 | | |
| **ILLINOIS WATERWAY** | | | | | | | | | | | | | | | |
| Rock Island | Pekin-LaMarsh | IL | Federal | Ag | 152.4 | 0.22 | 0.06 | 0.11 | 0.34 | 0.22 | 0.33 | 0.14 | 0.12 | 1.54 | 1 |
| Rock Island | Spring Lake | IL | Federal | Ag | 141.0 | 0.22 | 0.18 | 0.33 | 0.34 | 0.22 | 0.33 | 0.21 | 0.08 | 1.91 | 2 |
| Rock Island | East Liverpool | IL | Federal | Ag | 130.1 | 0.44 | 0.18 | 0.22 | 0.34 | 0.44 | 0.33 | 0.14 | 0.04 | 2.13 | 3 |
| Rock Island | Lacey, Langellier, W. Matanzas, Kerton Valley DLD | IL | Federal | Ag | 115.6 | 0.44 | 0.18 | 0.33 | 0.34 | 0.44 | 0,11 | 0.14 | 0.12 | 2.1 | 2 |
| Rock Island | Big Lake | IL | Federal | Ag | 105.7 | 0.66 | 0.18 | 0.22 | 0.51 | 0.66 | 0.22 | 0.14 | 0.12 | 2.71 | 3 |
| Rock Island | Kelly lake | IL | Federal | Ag | 101.7 | 0.66 | 0.18 | 0.11 | 0.51 | 0.66 | 0.33 | 0.07 | 0.12 | 2.64 | 3 |

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | WEIGHTED VALUES | | | | | | | | **TOTAL ENVIRONMENTAL SCORE** | **ENVIRONMENTAL RANKING** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within Pool Location | Urban Development | Agricultural Development | Tributary Feeders | Landowners | Floodplain below Bank Elevation | X-Sectional Area Below Bank Elev. | Contour Point Elevations | | |
| Rock Island | Hager Slough | IL | Non-Fed. | Ag | 92.0 | 0.66 | 0.18 | 0.22 | 0.34 | 0.66 | 0,11 | 0.07 | 0.08 | 2.32 | 3 |
| Rock Island | Coal Creek | IL | Federal | Ag | 88.5 | 0.66 | 0.18 | 0.22 | 0.51 | 0.66 | 0.33 | 0.21 | 0.08 | 2.85 | 3 |
| Rock Island | Lost Creek | IL | Federal | Ag | 89.7 | 0.66 | 0.06 | 0.22 | 0.34 | 0.66 | 0.33 | 0.07 | 0.04 | 2.38 | 3 |
| Rock Island | South Beardstown | IL | Federal | Ag | 84.2 | 0.66 | 0.12 | 0.22 | 0.17 | 0.22 | 0.33 | 0.21 | 0.12 | 2.05 | 2 |
| Rock Island | Crane Creek | IL | Federal | Ag | 84.2 | 0.66 | 0.18 | 0.22 | 0.51 | 0.66 | 0.33 | 0.14 | 0.12 | 2.82 | 3 |
| Rock Island | Seahorn | IL | Federal | Ag | 111.5 | 0.44 | 0.12 | 0.11 | 0.51 | 0.66 | 0,11 | 0.07 | 0.04 | 2.06 | 2 |
| Rock Island | Butler | IL | Non-Fed. | Ag | 0.0 | | | | | | | | | | |
| Rock Island | Herman Levee | IL | Non-Fed. | Ag | 178.0 | 0.66 | 0.18 | 0.11 | 0.17 | NX | NX | NX | NX | NX | NX |
| Rock Island | Hollerich | IL | Non-Fed. | Ag | 217.5 | 0.22 | NX | NX | NX | NX | NX | NX | NX | NX | NX |
| Rock Island | Keystone | IL | Non-Fed. | Ag | 157.5 | 0.22 | 0.06 | 0.11 | 0.17 | | 0,11 | 0.07 | 0.08 | | |
| Rock Island | Tersellic | IL | Non-Fed. | Ag | 225.9 | | | | | | | | | | |
| Rock Island | Hennepin | IL | Federal | Ag-Cons | 204.9 | 0.44 | 0.18 | 0.22 | 0.34 | 0.22 | 0.33 | 0.14 | 0.12 | 1.99 | 2 |
| Rock Island | Banner Special | IL | Federal | Ag-Cons | 141.9 | 0.22 | 0.18 | 0.11 | 0.51 | 0.66 | 0.22 | 0.14 | 0.12 | 2.16 | 3 |

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | WEIGHTED VALUES | | | | | | | | **TOTAL ENVIRONMENTAL SCORE** | **ENVIRONMENTAL RANKING** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within Pool Location | Urban Development | Agricultural Development | Tributary Feeders | Landowners | Floodplain below Bank Elevation | X-Sectional Area Below Bank Elev. | Contour Point Elevations | | |
| Rock Island | Thompson | IL | Federal | Ag-Cons | 123.4 | 0.44 | 0.12 | 0.22 | 0.34 | 0.22 | 0.33 | 0.21 | 0.12 | 2 | 2 |
| **St. Louis** | | | | | | | | | | | | | | | |
| **Miss.** | | | | | | | | | | | | | | | |
| St. Louis | Columbia | IL | Federal | Ag | 160.9 | 0.22 | 0.12 | 0.33 | 0,51 | 0.22 | 0,11 | 0.14 | 0.08 | 1.73 | 1 |
| St. Louis | "Harr,Str,Ft. Ch" | IL | Federal | Ag | 0.0 | | | | | | | | | | |
| St. Louis | Harrisonville | IL | Federal | Ag | 142.9 | 0.22 | 0.12 | 0.33 | 0,51 | 0.22 | 0,11 | 0.14 | 0.08 | 1.73 | 1 |
| St. Louis | Stringtown | IL | Federal | Ag | 139.5 | 0.22 | 0.18 | 0.22 | 0,17 | 0.66 | 0,11 | 0.14 | 0.04 | 1.74 | 1 |
| St. Louis | Fort Chartres & Ivy Landing | IL | Federal | Ag | 134.0 | 0.22 | 0.12 | 0.33 | 0,51 | 0.22 | 0,11 | 0.14 | 0.08 | 1.73 | 1 |
| St. Louis | Prairie Du Rocher & Modoc | IL | Federal | Ag | 124.5 | 0.22 | 0.12 | 0.33 | 0,51 | 0.22 | 0,11 | 0.14 | 0.08 | 1.73 | 1 |
| St. Louis | Kaskaskia Island | MO | Federal | Ag | 113.4 | 0.22 | 0.18 | 0.22 | 0,17 | 0.22 | 0.22 | 0.21 | 0.08 | 1.52 | 1 |
| St. Louis | Bois Brule | MO | Federal | Ag | 103.2 | 0.22 | 0.12 | 0.33 | 0.34 | 0.22 | 0.33 | 0.21 | 0.08 | 1.85 | 1 |

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | WEIGHTED VALUES | | | | | | | | **TOTAL ENVIRONMENTAL SCORE** | **ENVIRONMENTAL RANKING** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within Pool Location | Urban Development | Agricultural Development | Tributary Feeders | Landowners | Floodplain below Bank Elevation | X-Sectional Area Below Bank Elev. | Contour Point Elevations | | |
| St. Louis | Degognia & Fountain Bluff | IL | Federal | Ag | 91.8 | 0.22 | 0.12 | 0.33 | 0,51 | 0.22 | 0.22 | 0.21 | 0.08 | 1.91 | 2 |
| St. Louis | Grand Tower | IL | Federal | Ag | 78.9 | 0.22 | 0.12 | 0.22 | 0,17 | 0.22 | 0,11 | 0.14 | 0.04 | 1.24 | 1 |
| St. Louis | "The Big 5" | IL | Federal | Ag | 0.0 | | | | | | | | | | |
| St. Louis | Miller Pond | IL | Federal | Ag | 70.7 | 0.22 | 0.18 | 0.22 | 0,51 | 0.44 | 0.22 | 0.07 | 0.04 | 1.9 | 2 |
| St. Louis | Preston | IL | Federal | Ag | 70.7 | 0.22 | 0.12 | 0.33 | 0.34 | 0.22 | 0.22 | 0.14 | 0.08 | 1.67 | 1 |
| St. Louis | Clear Creek | IL | Federal | Ag | 61.0 | 0.22 | 0.12 | 0.33 | 0,51 | 0.22 | 0.33 | 0.21 | 0.08 | 2.02 | 2 |
| St. Louis | E. Cape Girardeau & Clear Creek | IL | Federal | Ag | 51.5 | 0.22 | 0.12 | 0.22 | 0,17 | 0.22 | 0.33 | 0.21 | 0.12 | 1.61 | 1 |
| St. Louis | N. Alexander Co. | IL | Federal | Ag | 51.5 | 0.22 | 0.12 | 0.11 | 0.34 | 0.44 | 0.33 | 0.21 | 0.12 | 1.89 | 2 |
| St. Louis | Riverland | MO | Non-Fed. | Ag | 289.6 | 0.44 | 0.18 | 0.11 | NA | NA | NA | NA | NA | NA | NA |
| St. Louis | Kissinger Levee District | MO | Non-Fed. | Ag | 266.4 | 0.22 | 0.18 | 0.11 | 0.34 | 0.44 | 0,11 | 0.07 | 0.04 | 1.51 | 1 |
| St. Louis | Elsberry Drainage District | MO | Non-Fed. | Ag | 255.9 | 0.44 | 0.18 | 0.33 | 0,51 | 0.22 | 0.22 | 0.14 | 0.04 | 2.08 | 2 |
| St. Louis | Kings Lake Drainage District | MO | Non-Fed. | Ag | 249.0 | 0.66 | 0.18 | 0.11 | 0,17 | 0.44 | 0.22 | 0.21 | 0.04 | 2.03 | 2 |
| St. Louis | Sandy Creek Drainage District | MO | Non-Fed. | Ag | 245.7 | 0.66 | 0.12 | 0.11 | 0.34 | 0.66 | 0,11 | 0.07 | 0.04 | 2.11 | 3 |

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | WEIGHTED VALUES | | | | | | | | **TOTAL ENVIRONMENTAL SCORE** | **ENVIRONMENTAL RANKING** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within Pool Location | Urban Development | Agricultural Development | Tributary Feeders | Landowners | Floodplain below Bank Elevation | X-Sectional Area Below Bank Elev. | Contour Point Elevations | | |
| St. Louis | Foley Drainage District | MO | Non-Fed. | Ag | 245.0 | 0.66 | 0.06 | 0.11 | 0.34 | 0.22 | 0,11 | 0.07 | 0.04 | 1.61 | 1 |
| St. Louis | Cap Au Gris D&LD | MO | Non-Fed. | Ag | 241.2 | 0.22 | 0.06 | 0.22 | 0.34 | 0.44 | 0.22 | 0.07 | 0.04 | 1.61 | 1 |
| St. Louis | Winfield D&LD | MO | Non-Fed. | Ag | 238.9 | 0.22 | 0.12 | 0.11 | 0,51 | 0.44 | 0.22 | 0.14 | 0.04 | 1.8 | 1 |
| St. Louis | Brevator D&LD | MO | Non-Fed. | Ag | 238.1 | 0.22 | 0.12 | 0.11 | 0.34 | 0.44 | 0,11 | 0.07 | 0.04 | 1.45 | 1 |
| St. Louis | St. Peters Drainage Association No. 1 | MO | Non-Fed. | Ag | 229.8 | 0.22 | | | 0,51 | 0.44 | 0,11 | 0.07 | 0.12 | | |
| St. Louis | Consolidated North County Levee District | MO | Non-Fed. | Ag | 206.3 | 0.66 | 0.06 | 0.33 | 0,17 | 0.44 | 0,11 | 0.14 | 0.04 | 1.95 | 2 |
| St. Louis | Columbia Bottoms Levee | MO | Non-Fed. | Ag | 194.2 | 0.44 | 0.12 | 0.22 | 0.34 | 0.22 | 0,11 | 0.07 | 0.04 | 1.56 | 1 |
| St. Louis | Chouteau Island D&LD | IL | Non-Fed. | Ag | 191.2 | 0.44 | 0.06 | 0.11 | 0,17 | 0.66 | 0.11 | 0.07 | 0.04 | 1.66 | 1 |
| St. Louis | Gabaret/Cabrolet Island D&LD | IL | Non-Fed. | Ag | 187.3 | 0.66 | 0.18 | 0.11 | 0,17 | 0.66 | 0,11 | 0.07 | 0.04 | 2 | 2 |
| St. Louis | Miller City/Len Small | IL | Non-Fed. | Ag | 23.6 | 0.22 | NA | NA | NA | 0.66 | NA | NA | NA | NA | NA |
| St. Louis | Petus-Burns-Prewitt-Jeager Private Levee | MO | Private | Ag | 271.6 | 0.22 | 0.12 | 0.11 | 0.34 | 0.66 | 0,11 | 0.07 | 0.12 | 1.75 | 1 |
| St. Louis | Clarksville Levees | MO | Private | Ag | 269.0 | 0.22 | 0.18 | 0.11 | 0,51 | 0.66 | 0,11 | 0.14 | 0.12 | 2.05 | 2 |
| St. Louis | Annada | MO | Private | Ag | 262.2 | 0.44 | 0.18 | 0.11 | 0,51 | 0.44 | 0,11 | 0.07 | 0.04 | 1.9 | 2 |

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | WEIGHTED VALUES | | | | | | | | **TOTAL ENVIRONMENTAL SCORE** | **ENVIRONMENTAL RANKING** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within Pool Location | Urban Development | Agricultural Development | Tributary Feeders | Landowners | Floodplain below Bank Elevation | X-Sectional Area Below Bank Elev. | Contour Point Elevations | | |
| St. Louis | Busch-Goose Pasture Farms | MO | Private | Ag | 264.1 | 0.22 | 0.18 | 0.11 | 0.34 | 0.66 | 0,11 | 0.07 | 0.04 | 1.73 | 1 |
| St. Louis | Cannon Wildlife Refuge Levee | MO | Private | Ag | 262.2 | 0.44 | | | 0.34 | 0.66 | 0.22 | 0.14 | 0.04 | | |
| St. Louis | Schramm Private Levee | MO | Private | Ag | 237.3 | 0.22 | 0.18 | 0.11 | NA | 0.66 | NA | NA | NA | NA | NA |
| St. Louis | Old Monroe Private Levee | MO | Private | Ag | 236.8 | 0.22 | 0.06 | 0.11 | 0,17 | 0.44 | 0,11 | 0.07 | 0.04 | 1.22 | 1 |
| St. Louis | Marstan-Portuchek Private Levee | MO | Private | Ag | 236.1 | 0.22 | 0.06 | 0.11 | 0.34 | 0.44 | 0,11 | 0.07 | 0.04 | 1.39 | 1 |
| St. Louis | Heitman Private Levee | MO | Private | Ag | 236.4 | 0.22 | 0.18 | 0.11 | 0.34 | 0.66 | NA | NA | NA | NA | NA |
| St. Louis | Ste. Genevieve Levee District No. 2 | MO | Private | Ag | 119.5 | 0.22 | 0.18 | 0.22 | 0,51 | 0.22 | 0.33 | 0.14 | 0.04 | 1.86 | 2 |
| **Illinois River** | | | | | | | | | | | | | | | |
| St. Louis | Nutwood | IL | Federal | Ag | 19.4 | 0.66 | 0.18 | 0.33 | 0.51 | 0.22 | 0.33 | 0.14 | 0.08 | 2.45 | 3 |
| St. Louis | Eldred - Spankey DL | IL | Federal | Ag | 28.1 | 0.44 | 0.18 | 0.33 | 0.51 | 0.44 | 0.33 | 0.14 | 0.08 | 2.45 | 3 |
| St. Louis | Schaefer - Farrow | IL | Private | Ag | 32.6 | 0.44 | 0.06 | 0.11 | 0.51 | 0.66 | 0.33 | 0.07 | 0.04 | 2.22 | 3 |
| St. Louis | Bluffdale Farms | IL | Non-Federal | Ag | 32.3 | 0.44 | 0.18 | 0.11 | 0.34 | 0.66 | 0,11 | 0.07 | 0.04 | 1.95 | 2 |
| St. Louis | Keach | IL | Federal | Ag | 35.3 | 0.44 | 0.18 | 0.22 | 0.51 | 0.66 | 0.22 | 0.14 | 0.12 | 2.49 | 3 |

| District | Name | State | Type of Construction | Urban or Ag | mid point river mile | WEIGHTED VALUES | | | | | | | | **TOTAL ENVIRONMENTAL SCORE** | **ENVIRONMENTAL RANKING** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Within Pool Location | Urban Development | Agricultural Development | Tributary Feeders | Landowners | Floodplain below Bank Elevation | X-Sectional Area Below Bank Elev. | Contour Point Elevations | | |
| St. Louis | Hartwell | IL | Federal | Ag | 40.7 | 0.44 | 0.18 | 0.33 | 0.51 | 0.66 | 0.33 | 0,21 | 0.12 | 2.78 | 3 |
| St. Louis | Hillview | IL | Federal | Ag | 46.6 | 0.44 | 0.18 | 0.33 | 0.51 | 0.44 | 0.22 | 0.21 | 0.08 | 2.41 | 3 |
| St. Louis | Big Swan | IL | Federal | Ag | 53.6 | 0.22 | 0.18 | 0.33 | 0.51 | 0.44 | 0.22 | 0.21 | 0.08 | 2.19 | 3 |
| St. Louis | Walnut Creek | IL | Non-Federal | Ag | 56.3 | 0.22 | NA | NA | 0.51 | 0.66 | NA | NA | NA | NA | NA |
| St. Louis | Scott County | IL | Federal | Ag | 59.3 | 0.22 | 0.18 | 0.33 | 0.51 | 0.22 | 0.22 | 0.21 | 0.08 | 1.97 | 2 |
| St. Louis | Valley City | IL | Federal | Ag | 65.1 | 0.22 | 0.18 | 0.22 | 0.51 | 0.44 | 0.33 | 0.14 | 0.08 | 2.12 | 3 |
| St. Louis | Robertson | IL | Private | Ag | 63.3 | 0.22 | 0.18 | 0.11 | 0.34 | 0.66 | 0.22 | 0.07 | 0.12 | 1.92 | 2 |
| St. Louis | Mauvaise Terre | IL | Federal | Ag | 64.8 | 0.22 | 0.12 | 0.22 | 0.51 | 0.22 | 0.22 | 0.21 | 0.12 | 1.84 | 1 |
| St. Louis | Oakes | IL | Private | Ag | 66.3 | 0.22 | 0.18 | 0.11 | 0.34 | 0.66 | 0.22 | 0.07 | 0.12 | 1.92 | 2 |
| St. Louis | Smith Lake | IL | Private | Ag | 67.2 | 0.22 | | | | 0.66 | 0.22 | 0.14 | 0.12 | | |
| St. Louis | Coon Run | IL | Federal | Ag | 68.9 | 0.22 | 0.18 | 0.11 | 0.51 | 0.44 | 0.22 | 0.07 | 0.12 | 1.87 | 2 |
| St. Louis | Meredosia & Willow Cr | IL | Federal | Ag | 69.5 | 0.22 | 0.06 | 0.33 | 0.51 | 0.22 | 0.33 | 0.21 | 0.12 | 2 | 2 |
| St. Louis | McGee Creek | IL | Federal | Ag | 69.2 | 0.22 | 0.18 | 0.33 | 0.51 | 0.22 | 0.33 | 0.21 | 0.12 | 2.12 | 3 |

## CHAPTER 1—ATTACHMENT G

## NUMBER UMRS ENVIRONMENTAL OBJECTIVES & ECOSYSTEM RESTORATION PROJECTS IDENTIFIED BY POOL LOCATION & HNA RIVER REACH

**ATTACHMENT G, TABLE 1. NUMBER OF ENVIRONMENTAL OBJECTIVES IDENTIFIED WITHIN UMRS**

**UMRCP STUDY REACH 1**

| **HNA Reach 1 -- Miss R. HN (St. Paul, MN) to L&D 3 (Red Wing, MN)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Pool 1 | Pool 2 | Pool 3 | | | | Total |
| Water Clarity | 0 | 8 | 6 | | | | 14 |
| Backwater Depth | 0 | 8 | 8 | | | | 16 |
| Water Level | 1 | 3 | 1 | | | | 5 |
| Connectivity | 1 | 6 | 9 | | | | 16 |
| Aquatic Areas | 13 | 1 | 1 | | | | 15 |
| Terrestrial Areas | 1 | 19 | 7 | | | | 27 |
| Land Cover/Use | 2 | 55 | 41 | | | | 98 |
| Plants | 0 | 0 | 0 | | | | 0 |
| Fish | 0 | 0 | 0 | | | | 0 |
| Birds | 0 | 0 | 0 | | | | 0 |
| Other | 1 | 2 | 3 | | | | 6 |
| Total | 19 | 102 | 76 | | | | 197 |
| **HNA Reach 2 -- Miss R. L&D 3 (Red Wing, MN) to L&D 4 (Alma, WI)** | | | | | | | |
| Objective | Pool 4 | | | | | | Total |
| Water Clarity | 11 | | | | | | 11 |
| Backwater Depth | 12 | | | | | | 12 |
| Water Level | 2 | | | | | | 2 |
| Connectivity | 8 | | | | | | 8 |
| Aquatic Areas | 7 | | | | | | 7 |
| Terrestrial Areas | 38 | | | | | | 38 |
| Land Cover/Use | 36 | | | | | | 36 |
| Plants | 0 | | | | | | 0 |
| Fish | 0 | | | | | | 0 |
| Birds | 0 | | | | | | 0 |
| Other | 1 | | | | | | 1 |
| Total | 115 | | | | | | 115 |
| **HNA Reach 3 -- Miss R. L&D 4 (Alma, WI) to L&D 9 (Harper's Ferry, IA)** | | | | | | | |
| Objective | Pool 5 | Pool 5a | Pool 6 | Pool 7 | Pool 8 | Pool 9 | Total |
| Water Clarity | 10 | 7 | 7 | 10 | 25 | 26 | 85 |
| Backwater Depth | 11 | 8 | 10 | 10 | 21 | 25 | 85 |
| Water Level | 1 | 1 | 4 | 2 | 1 | 2 | 11 |
| Connectivity | 6 | 3 | 7 | 6 | 5 | 4 | 31 |
| Aquatic Areas | 4 | 3 | 1 | 5 | 1 | 3 | 17 |
| Terrestrial Areas | 21 | 6 | 12 | 21 | 37 | 36 | 133 |
| Land Cover/Use | 36 | 16 | 10 | 25 | 42 | 46 | 175 |
| Plants | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fish | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Birds | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other | 0 | 3 | 2 | 0 | 4 | 0 | 9 |
| Total | 89 | 47 | 53 | 79 | 136 | 142 | 546 |
| **HNA Reach 4 -- Miss R. L&D 9 (Harper's Ferry, IA) to Pool 13 (Clinton, IA)** | | | | | | | |
| Objective | Pool 10 | Pool 11 | Pool 12 | Pool 13 | | | Total |
| Water Clarity | 30 | 20 | 14 | 14 | | | 78 |
| Backwater Depth | 40 | 20 | 16 | 14 | | | 90 |
| Water Level | 1 | 2 | 1 | 1 | | | 5 |
| Connectivity | 9 | 3 | 2 | 2 | | | 16 |
| Aquatic Areas | 15 | 18 | 4 | 9 | | | 46 |
| Terrestrial Areas | 51 | 40 | 12 | 16 | | | 119 |
| Land Cover/Use | 26 | 30 | 15 | 15 | | | 86 |
| Plants | 0 | 0 | 0 | 0 | | | 0 |
| Fish | 0 | 0 | 1 | 1 | | | 2 |
| Birds | 0 | 0 | 0 | 0 | | | 0 |
| Other | 3 | 2 | 0 | 0 | | | 5 |
| Total | 175 | 135 | 65 | 72 | | | 447 |

**ATTACHMENT G, TABLE 1. NUMBER OF ENVIRONMENTAL OBJECTIVES IDENTIFIED WITHIN UMRS (Continued)**

**UMRCP STUDY REACH 2**

| **HNA Reach 5 -- Miss R. Pool 13 (Clinton, IA) to L&D 17 (New Boston, IL)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Pool 14 | Pool 15 | Pool 16 | Pool 17 | | | Total |
| Water Clarity | 10 | 0 | 8 | 6 | | | 24 |
| Backwater Depth | 12 | 0 | 7 | 7 | | | 26 |
| Water Level | 1 | 1 | 1 | 1 | | | 4 |
| Connectivity | 2 | 2 | 2 | 4 | | | 10 |
| Aquatic Areas | 5 | 2 | 11 | 7 | | | 25 |
| Terrestrial Areas | 6 | 1 | 2 | 1 | | | 10 |
| Land Cover/Use | 11 | 0 | 9 | 12 | | | 32 |
| Plants | 0 | 0 | 0 | 0 | | | 0 |
| Fish | 1 | 1 | 0 | 0 | | | 2 |
| Birds | 0 | 0 | 0 | 0 | | | 0 |
| Other | 3 | 3 | 1 | 2 | | | 9 |
| Total | 51 | 10 | 41 | 40 | | | 142 |
| **HNA Reach 6 -- Miss R. L&D 17 (New Boston, IL) to L&D 19 (Keokuk, IA)** | | | | | | | |
| Objective | Pool 18 | Pool 19 | | | | | Total |
| Water Clarity | 8 | 8 | | | | | 16 |
| Backwater Depth | 8 | 9 | | | | | 17 |
| Water Level | 1 | 1 | | | | | 2 |
| Connectivity | 6 | 2 | | | | | 8 |
| Aquatic Areas | 9 | 6 | | | | | 15 |
| Terrestrial Areas | 7 | 10 | | | | | 17 |
| Land Cover/Use | 10 | 12 | | | | | 22 |
| Plants | 0 | 0 | | | | | 0 |
| Fish | 1 | 0 | | | | | 1 |
| Birds | 0 | 0 | | | | | 0 |
| Other | 0 | 3 | | | | | 3 |
| Total | 50 | 51 | | | | | 101 |

**ATTACHMENT G, TABLE 1. NUMBER OF ENVIRONMENTAL OBJECTIVES IDENTIFIED WITHIN UMRS (Continued)**

**UMRCP STUDY REACH 3**

| **HNA Reach 7 -- Miss R. L&D 19 (Keokuk, IA) to L&D 22 (Saverton, MO)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Pool 20 | Pool 21 | Pool 22 | | | | Total |
| Water Clarity | 9 | 9 | 11 | | | | 29 |
| Backwater Depth | 6 | 6 | 11 | | | | 23 |
| Water Level | 2 | 1 | 1 | | | | 4 |
| Connectivity | 1 | 9 | 10 | | | | 20 |
| Aquatic Areas | 21 | 3 | 19 | | | | 43 |
| Terrestrial Areas | 3 | 9 | 9 | | | | 21 |
| Land Cover/Use | 18 | 10 | 23 | | | | 51 |
| Plants | 0 | 0 | 0 | | | | 0 |
| Fish | 0 | 0 | 0 | | | | 0 |
| Birds | 0 | 0 | 0 | | | | 0 |
| Other | 20 | 14 | 16 | | | | 50 |
| Total | 80 | 61 | 100 | | | | 241 |
| **HNA Reach 8 -- Miss R. L&D 22 (Saverton, MO) to L&D 27 (Granite City, IL)** | | | | | | | |
| Objective | Pool 24 | Pool 25 | Pool 26 | | | | Total |
| Water Clarity | 10 | 19 | 16 | | | | 45 |
| Backwater Depth | 14 | 21 | 18 | | | | 53 |
| Water Level | 1 | 0 | 0 | | | | 1 |
| Connectivity | 9 | 13 | 4 | | | | 26 |
| Aquatic Areas | 8 | 17 | 7 | | | | 32 |
| Terrestrial Areas | 7 | 3 | 2 | | | | 12 |
| Land Cover/Use | 13 | 26 | 18 | | | | 57 |
| Plants | 0 | 0 | 0 | | | | 0 |
| Fish | 0 | 0 | 0 | | | | 0 |
| Birds | 0 | 0 | 0 | | | | 0 |
| Other | 4 | 6 | 4 | | | | 14 |
| Total | 66 | 105 | 69 | | | | 240 |
| **HNA Reach 9-10 -- Miss R. L&D 27 (Granite City, MO) to Cairo, IL** | | | | | | | |
| Objective | Lock 26 to Kaskaskia R. | Kaskaskia R. to Grand Tower | Grand Tower to Ohio R. | | | | Total |
| Water Clarity | 1 | 1 | 3 | | | | 5 |
| Backwater Depth | 1 | 1 | 3 | | | | 5 |
| Water Level | 0 | 0 | 0 | | | | 0 |
| Connectivity | 11 | 6 | 12 | | | | 29 |
| Aquatic Areas | 34 | 15 | 43 | | | | 92 |
| Terrestrial Areas | 10 | 3 | 5 | | | | 18 |
| Land Cover/Use | 18 | 9 | 14 | | | | 41 |
| Plants | 0 | 0 | 0 | | | | 0 |
| Fish | 0 | 1 | 0 | | | | 1 |
| Birds | 0 | 0 | 0 | | | | 0 |
| Other | 4 | 0 | 1 | | | | 5 |
| Total | 79 | 36 | 81 | | | | 196 |

**ATTACHMENT G, TABLE 1. NUMBER OF ENVIRONMENTAL OBJECTIVES IDENTIFIED WITHIN UMRS (Continued)**

**UMRCP STUDY REACH 4**

| **HNA Reach 11 -- IL R HN (Chicago, IL) to Starved Rock L&D (Utica, IL)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Lockport | Brandon | Dresden | Marseilles | Starved Rock | | Total |
| Water Clarity | 0 | 0 | 1 | 4 | 3 | | 8 |
| Backwater Depth | 0 | 0 | 1 | 4 | 3 | | 8 |
| Water Level | 0 | 0 | 0 | 0 | 0 | | 0 |
| Connectivity | 0 | 0 | 1 | 2 | 1 | | 4 |
| Aquatic Areas | 0 | 1 | 2 | 2 | 3 | | 8 |
| Terrestrial Areas | 0 | 0 | 0 | 3 | 2 | | 5 |
| Land Cover/Use | 0 | 0 | 1 | 5 | 4 | | 10 |
| Plants | 2 | 0 | 0 | 0 | 0 | | 2 |
| Fish | 0 | 0 | 0 | 0 | 0 | | 0 |
| Birds | 0 | 0 | 0 | 0 | 0 | | 0 |
| Other | 0 | 1 | 3 | 1 | 4 | | 9 |
| Total | 2 | 2 | 9 | 21 | 20 | | 54 |
| **HNA Reach 12 -- IL R Starved Rock L&D (Utica, IL) to River's mouth (Grafton, IL)** | | | | | | | |
| Objective | Peoria | La Grange | Alton | | | | Total |
| Water Clarity | 14 | 22 | 7 | | | | 43 |
| Backwater Depth | 15 | 25 | 8 | | | | 48 |
| Water Level | 0 | 0 | 0 | | | | 0 |
| Connectivity | 3 | 13 | 7 | | | | 23 |
| Aquatic Areas | 9 | 12 | 14 | | | | 35 |
| Terrestrial Areas | 23 | 3 | 23 | | | | 49 |
| Land Cover/Use | 17 | 29 | 22 | | | | 68 |
| Plants | 1 | 0 | 0 | | | | 1 |
| Fish | 0 | 0 | 0 | | | | 0 |
| Birds | 1 | 0 | 0 | | | | 1 |
| Other | 11 | 2 | 7 | | | | 20 |
| Total | 94 | 106 | 88 | | | | 288 |

**GRAND TOTAL 2567**

**ATTACHMENT G, TABLE 2. NUMBER OF ECOSYSTEM RESTORATION PROJECT OPPORTUNITIES IDENTIFIED WITHIN UMRS (= VIRTUAL REFERENCE)**

**UMRCP STUDY REACH 1**

| **HNA Reach 1 -- Miss R. HN (St. Paul, MN) to L&D 3 (Red Wing, MN)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Pool 1 | Pool 2 | Pool 3 | | | | Total |
| SC Connectivity | 0 | 4 | 0 | | | | 4 |
| Island Protection | 0 | 0 | 0 | | | | 0 |
| Dike Modification | 0 | 0 | 0 | | | | 0 |
| Island Area | 1 | 13 | 5 | | | | 19 |
| Fish Passage | 1 | 1 | 1 | | | | 3 |
| WLM—Pool | 1 | 1 | 1 | | | | 3 |
| WLM—BW | 0 | 1 | 0 | | | | 1 |
| FP Connectivity | 0 | 1 | 7 | | | | 8 |
| Topographic Diversity | 0 | 6 | 0 | | | | 6 |
| Depth | 0 | 8 | 8 | | | | 16 |
| Shore Protection | 4 | 7 | 4 | | | | 15 |
| Dam Point Control | 0 | 0 | 0 | | | | 0 |
| FP Immediate Projects | 0 | 0 | 0 | | | | 0 |
| Total | 7 | 42 | 26 | | | | 75 |
| **HNA Reach 2 -- Miss R. L&D 3 (Red Wing, MN) to L&D 4 (Alma, WI)** | | | | | | | |
| Objective | Pool 4 | | | | | | Total |
| SC Connectivity | 4 | | | | | | 4 |
| Island Protection | 19 | | | | | | 19 |
| Dike Modification | 2 | | | | | | 2 |
| Island Area | 13 | | | | | | 13 |
| Fish Passage | 1 | | | | | | 1 |
| WLM—Pool | 1 | | | | | | 1 |
| WLM—BW | 1 | | | | | | 1 |
| FP Connectivity | 7 | | | | | | 7 |
| Topographic Diversity | 0 | | | | | | 0 |
| Depth | 12 | | | | | | 12 |
| Shore Protection | 9 | | | | | | 9 |
| Dam Point Control | 0 | | | | | | 0 |
| FP Immediate Projects | 0 | | | | | | 0 |
| Total | 69 | | | | | | 69 |
| **HNA Reach 3 -- Miss R. L&D 4 (Alma, WI) to L&D 9 (Harper's Ferry, IA)** | | | | | | | |
| Objective | Pool 5 | Pool 5a | Pool 6 | Pool 7 | Pool 8 | Pool 9 | Total |
| SC Connectivity | 2 | 1 | 0 | 3 | 2 | 0 | 8 |
| Island Protection | 7 | 3 | 4 | 16 | 16 | 16 | 62 |
| Dike Modification | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| Island Area | 13 | 3 | 7 | 3 | 18 | 18 | 62 |
| Fish Passage | 1 | 1 | 1 | 1 | 1 | 1 | 6 |
| WLM—Pool | 1 | 1 | 1 | 1 | 1 | 1 | 6 |
| WLM—BW | 0 | 0 | 3 | 1 | 0 | 1 | 5 |
| FP Connectivity | 4 | 2 | 6 | 5 | 1 | 3 | 21 |
| Topographic Diversity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Depth | 11 | 8 | 10 | 10 | 21 | 25 | 85 |
| Shore Protection | 3 | 2 | 3 | 2 | 5 | 6 | 21 |
| Dam Point Control | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FP Immediate Projects | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 42 | 21 | 36 | 42 | 65 | 71 | 277 |

**ATTACHMENT G, TABLE 2. NUMBER OF ECOSYSTEM RESTORATION PROJECT OPPORTUNITIES IDENTIFIED WITHIN UMRS (= VIRTUAL REFERENCE) (Continued)**

**UMRCP STUDY REACH 1**

| **HNA Reach 4 -- Miss R. L&D 9 (Harper's Ferry, IA) to Pool 13 (Clinton, IA)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Pool 10 | Pool 11 | Pool 12 | Pool 13 | | | Total |
| SC Connectivity | 11 | 4 | 1 | 3 | | | 19 |
| Island Protection | 25 | 16 | 3 | 6 | | | 50 |
| Dike Modification | 1 | 4 | 0 | 2 | | | 7 |
| Island Area | 25 | 21 | 0 | 6 | | | 52 |
| Fish Passage | 1 | 1 | 1 | 1 | | | 4 |
| WLM—Pool | 1 | 1 | 1 | 1 | | | 4 |
| WLM—BW | 0 | 1 | 0 | 0 | | | 1 |
| FP Connectivity | 4 | 2 | 1 | 1 | | | 8 |
| Topographic Diversity | 0 | 0 | 8 | 2 | | | 10 |
| Depth | 40 | 20 | 16 | 14 | | | 90 |
| Shore Protection | 7 | 6 | 5 | 7 | | | 25 |
| Dam Point Control | 0 | 0 | 0 | 0 | | | 0 |
| FP Immediate Projects | 0 | 0 | 0 | 0 | | | 0 |
| Total | 115 | 76 | 36 | 43 | | | 270 |

**ATTACHMENT G, TABLE 2. NUMBER OF ECOSYSTEM RESTORATION PROJECT OPPORTUNITIES IDENTIFIED WITHIN UMRS (= VIRTUAL REFERENCE)**

**UMRCP STUDY REACH 2**

| **HNA Reach 5 -- Miss R. Pool 13 (Clinton, IA) to L&D 17 (New Boston, IL)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Pool 14 | Pool 15 | Pool 16 | Pool 17 | | | Total |
| SC Connectivity | 2 | 2 | 4 | 4 | | | 12 |
| Island Protection | 1 | 0 | 0 | 0 | | | 1 |
| Dike Modification | 2 | 0 | 1 | 1 | | | 4 |
| Island Area | 0 | 1 | 0 | 0 | | | 1 |
| Fish Passage | 1 | 1 | 1 | 1 | | | 4 |
| WLM—Pool | 1 | 1 | 1 | 1 | | | 4 |
| WLM—BW | 0 | 0 | 0 | 0 | | | 0 |
| FP Connectivity | 1 | 0 | 1 | 2 | | | 4 |
| Topographic Diversity | 5 | 0 | 0 | 0 | | | 5 |
| Depth | 12 | 0 | 7 | 7 | | | 26 |
| Shore Protection | 6 | 2 | 5 | 4 | | | 17 |
| Dam Point Control | 0 | 0 | 1 | 0 | | | 1 |
| FP Immediate Projects | 0 | 0 | 0 | 0 | | | 0 |
| Total | 31 | 7 | 21 | 20 | | | 79 |
| **HNA Reach 6 -- Miss R. L&D 17 (New Boston, IL) to L&D 19 (Keokuk, IA)** | | | | | | | |
| Objective | Pool 18 | Pool 19 | | | | | Total |
| SC Connectivity | 6 | 2 | | | | | 8 |
| Island Protection | 0 | 0 | | | | | 0 |
| Dike Modification | 1 | 1 | | | | | 2 |
| Island Area | 2 | 3 | | | | | 5 |
| Fish Passage | 1 | 1 | | | | | 2 |
| WLM—Pool | 1 | 1 | | | | | 2 |
| WLM—BW | 0 | 0 | | | | | 0 |
| FP Connectivity | 3 | 1 | | | | | 4 |
| Topographic Diversity | 3 | 0 | | | | | 3 |
| Depth | 8 | 9 | | | | | 17 |
| Shore Protection | 5 | 9 | | | | | 14 |
| Dam Point Control | 0 | 0 | | | | | 0 |
| FP Immediate Projects | 0 | 0 | | | | | 0 |
| Total | 30 | 27 | | | | | 57 |

**ATTACHMENT G, TABLE 2. NUMBER OF ECOSYSTEM RESTORATION PROJECT OPPORTUNITIES IDENTIFIED WITHIN UMRS (= VIRTUAL REFERENCE)**

**UMRCP STUDY REACH 3**

| **HNA Reach 7 -- Miss R. L&D 19 (Keokuk, IA) to L&D 22 (Saverton, MO)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Pool 20 | Pool 21 | Pool 22 | | | | Total |
| SC Connectivity | 11 | 3 | 14 | | | | 28 |
| Island Protection | 2 | 2 | 4 | | | | 8 |
| Dike Modification | 9 | 0 | 6 | | | | 15 |
| Island Area | 1 | 3 | 3 | | | | 7 |
| Fish Passage | 1 | 1 | 1 | | | | 3 |
| WLM—Pool | 1 | 1 | 1 | | | | 3 |
| WLM—BW | 1 | 0 | 0 | | | | 1 |
| FP Connectivity | 0 | 7 | 3 | | | | 10 |
| Topographic Diversity | 0 | 0 | 0 | | | | 0 |
| Depth | 6 | 6 | 11 | | | | 23 |
| Shore Protection | 4 | 4 | 5 | | | | 13 |
| Dam Point Control | 0 | 0 | 0 | | | | 0 |
| FP Immediate Projects | 0 | 0 | 0 | | | | 0 |
| Total | 36 | 27 | 48 | | | | 111 |
| **HNA Reach 8 -- Miss R. L&D 22 (Saverton, MO) to L&D 27 (Granite City, IL)** | | | | | | | |
| Objective | Pool 24 | Pool 25 | Pool 26 | | | | Total |
| SC Connectivity | 8 | 13 | 8 | | | | 29 |
| Island Protection | 0 | 0 | 0 | | | | 0 |
| Dike Modification | 1 | 4 | 0 | | | | 5 |
| Island Area | 3 | 1 | 1 | | | | 5 |
| Fish Passage | 1 | 1 | 1 | | | | 3 |
| WLM—Pool | 1 | 1 | 1 | | | | 3 |
| WLM—BW | 0 | 0 | 0 | | | | 0 |
| FP Connectivity | 4 | 6 | 1 | | | | 11 |
| Topographic Diversity | 0 | 0 | 0 | | | | 0 |
| Depth | 14 | 21 | 18 | | | | 53 |
| Shore Protection | 6 | 6 | 8 | | | | 20 |
| Dam Point Control | 1 | 1 | 0 | | | | 2 |
| FP Immediate Projects | 0 | 0 | 0 | | | | 0 |
| Total | 39 | 54 | 38 | | | | 131 |
| **HNA Reach 9-10 -- Miss R. L&D 27 (Granite City, MO) to Cairo, IL** | | | | | | | |
| Objective | Lock 26 to Kaskaskia R. | Kaskaskia R. to Grand Tower | Grand Tower to Ohio R. | | | | Total |
| SC Connectivity | 28 | 14 | 32 | | | | 74 |
| Island Protection | 2 | 0 | 0 | | | | 2 |
| Dike Modification | 11 | 6 | 18 | | | | 35 |
| Island Area | 1 | 1 | 2 | | | | 4 |
| Fish Passage | 2 | 0 | 0 | | | | 2 |
| WLM—Pool | 0 | 0 | 0 | | | | 0 |
| WLM—BW | 0 | 0 | 0 | | | | 0 |
| FP Connectivity | 5 | 4 | 1 | | | | 10 |
| Topographic Diversity | 6 | 1 | 1 | | | | 8 |
| Depth | 1 | 1 | 3 | | | | 5 |
| Shore Protection | 16 | 8 | 16 | | | | 40 |
| Dam Point Control | 0 | 0 | 0 | | | | 0 |
| FP Immediate Projects | 0 | 0 | 0 | | | | 0 |
| Total | 72 | 35 | 73 | | | | 180 |

**ATTACHMENT G, TABLE 2. NUMBER OF ECOSYSTEM RESTORATION PROJECT OPPORTUNITIES IDENTIFIED WITHIN UMRS (= VIRTUAL REFERENCE)**

**UMRCP STUDY REACH 4**

| **HNA Reach 11 -- IL R HN (Chicago, IL) to Starved Rock L&D (Utica, IL)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Lockport | Brandon | Dresden | Marseilles | Starved Rock | | Total |
| SC Connectivity | 0 | 1 | 3 | 3 | 2 | | 9 |
| Island Protection | 0 | 0 | 0 | 0 | 0 | | 0 |
| Dike Modification | 0 | 0 | 0 | 0 | 0 | | 0 |
| Island Area | 0 | 0 | 0 | 0 | 0 | | 0 |
| Fish Passage | 0 | 1 | 1 | 1 | 1 | | 4 |
| WLM—Pool | 0 | 0 | 0 | 0 | 0 | | 0 |
| WLM—BW | 0 | 0 | 0 | 0 | 0 | | 0 |
| FP Connectivity | 0 | 0 | 0 | 0 | 0 | | 0 |
| Topographic Diversity | 0 | 0 | 0 | 0 | 0 | | 0 |
| Depth | 0 | 0 | 1 | 4 | 3 | | 8 |
| Shore Protection | 2 | 1 | 3 | 5 | 3 | | 14 |
| Dam Point Control | 0 | 0 | 0 | 0 | 0 | | 0 |
| FP Immediate Projects | 0 | 0 | 0 | 0 | 0 | | 0 |
| Total | 2 | 3 | 8 | 13 | 9 | | 35 |
| **HNA Reach 12 -- IL R Starved Rock L&D (Utica, IL) to River's mouth (Grafton, IL)** | | | | | | | |
| Objective | Peoria | La Grange | Alton | | | | Total |
| SC Connectivity | 3 | 14 | 13 | | | | 30 |
| Island Protection | 0 | 0 | 15 | | | | 15 |
| Dike Modification | 0 | 2 | 1 | | | | 3 |
| Island Area | 3 | 0 | 1 | | | | 4 |
| Fish Passage | 1 | 0 | 0 | | | | 1 |
| WLM—Pool | 0 | 0 | 0 | | | | 0 |
| WLM—BW | 1 | 0 | 0 | | | | 1 |
| FP Connectivity | 0 | 8 | 7 | | | | 15 |
| Topographic Diversity | 0 | 0 | 0 | | | | 0 |
| Depth | 15 | 25 | 8 | | | | 48 |
| Shore Protection | 14 | 16 | 16 | | | | 46 |
| Dam Point Control | 0 | 0 | 0 | | | | 0 |
| FP Immediate Projects | 1 | 1 | 1 | | | | 3 |
| Total | 38 | 66 | 62 | | | | 166 |
| | | | | | | **GRAND TOTAL** | **1,450** |

**ATTACHMENT G, TABLE 3. NUMBER OF ECOSYSTEM RESTORATION PROJECT OPPORTUNITIES ADDRESSED BY NAVIGATION STUDY**

**UMRCP STUDY REACH 1**

| **HNA Reach 1 -- Miss R. HN (St. Paul, MN) to L&D 3 (Red Wing, MN)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Pool 1 | Pool 2 | Pool 3 | | | | Total |
| SC Connectivity | 0 | 4 | 0 | | | | 4 |
| Island Protection | 0 | 0 | 0 | | | | 0 |
| Dike Modification | 0 | 0 | 0 | | | | 0 |
| Island Area | 1 | 5 | 5 | | | | 11 |
| Fish Passage | 0 | 0 | 1 | | | | 1 |
| WLM—Pool | 0 | 0 | 0 | | | | 0 |
| WLM—BW | 0 | 1 | 0 | | | | 1 |
| FP Connectivity | 0 | 0 | 2 | | | | 2 |
| Topographic Diversity | 0 | 6 | 0 | | | | 6 |
| Depth | 0 | 5 | 3 | | | | 8 |
| Shore Protection | 4 | 7 | 4 | | | | 15 |
| Dam Point Control | 0 | 0 | 0 | | | | 0 |
| FP Immediate Projects | 0 | 0 | 0 | | | | 0 |
| Total | 5 | 28 | 15 | | | | 48 |
| **HNA Reach 2 -- Miss R. L&D 3 (Red Wing, MN) to L&D 4 (Alma, WI)** | | | | | | | |
| Objective | Pool 4 | | | | | | Total |
| SC Connectivity | 4 | | | | | | 4 |
| Island Protection | 19 | | | | | | 19 |
| Dike Modification | 2 | | | | | | 2 |
| Island Area | 6 | | | | | | 6 |
| Fish Passage | 0 | | | | | | 0 |
| WLM—Pool | 0 | | | | | | 0 |
| WLM—BW | 1 | | | | | | 1 |
| FP Connectivity | 2 | | | | | | 2 |
| Topographic Diversity | 0 | | | | | | 0 |
| Depth | 6 | | | | | | 6 |
| Shore Protection | 9 | | | | | | 9 |
| Dam Point Control | 0 | | | | | | 0 |
| FP Immediate Projects | 0 | | | | | | 0 |
| Total | 49 | | | | | | 49 |
| **HNA Reach 3 -- Miss R. L&D 4 (Alma, WI) to L&D 9 (Harper's Ferry, IA)** | | | | | | | |
| Objective | Pool 5 | Pool 5a | Pool 6 | Pool 7 | Pool 8 | Pool 9 | Total |
| SC Connectivity | 2 | 1 | 0 | 3 | 2 | 0 | 8 |
| Island Protection | 7 | 3 | 4 | 16 | 16 | 16 | 62 |
| Dike Modification | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| Island Area | 2 | 3 | 3 | 2 | 6 | 10 | 26 |
| Fish Passage | 1 | 0 | 0 | 0 | 0 | 1 | 2 |
| WLM—Pool | 1 | 0 | 0 | 1 | 1 | 1 | 4 |
| WLM—BW | 0 | 0 | 1 | 1 | 0 | 1 | 3 |
| FP Connectivity | 1 | 1 | 2 | 2 | 1 | 3 | 10 |
| Topographic Diversity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Depth | 3 | 3 | 3 | 3 | 7 | 12 | 31 |
| Shore Protection | 3 | 2 | 3 | 2 | 5 | 6 | 21 |
| Dam Point Control | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FP Immediate Projects | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 20 | 13 | 17 | 30 | 38 | 50 | 168 |

**ATTACHMENT G, TABLE 3. NUMBER OF ECOSYSTEM RESTORATION PROJECT OPPORTUNITIES ADDRESSED BY NAVIGATION STUDY**

**UMRCP STUDY REACH 1**

| **HNA Reach 4 -- Miss R. L&D 9 (Harper's Ferry, IA) to Pool 13 (Clinton, IA)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Pool 10 | Pool 11 | Pool 12 | Pool 13 | | | Total |
| SC Connectivity | 8 | 3 | 1 | 3 | | | 15 |
| Island Protection | 25 | 16 | 3 | 6 | | | 50 |
| Dike Modification | 1 | 3 | 0 | 2 | | | 6 |
| Island Area | 11 | 6 | 0 | 5 | | | 22 |
| Fish Passage | 1 | 1 | 1 | 0 | | | 3 |
| WLM—Pool | 0 | 1 | 0 | 1 | | | 2 |
| WLM—BW | 0 | 0 | 0 | 0 | | | 0 |
| FP Connectivity | 3 | 2 | 1 | 1 | | | 7 |
| Topographic Diversity | 0 | 0 | 8 | 2 | | | 10 |
| Depth | 13 | 10 | 6 | 8 | | | 37 |
| Shore Protection | 7 | 6 | 5 | 7 | | | 25 |
| Dam Point Control | 0 | 0 | 0 | 0 | | | 0 |
| FP Immediate Projects | 0 | 0 | 0 | 0 | | | 0 |
| Total | 69 | 48 | 25 | 35 | | | 177 |

**ATTACHMENT G, TABLE 3. NUMBER OF ECOSYSTEM RESTORATION PROJECT OPPORTUNITIES ADDRESSED BY NAVIGATION STUDY**

**UMRCP STUDY REACH 2**

| **HNA Reach 5 -- Miss R. Pool 13 (Clinton, IA) to L&D 17 (New Boston, IL)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Pool 14 | Pool 15 | Pool 16 | Pool 17 | | | Total |
| SC Connectivity | 2 | 2 | 4 | 3 | | | 11 |
| Island Protection | 1 | 0 | 0 | 0 | | | 1 |
| Dike Modification | 2 | 0 | 1 | 1 | | | 4 |
| Island Area | 0 | 1 | 0 | 0 | | | 1 |
| Fish Passage | 1 | 0 | 0 | 0 | | | 1 |
| WLM—Pool | 0 | 0 | 1 | 0 | | | 1 |
| WLM—BW | 0 | 0 | 0 | 0 | | | 0 |
| FP Connectivity | 1 | 0 | 0 | 2 | | | 3 |
| Topographic Diversity | 5 | 0 | 0 | 0 | | | 5 |
| Depth | 7 | 0 | 6 | 4 | | | 17 |
| Shore Protection | 6 | 2 | 5 | 4 | | | 17 |
| Dam Point Control | 0 | 0 | 1 | 0 | | | 1 |
| FP Immediate Projects | 0 | 0 | 0 | 0 | | | 0 |
| Total | 25 | 5 | 18 | 14 | | | 62 |
| **HNA Reach 6 -- Miss R. L&D 17 (New Boston, IL) to L&D 19 (Keokuk, IA)** | | | | | | | |
| Objective | Pool 18 | Pool 19 | | | | | Total |
| SC Connectivity | 6 | 2 | | | | | 8 |
| Island Protection | 0 | 0 | | | | | 0 |
| Dike Modification | 1 | 1 | | | | | 2 |
| Island Area | 2 | 3 | | | | | 5 |
| Fish Passage | 0 | 1 | | | | | 1 |
| WLM—Pool | 1 | 1 | | | | | 2 |
| WLM—BW | 0 | 0 | | | | | 0 |
| FP Connectivity | 2 | 1 | | | | | 3 |
| Topographic Diversity | 3 | 0 | | | | | 3 |
| Depth | 5 | 9 | | | | | 14 |
| Shore Protection | 5 | 9 | | | | | 14 |
| Dam Point Control | 0 | 0 | | | | | 0 |
| FP Immediate Projects | 0 | 0 | | | | | 0 |
| Total | 25 | 27 | | | | | 52 |

**ATTACHMENT G, TABLE 3. NUMBER OF ECOSYSTEM RESTORATION PROJECT OPPORTUNITIES ADDRESSED BY NAVIGATION STUDY**

**UMRCP STUDY REACH 3**

| **HNA Reach 7 -- Miss R. L&D 19 (Keokuk, IA) to L&D 22 (Saverton, MO)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Pool 20 | Pool 21 | Pool 22 | | | | Total |
| SC Connectivity | 7 | 2 | 6 | | | | 15 |
| Island Protection | 2 | 2 | 4 | | | | 8 |
| Dike Modification | 7 | 0 | 5 | | | | 12 |
| Island Area | 1 | 3 | 3 | | | | 7 |
| Fish Passage | 1 | 0 | 0 | | | | 1 |
| WLM—Pool | 0 | 0 | 0 | | | | 0 |
| WLM—BW | 1 | 0 | 0 | | | | 1 |
| FP Connectivity | 0 | 0 | 1 | | | | 1 |
| Topographic Diversity | 0 | 0 | 0 | | | | 0 |
| Depth | 5 | 5 | 6 | | | | 16 |
| Shore Protection | 4 | 4 | 5 | | | | 13 |
| Dam Point Control | 0 | 0 | 0 | | | | 0 |
| FP Immediate Projects | 0 | 0 | 0 | | | | 0 |
| Total | 28 | 16 | 30 | | | | 74 |
| **HNA Reach 8 -- Miss R. L&D 22 (Saverton, MO) to L&D 27 (Granite City, IL)** | | | | | | | |
| Objective | Pool 24 | Pool 25 | Pool 26 | | | | Total |
| SC Connectivity | 5 | 7 | 4 | | | | 16 |
| Island Protection | 0 | 0 | 0 | | | | 0 |
| Dike Modification | 1 | 4 | 0 | | | | 5 |
| Island Area | 3 | 1 | 1 | | | | 5 |
| Fish Passage | 1 | 1 | 0 | | | | 2 |
| WLM—Pool | 1 | 1 | 1 | | | | 3 |
| WLM—BW | 0 | 0 | 0 | | | | 0 |
| FP Connectivity | 0 | 1 | 1 | | | | 2 |
| Topographic Diversity | 0 | 0 | 0 | | | | 0 |
| Depth | 7 | 9 | 11 | | | | 27 |
| Shore Protection | 6 | 6 | 8 | | | | 20 |
| Dam Point Control | 1 | 1 | 0 | | | | 2 |
| FP Immediate Projects | 0 | 0 | 0 | | | | 0 |
| Total | 25 | 31 | 26 | | | | 82 |
| **HNA Reach 9-10 -- Miss R. L&D 27 (Granite City, MO) to Cairo, IL** | | | | | | | |
| Objective | Lock 26 to Kaskaskia R. | Kaskaskia R. to Grand Tower | Grand Tower to Ohio R. | | | | Total |
| SC Connectivity | 13 | 6 | 13 | | | | 32 |
| Island Protection | 2 | 0 | 0 | | | | 2 |
| Dike Modification | 8 | 6 | 15 | | | | 29 |
| Island Area | 1 | 1 | 2 | | | | 4 |
| Fish Passage | 2 | 0 | 0 | | | | 2 |
| WLM—Pool | 0 | 0 | 0 | | | | 0 |
| WLM—BW | 0 | 0 | 0 | | | | 0 |
| FP Connectivity | 1 | 1 | 1 | | | | 3 |
| Topographic Diversity | 6 | 1 | 1 | | | | 8 |
| Depth | 1 | 1 | 3 | | | | 5 |
| Shore Protection | 16 | 8 | 16 | | | | 40 |
| Dam Point Control | 0 | 0 | 0 | | | | 0 |
| FP Immediate Projects | 0 | 0 | 0 | | | | 0 |
| Total | 50 | 24 | 51 | | | | 125 |

**ATTACHMENT G, TABLE 3. NUMBER OF ECOSYSTEM RESTORATION PROJECT OPPORTUNITIES ADDRESSED BY NAVIGATION STUDY**

**UMRCP STUDY REACH 4**

| **HNA Reach 11 -- IL R HN (Chicago, IL) to Starved Rock L&D (Utica, IL)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Lockport | Brandon | Dresden | Marseilles | Starved Rock | | Total |
| SC Connectivity | 0 | 1 | 3 | 3 | 2 | | 9 |
| Island Protection | 0 | 0 | 0 | 0 | 0 | | 0 |
| Dike Modification | 0 | 0 | 0 | 0 | 0 | | 0 |
| Island Area | 0 | 0 | 0 | 0 | 0 | | 0 |
| Fish Passage | 0 | 0 | 0 | 0 | 0 | | 0 |
| WLM—Pool | 0 | 0 | 0 | 0 | 0 | | 0 |
| WLM—BW | 0 | 0 | 0 | 0 | 0 | | 0 |
| FP Connectivity | 0 | 0 | 0 | 0 | 0 | | 0 |
| Topographic Diversity | 0 | 0 | 0 | 0 | 0 | | 0 |
| Depth | 0 | 0 | 1 | 4 | 3 | | 8 |
| Shore Protection | 2 | 1 | 3 | 5 | 3 | | 14 |
| Dam Point Control | 0 | 0 | 0 | 0 | 0 | | 0 |
| FP Immediate Projects | 0 | 0 | 0 | 0 | 0 | | 0 |
| Total | 2 | 2 | 7 | 12 | 8 | | 31 |
| **HNA Reach 12 -- IL R Starved Rock L&D (Utica, IL) to River's mouth (Grafton, IL)** | | | | | | | |
| Objective | Peoria | La Grange | Alton | | | | Total |
| SC Connectivity | 3 | 12 | 10 | | | | 25 |
| Island Protection | 0 | 0 | 15 | | | | 15 |
| Dike Modification | 0 | 2 | 1 | | | | 3 |
| Island Area | 3 | 0 | 1 | | | | 4 |
| Fish Passage | 0 | 0 | 0 | | | | 0 |
| WLM—Pool | 0 | 0 | 0 | | | | 0 |
| WLM—BW | 1 | 0 | 0 | | | | 1 |
| FP Connectivity | 0 | 2 | 2 | | | | 4 |
| Topographic Diversity | 0 | 0 | 0 | | | | 0 |
| Depth | 12 | 18 | 8 | | | | 38 |
| Shore Protection | 14 | 16 | 16 | | | | 46 |
| Dam Point Control | 0 | 0 | 0 | | | | 0 |
| FP Immediate Projects | 1 | 1 | 1 | | | | 3 |
| Total | 34 | 51 | 53 | | | | 139 |

**GRAND TOTAL 1,007**

**ATTACHMENT G, TABLE 4. NUMBER OF ECOSYSTEM RESTORATION PROJECT OPPORTUNITIES NOT ADDRESSED BY NAVIGATION STUDY**

**UMRCP STUDY REACH 1**

| **HNA Reach 1 -- Miss R. HN (St. Paul, MN) to L&D 3 (Red Wing, MN)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Pool 1 | Pool 2 | Pool 3 | | | | Total |
| SC Connectivity | 0 | 0 | 0 | | | | 0 |
| Island Protection | 0 | 0 | 0 | | | | 0 |
| Dike Modification | 0 | 0 | 0 | | | | 0 |
| Island Area | 0 | 8 | 0 | | | | 8 |
| Fish Passage | 1 | 1 | 0 | | | | 2 |
| WLM—Pool | 1 | 1 | 1 | | | | 3 |
| WLM—BW | 0 | 0 | 0 | | | | 0 |
| FP Connectivity | 0 | 1 | 5 | | | | 6 |
| Topographic Diversity | 0 | 0 | 0 | | | | 0 |
| Depth | 0 | 3 | 5 | | | | 8 |
| Shore Protection | 0 | 0 | 0 | | | | 0 |
| Dam Point Control | 0 | 0 | 0 | | | | 0 |
| FP Immediate Projects | 0 | 0 | 0 | | | | 0 |
| Total | 2 | 14 | 11 | | | | 27 |
| **HNA Reach 2 -- Miss R. L&D 3 (Red Wing, MN) to L&D 4 (Alma, WI)** | | | | | | | |
| Objective | Pool 4 | | | | | | Total |
| SC Connectivity | 0 | | | | | | 0 |
| Island Protection | 0 | | | | | | 0 |
| Dike Modification | 0 | | | | | | 0 |
| Island Area | 7 | | | | | | 7 |
| Fish Passage | 1 | | | | | | 1 |
| WLM—Pool | 1 | | | | | | 1 |
| WLM—BW | 0 | | | | | | 0 |
| FP Connectivity | 5 | | | | | | 5 |
| Topographic Diversity | 0 | | | | | | 0 |
| Depth | 6 | | | | | | 6 |
| Shore Protection | 0 | | | | | | 0 |
| Dam Point Control | 0 | | | | | | 0 |
| FP Immediate Projects | 0 | | | | | | 0 |
| Total | 20 | | | | | | 20 |
| **HNA Reach 3 -- Miss R. L&D 4 (Alma, WI) to L&D 9 (Harper's Ferry, IA)** | | | | | | | |
| Objective | Pool 5 | Pool 5a | Pool 6 | Pool 7 | Pool 8 | Pool 9 | Total |
| SC Connectivity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Island Protection | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dike Modification | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Island Area | 11 | 0 | 4 | 1 | 12 | 8 | 36 |
| Fish Passage | 0 | 1 | 1 | 1 | 1 | 0 | 4 |
| WLM—Pool | 0 | 1 | 1 | 0 | 0 | 0 | 2 |
| WLM—BW | 0 | 0 | 2 | 0 | 0 | 0 | 2 |
| FP Connectivity | 3 | 1 | 4 | 3 | 0 | 0 | 11 |
| Topographic Diversity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Depth | 8 | 5 | 7 | 7 | 14 | 13 | 54 |
| Shore Protection | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dam Point Control | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FP Immediate Projects | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 22 | 8 | 19 | 12 | 27 | 21 | 109 |

**ATTACHMENT G, TABLE 4. NUMBER OF ECOSYSTEM RESTORATION PROJECT OPPORTUNITIES NOT ADDRESSED BY NAVIGATION STUDY (Continued)**

**UMRCP STUDY REACH 1**

| **HNA Reach 4 -- Miss R. L&D 9 (Harper's Ferry, IA) to Pool 13 (Clinton, IA)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Pool 10 | Pool 11 | Pool 12 | Pool 13 | | | Total |
| SC Connectivity | 3 | 1 | 0 | 0 | | | 4 |
| Island Protection | 0 | 0 | 0 | 0 | | | 0 |
| Dike Modification | 0 | 1 | 0 | 0 | | | 1 |
| Island Area | 14 | 15 | 0 | 1 | | | 30 |
| Fish Passage | 0 | 0 | 0 | 1 | | | 1 |
| WLM—Pool | 1 | 0 | 1 | 0 | | | 2 |
| WLM—BW | 0 | 1 | 0 | 0 | | | 1 |
| FP Connectivity | 1 | 0 | 0 | 0 | | | 1 |
| Topographic Diversity | 0 | 0 | 0 | 0 | | | 0 |
| Depth | 27 | 10 | 10 | 6 | | | 53 |
| Shore Protection | 0 | 0 | 0 | 0 | | | 0 |
| Dam Point Control | 0 | 0 | 0 | 0 | | | 0 |
| FP Immediate Projects | 0 | 0 | 0 | 0 | | | 0 |
| Total | 46 | 28 | 11 | 8 | | | 93 |

**ATTACHMENT G, TABLE 4. NUMBER OF ECOSYSTEM RESTORATION PROJECT OPPORTUNITIES NOT ADDRESSED BY NAVIGATION STUDY (Continued)**

**UMRCP STUDY REACH 2**

| **HNA Reach 5 -- Miss R. Pool 13 (Clinton, IA) to L&D 17 (New Boston, IL)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Pool 14 | Pool 15 | Pool 16 | Pool 17 | | | Total |
| SC Connectivity | 0 | 0 | 0 | 1 | | | 1 |
| Island Protection | 0 | 0 | 0 | 0 | | | 0 |
| Dike Modification | 0 | 0 | 0 | 0 | | | 0 |
| Island Area | 0 | 0 | 0 | 0 | | | 0 |
| Fish Passage | 0 | 1 | 1 | 1 | | | 3 |
| WLM—Pool | 1 | 1 | 0 | 1 | | | 3 |
| WLM—BW | 0 | 0 | 0 | 0 | | | 0 |
| FP Connectivity | 0 | 0 | 1 | 0 | | | 1 |
| Topographic Diversity | 0 | 0 | 0 | 0 | | | 0 |
| Depth | 5 | 0 | 1 | 3 | | | 9 |
| Shore Protection | 0 | 0 | 0 | 0 | | | 0 |
| Dam Point Control | 0 | 0 | 0 | 0 | | | 0 |
| FP Immediate Projects | 0 | 0 | 0 | 0 | | | 0 |
| Total | 6 | 2 | 3 | 6 | | | 17 |
| **HNA Reach 6 -- Miss R. L&D 17 (New Boston, IL) to L&D 19 (Keokuk, IA)** | | | | | | | |
| Objective | Pool 18 | Pool 19 | | | | | Total |
| SC Connectivity | 0 | 0 | | | | | 0 |
| Island Protection | 0 | 0 | | | | | 0 |
| Dike Modification | 0 | 0 | | | | | 0 |
| Island Area | 0 | 0 | | | | | 0 |
| Fish Passage | 1 | 0 | | | | | 1 |
| WLM—Pool | 0 | 0 | | | | | 0 |
| WLM—BW | 0 | 0 | | | | | 0 |
| FP Connectivity | 1 | 0 | | | | | 1 |
| Topographic Diversity | 0 | 0 | | | | | 0 |
| Depth | 3 | 0 | | | | | 3 |
| Shore Protection | 0 | 0 | | | | | 0 |
| Dam Point Control | 0 | 0 | | | | | 0 |
| FP Immediate Projects | 0 | 0 | | | | | 0 |
| Total | 5 | 0 | | | | | 5 |

**ATTACHMENT G, TABLE 4. NUMBER OF ECOSYSTEM RESTORATION PROJECT OPPORTUNITIES NOT ADDRESSED BY NAVIGATION STUDY (Continued)**

**UMRCP STUDY REACH 3**

| **HNA Reach 7 -- Miss R. L&D 19 (Keokuk, IA) to L&D 22 (Saverton, MO)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Pool 20 | Pool 21 | Pool 22 | | | | Total |
| SC Connectivity | 4 | 1 | 8 | | | | 13 |
| Island Protection | 0 | 0 | 0 | | | | 0 |
| Dike Modification | 2 | 0 | 1 | | | | 3 |
| Island Area | 0 | 0 | 0 | | | | 0 |
| Fish Passage | 0 | 1 | 1 | | | | 2 |
| WLM—Pool | 1 | 1 | 1 | | | | 3 |
| WLM—BW | 0 | 0 | 0 | | | | 0 |
| FP Connectivity | 0 | 7 | 2 | | | | 9 |
| Topographic Diversity | 0 | 0 | 0 | | | | 0 |
| Depth | 1 | 1 | 5 | | | | 7 |
| Shore Protection | 0 | 0 | 0 | | | | 0 |
| Dam Point Control | 0 | 0 | 0 | | | | 0 |
| FP Immediate Projects | 0 | 0 | 0 | | | | 0 |
| Total | 8 | 11 | 18 | | | | 37 |
| **HNA Reach 8 -- Miss R. L&D 22 (Saverton, MO) to L&D 27 (Granite City, IL)** | | | | | | | |
| Objective | Pool 24 | Pool 25 | Pool 26 | | | | Total |
| SC Connectivity | 3 | 6 | 4 | | | | 13 |
| Island Protection | 0 | 0 | 0 | | | | 0 |
| Dike Modification | 0 | 0 | 0 | | | | 0 |
| Island Area | 0 | 0 | 0 | | | | 0 |
| Fish Passage | 0 | 0 | 1 | | | | 1 |
| WLM—Pool | 0 | 0 | 0 | | | | 0 |
| WLM—BW | 0 | 0 | 0 | | | | 0 |
| FP Connectivity | 4 | 5 | 0 | | | | 9 |
| Topographic Diversity | 0 | 0 | 0 | | | | 0 |
| Depth | 7 | 12 | 7 | | | | 26 |
| Shore Protection | 0 | 0 | 0 | | | | 0 |
| Dam Point Control | 0 | 0 | 0 | | | | 0 |
| FP Immediate Projects | 0 | 0 | 0 | | | | 0 |
| Total | 14 | 23 | 12 | | | | 49 |
| **HNA Reach 9-10 -- Miss R. L&D 27 (Granite City, MO) to Cairo, IL** | | | | | | | |
| Objective | Lock 26 to Kaskaskia R. | Kaskaskia R. to Grand Tower | Grand Tower to Ohio R. | | | | Total |
| SC Connectivity | 15 | 8 | 19 | | | | 42 |
| Island Protection | 0 | 0 | 0 | | | | 0 |
| Dike Modification | 3 | 0 | 3 | | | | 6 |
| Island Area | 0 | 0 | 0 | | | | 0 |
| Fish Passage | 0 | 0 | 0 | | | | 0 |
| WLM—Pool | 0 | 0 | 0 | | | | 0 |
| WLM—BW | 0 | 0 | 0 | | | | 0 |
| FP Connectivity | 4 | 3 | 0 | | | | 7 |
| Topographic Diversity | 0 | 0 | 0 | | | | 0 |
| Depth | 0 | 0 | 0 | | | | 0 |
| Shore Protection | 0 | 0 | 0 | | | | 0 |
| Dam Point Control | 0 | 0 | 0 | | | | 0 |
| FP Immediate Projects | 0 | 0 | 0 | | | | 0 |
| Total | 22 | 11 | 22 | | | | 55 |

**ATTACHMENT G, TABLE 4. NUMBER OF ECOSYSTEM RESTORATION PROJECT OPPORTUNITIES NOT ADDRESSED BY NAVIGATION STUDY (Continued)**

**UMRCP STUDY REACH 4**

| **HNA Reach 11 -- IL R HN (Chicago, IL) to Starved Rock L&D (Utica, IL)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Lockport | Brandon | Dresden | Marseilles | Starved Rock | | Total |
| SC Connectivity | 0 | 0 | 0 | 0 | 0 | | 0 |
| Island Protection | 0 | 0 | 0 | 0 | 0 | | 0 |
| Dike Modification | 0 | 0 | 0 | 0 | 0 | | 0 |
| Island Area | 0 | 0 | 0 | 0 | 0 | | 0 |
| Fish Passage | 0 | 1 | 1 | 1 | 1 | | 4 |
| WLM—Pool | 0 | 0 | 0 | 0 | 0 | | 0 |
| WLM—BW | 0 | 0 | 0 | 0 | 0 | | 0 |
| FP Connectivity | 0 | 0 | 0 | 0 | 0 | | 0 |
| Topographic Diversity | 0 | 0 | 0 | 0 | 0 | | 0 |
| Depth | 0 | 0 | 0 | 0 | 0 | | 0 |
| Shore Protection | 0 | 0 | 0 | 0 | 0 | | 0 |
| Dam Point Control | 0 | 0 | 0 | 0 | 0 | | 0 |
| FP Immediate Projects | 0 | 0 | 0 | 0 | 0 | | 0 |
| Total | 0 | 1 | 1 | 1 | 1 | | 4 |
| **HNA Reach 12 -- IL R Starved Rock L&D (Utica, IL) to River's mouth (Grafton, IL)** | | | | | | | |
| Objective | Peoria | La Grange | Alton | | | | Total |
| SC Connectivity | 0 | 2 | 3 | | | | 5 |
| Island Protection | 0 | 0 | 0 | | | | 0 |
| Dike Modification | 0 | 0 | 0 | | | | 0 |
| Island Area | 0 | 0 | 0 | | | | 0 |
| Fish Passage | 1 | 0 | 0 | | | | 1 |
| WLM—Pool | 0 | 0 | 0 | | | | 0 |
| WLM—BW | 0 | 0 | 0 | | | | 0 |
| FP Connectivity | 0 | 6 | 5 | | | | 11 |
| Topographic Diversity | 0 | 0 | 0 | | | | 0 |
| Depth | 3 | 7 | 0 | | | | 10 |
| Shore Protection | 0 | 0 | 0 | | | | 0 |
| Dam Point Control | 0 | 0 | 0 | | | | 0 |
| FP Immediate Projects | 0 | 0 | 0 | | | | 0 |
| Total | 4 | 15 | 8 | | | | 27 |
| | | | | | | **GRAND TOTAL** | **443** |

**ATTACHMENT G, TABLE 4. NUMBER OF FLOODPLAIN RELATED ECOSYSTEM RESTORATION PROJECT OPPORTUNITIES NOT ADDRESSED BY NAVIGATION STUDY**

**UMRCP STUDY REACH 1**

| **HNA Reach 1 -- Miss R. HN (St. Paul, MN) to L&D 3 (Red Wing, MN)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Pool 1 | Pool 2 | Pool 3 | | | | Total |
| WLM—BW | 0 | 0 | 0 | | | | 0 |
| FP Connectivity | 0 | 1 | 5 | | | | 6 |
| Depth | 0 | 3 | 5 | | | | 8 |
| Total | 0 | 4 | 10 | | | | 14 |
| **HNA Reach 2 -- Miss R. L&D 3 (Red Wing, MN) to L&D 4 (Alma, WI)** | | | | | | | |
| Objective | Pool 4 | | | | | | Total |
| WLM—BW | 0 | | | | | | 0 |
| FP Connectivity | 5 | | | | | | 5 |
| Depth | 6 | | | | | | 6 |
| Total | 11 | | | | | | 11 |
| **HNA Reach 3 -- Miss R. L&D 4 (Alma, WI) to L&D 9 (Harper's Ferry, IA)** | | | | | | | |
| Objective | Pool 5 | Pool 5a | Pool 6 | Pool 7 | Pool 8 | Pool 9 | Total |
| WLM—BW | 0 | 0 | 2 | 0 | 0 | 0 | 2 |
| FP Connectivity | 3 | 1 | 4 | 3 | 0 | 0 | 11 |
| Depth | 8 | 5 | 7 | 7 | 14 | 13 | 54 |
| Total | 11 | 6 | 13 | 10 | 14 | 13 | 67 |
| **HNA Reach 4 -- Miss R. L&D 9 (Harper's Ferry, IA) to Pool 13 (Clinton, IA)** | | | | | | | |
| Objective | Pool 10 | Pool 11 | Pool 12 | Pool 13 | | | Total |
| WLM—BW | 0 | 1 | 0 | 0 | | | 1 |
| FP Connectivity | 1 | 0 | 0 | 0 | | | 1 |
| Depth | 27 | 10 | 10 | 6 | | | 53 |
| Total | 28 | 11 | 10 | 6 | | | 55 |

**UMRCP STUDY REACH 2**

| **HNA Reach 5 -- Miss R. Pool 13 (Clinton, IA) to L&D 17 (New Boston, IL)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Pool 14 | Pool 15 | Pool 16 | Pool 17 | | | Total |
| WLM—BW | 0 | 0 | 0 | 0 | | | 0 |
| FP Connectivity | 0 | 0 | 1 | 0 | | | 1 |
| Depth | 5 | 0 | 1 | 3 | | | 9 |
| Total | 5 | 0 | 2 | 3 | | | 10 |
| **HNA Reach 6 -- Miss R. L&D 17 (New Boston, IL) to L&D 19 (Keokuk, IA)** | | | | | | | |
| Objective | Pool 18 | Pool 19 | | | | | Total |
| WLM—BW | 0 | 0 | | | | | 0 |
| FP Connectivity | 1 | 0 | | | | | 1 |
| Depth | 3 | 0 | | | | | 3 |
| Total | 4 | 0 | | | | | 4 |

**ATTACHMENT G, TABLE 4. NUMBER OF FLOODPLAIN RELATED ECOSYSTEM RESTORATION PROJECT OPPORTUNITIES NOT ADDRESSED BY NAVIGATION STUDY (Continued)**

**UMRCP STUDY REACH 3**

| **HNA Reach 7 -- Miss R. L&D 19 (Keokuk, IA) to L&D 22 (Saverton, MO)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Pool 20 | Pool 21 | Pool 22 | | | | Total |
| WLM—BW | 0 | 0 | 0 | | | | 0 |
| FP Connectivity | 0 | 7 | 2 | | | | 9 |
| Depth | 1 | 1 | 5 | | | | 7 |
| Total | 1 | 8 | 7 | | | | 16 |
| **HNA Reach 8 -- Miss R. L&D 22 (Saverton, MO) to L&D 27 (Granite City, IL)** | | | | | | | |
| Objective | Pool 24 | Pool 25 | Pool 26 | | | | Total |
| WLM—BW | 0 | 0 | 0 | | | | 0 |
| FP Connectivity | 4 | 5 | 0 | | | | 9 |
| Depth | 7 | 12 | 7 | | | | 26 |
| Total | 11 | 17 | 7 | | | | 35 |
| **HNA Reach 9-10 -- Miss R. L&D 27 (Granite City, MO) to Cairo, IL** | | | | | | | |
| Objective | Lock 26 to Kaskaskia R. | Kaskaskia R. to Grand Tower | Grand Tower to Ohio R. | | | | Total |
| WLM—BW | 0 | 0 | 0 | | | | 0 |
| FP Connectivity | 4 | 3 | 0 | | | | 7 |
| Depth | 0 | 0 | 0 | | | | 0 |
| Total | 4 | 3 | 0 | | | | 7 |

**UMRCP STUDY REACH 4**

| **HNA Reach 11 -- IL R HN (Chicago, IL) to Starved Rock L&D (Utica, IL)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Objective | Lockport | Brandon | Dresden | Marseilles | Starved Rock | | Total |
| WLM—BW | 0 | 0 | 0 | 0 | 0 | | 0 |
| FP Connectivity | 0 | 0 | 0 | 0 | 0 | | 0 |
| Depth | 0 | 0 | 0 | 0 | 0 | | 0 |
| Total | 0 | 0 | 0 | 0 | 0 | | 0 |
| **HNA Reach 12 -- IL R Starved Rock L&D (Utica, IL) to River's mouth (Grafton, IL)** | | | | | | | |
| Objective | Peoria | La Grange | Alton | | | | Total |
| WLM—BW | 0 | 0 | 0 | | | | 0 |
| FP Connectivity | 0 | 6 | 5 | | | | 11 |
| Depth | 3 | 7 | 0 | | | | 10 |
| Total | 3 | 13 | 5 | | | | 21 |

**GRAND TOTAL 240**

# CHAPTER 1—ATTACHMENT H

# DESCRIPTION OF MANAGEMENT STRATEGIES

# CHAPTER 1—ATTACHMENT H

# DESCRIPTION OF MANAGEMENT STRATEGIES

## 1. CORPS JURISDICTIONAL PROGRAMS.

### 1.1. Management Program Strategies.

This study has identified two basic types of environmental management strategies for the UMRS floodplain. These approaches are conservation easements and buyouts, and are further described as follows:

#### *1.1.1. Conservation Easements.*

Under a conservation easement, a landowner would be paid by the Government for the right to use specified properties for the purposes of fish and wildlife management. Two different applications of conservation easements were identified: those associated with UMRCP flowage easement lands, and those not involved in flowage requirements, but that lie adjacent to areas of levee construction.

***1.1.1.1. Easements Acquired in Conjunction with Plan Flowage Easements***. Under this option, a payment for the residual property rights on FDR flowage easement lands would be offered to landowners on a voluntary basis. The conservation easement cost would be equivalent to the difference between the cost of a fee simple acquisition and the costs of a flowage easement. The acreage opportunities available would be directly proportional to the amount of landowner interest in the program.

***1.1.1.2. Easements on Lands adjacent to Levees Construction.*** This measure is similar to the one just described. However, since no flowage easements would be involved, obtaining conservation interests landward of the levees would be tantamount to the cost of a fee simple acquisition. Areas of high physical diversity, and areas in close vicinity to existing federal refuges and state management areas would receive a high priority for future study.

#### *1.1.2. Buyouts.*

Under this option, lands acquired by the federal government in fee for flood damage reduction would subsequently be used for both FDR and habitat management purposes. This option addresses a more literal interpretation of the WRDA ’99 language that states “FDR and floodplain management by means of…habitat management…”

## 1.2. Management Framework.

### *1.2.1. Cooperative Agreements.*

Regardless of the mechanism used for acquiring the lands, these areas would subsequently be managed by the Corps in a fashion similar to that of the "General Plan" lands acquired by the Corps for the 9-foot channel project. Accordingly, the lands would in essence be managed as a fish and wildlife refuge via a lease agreement for direct management by the U.S. Fish and Wildlife Service or via a sublease agreement between the Service and the States or an approved NGO.

### *1.2.2. Ecosystem Restoration Program.*

The placement of ecosystem restoration facilities on acquired properties would be most efficiently accomplished using the existing institutional framework of the UMRS—Environmental Management Program (EMP), and the Environmental Continuing Authorities Program. Areas of high physical diversity and areas in close vicinity to existing federal refuges and state management areas would receive a high priority for future study.

The acquired lands would be enhanced using a wide variety of available habitat improvement methods similar to those listed and defined in **Appendix F, Attachment C**. For fisheries management these could include: backwater channel dredging, the incorporation of woody debris, or the placement of rock and gravel within aquatic areas to serve as aquatic habitat structures. For wildlife management they might include such things as the placement of bird nesting structures, the protection of special habitat areas, the enhancement of habitat corridors, the planting of prairie vegetation, the planting of trees on dredged disposal material sites, the creation of a mix of successional stages, exotic species control, and water level management. The physical/biological monitoring program applied would be similar to that currently in place for the EMP. The need for adjustments to project features would be accomplished via the adaptive management process of the EMP.

### *1.2.3. Program Compatibility.*

The above management program approach appears to be compatible with the stated refuge expansion objectives of the USFWS's draft Comprehensive Conservation Plan (CCP) for the Mark Twain National Wildlife Refuge (MTNWR) complex. This is especially true for the river area below St. Louis, as it has been identified by the UMRCP study as a strategic area for flood water storage.

The 45,000 acres MTNWR complex was established in 1958, and spans 350 miles of the Mississippi River bottoms between Muscatine, Iowa and Gorham, Illinois. It consists

of five refuges: the Port Louisa National Wildlife Refuge in Wapello, Iowa; the Great River and Clarence Cannon National Wildlife Refuge in Annada, Missouri; the Two Rivers National Wildlife Refuge in Brussels, Illinois, and the Middle Mississippi River National Wildlife Refuge (MMRNWR) located south of St. Louis, Missouri. Leadership for the complex is provided through coordination and involvement with the Refuge Complex Office in Quincy, Illinois. The draft CCP for the refuge was completed in 2003, and can be found at the following website (http://midwest.fws.gov/planning/marktwain/). The CCP is currently working on a boundary expansion of 28,000 acres for four of the five complex refuges, which represents one portion of a 130,000 acre habitat need identified in the UMRS-EMP Habitat Needs Assessment (HNA).

The existing refuge proposal delineates an approach to address Service habitat, and floodplain concerns, with willing sellers during a15-year planning horizon. The expansion concept originated in the early 1990's when the Service began efforts to look at a larger section of UMR corridor. The evaluation included the "Middle Mississippi River", which had not been included in earlier efforts. In response to the Great Flood of 1993, the Service prepared a Big Rivers Ascertainment Initiative that proposed strategies for evaluating lands to be acquired for the protection and restoration of sustainable representative habitats along the Illinois, Missouri and Mississippi Rivers.

Approval was granted in 1997 to study the potential addition of 60,000 acres to the MTNWR Complex. This study was incorporated into the CCP planning effort. Specific parcels were identified and were prioritized into four tiers. The first tier contains 28,000 acres, the second tier 14,100 acres, the third 8,500 acres and the fourth 5,400 acres. Of the first tier areas, 14,800 acres occurs within the MMRNWR. The selection and prioritization of parcels include a consideration of: refuge purposes; goals/objectives of CCP; interagency input, site restoration potential for wetland and forest values, levee District flood histories; HNA; opportunity to remove erosion/flood prone ag lands; and recreational access areas. The parcels within the project boundary also contribute to policy matters addressed by other agencies as well. Nutrient cycling on additional lands contributes to a reduction in river nutrients loading, increased flood storage on these lands can provide FDR related benefits, and reduced disaster relief payments by the government.

The USFWS notes that the MMRNWR reach has very little public ownership and floods have been particularly hard on floodplain farmers. The Service indicates that a precise prediction of habitat types that will result in any area cannot be made until the areas have been acquired and detailed options can be explored on-site. However, it has made estimates of the habitat types needed. For refuge areas above St. Louis would be proportioned close to the distribution that now occurs in those refuges, i.e. 50 percent forest, 30 percent wetland and aquatic, and 20 percent other terrestrial types. There would be increased emphasis on connectivity in the MMRNWR with the proportions being 65 percent forest, 20 percent wetland, and 15 percent other terrestrial habitats.

The 28,000 acres demarcated by the refuge includes 31 areas and 134 landowners. During the next 15-years, it is anticipated that 12,000 to 15,000 acres will be acquired.

## 2. NON-CORPS JURISDITIONAL PROGRAMS.

### 2.1. Background.

In 1998, Defenders of Wildlife published a report entitled *National Stewardship Incentives: Conservation Strategies for U.S. Landowners* (http://www.biodiversitypartners.org/pubs/CinAReport/Background.shtml), and in 2002, they published a report entitled *Conservation in America: State Government Incentives for Habitat Conservation* (http://www.biodiversitypartners.org/pubs/CinAReport/Background.shtml). These reports compile source information about conservation incentives provided by federal and state government programs across the country. The following is a summary of information relevant to the UMRS.

In most eco-regions, about one-half of the lands needed to effectively conserve native biodiversity is privately owned. Because of this, private landowners have a key role in wildlife conservation.

Most incentive programs fall into the following three categories: direct payments, education/technical assistance and tax relief:

Direct Payments. These are payments made to the landowner for expenses requiring a direct monetary outlay for conservation project purposes. The most common direct payments are grants or cost share programs.

Education/Technical Assistance. Agency staff providing advice to landowners on conservation issues is the most common form of assistance.

Tax Relief. Tax incentives include property tax relief, income tax credits or deductions, and other tax incentives.

- Income Tax Relief. It most often takes the form of credits or deductions allowable against income. The most common type being donations of property, or the rights to property for a period of time to a state or NGO entity for conservation purposes. It typically allows a credit against the state income tax in some portion to the value of the donation.

- Property Tax Relief. It offers tax programs for the maintenance of property in conditions suitable for wildlife habitat. Common methods include current use valuation for tax assessment purposes, reduced property taxes, and exemption from taxation.

- Other Tax Relief. Some states allow other tax incentives. These programs include estate and inheritance tax benefits, capital gains reductions, real estate transfer tax exemptions.

Most conservation programs or individual incentives are administered by the state fish and game agencies. However, incentives focused on specific land types (e.g. farm or forest lands) are often managed by the state departments of agriculture or forestry, sometimes with assistance from the departments of fish and game or natural resources. Tax incentives are typically managed by county or local tax assessor' offices, but they often rely upon a wildlife or fish and game agency to certify that there is a product eligible for tax reductions.

Most often conservation programs are partnerships with others, such as federal agencies (e.g. NRCS, USFWS, and USFS), other state agencies (e.g. departments of agriculture, natural resources, and conservation districts) and NGOs (e.g. TNC, DU).

Many programs provide direct monetary benefits to the landowners, while some rely on landowner interest or public recognition to capture landowner participation. Programs involving fee title purchase for those rights can result in large payments to landowners. Property tax credits can reduce tax bills, thus encouraging them to maintain land as open or natural space.

State incentives program funding comes from three potential sources. These are general revenue funds from the state's legislature, dedicated funding (e.g. funds from the sale of hunting and fishing licenses), NGOs, federal programs, or other state funds.

The primary weaknesses of state landowner incentive programs are a lack of funds and personnel. Other weaknesses include: indirect rather than direct wildlife benefits (e.g. a forestry program is geared towards timber production and not wildlife production), legislative and political interference, and a lack of monitoring and follow-up. Some see some see the voluntary nature of the programs as weakness, but others see it as a strength (tending to encourage landowners to participate that ordinarily would not). Another strength is the cooperative approach to conservation.

Undoubtedly, with the many acres that are in place with state incentives programs, it is certain that these programs are making an important difference for wildlife habitat. However, some changes are needed. There is not sufficient data on the overall impacts of incentive programs. While many agencies track data, some do not. A more quantitative method of tracing the acreages and species is needed. Funding and personnel appear to be the critical resources needed to manage these programs. Emphasis should be put on direct financial payments as these are the most popular type of incentive. Incentive programs need to be part of a bigger picture for habitat conservation. Few are currently designed to target the specific land types and species most in need of protection. These complexities are made worse by the fact that many different agencies administer the programs. There is a need for better coordination among federal/state/private land

managers and for a strategic conservation framework in which many small projects can contribute to a common vision.

#### *2.1.1. Federal Programs.*

Existing federal incentive programs for cost-shared conservation projects are listed in **Appendix F, Attachment H, Table 2**. This table also includes various website addresses for more detailed information on specific programs.

Attributes of a good incentives program includes the following:

- Program should minimize regulatory burdens on the landowner
- Program should consider zoning as an important management tool (e.g. urban areas managed more intensively could spare other areas from development)
- Program should take actions on the ground, even though some data gaps may still exist
- Program should emphasize incentives that don't require large budgets
- Program policies should not hinder biodiversity conservation efforts
- Program should give people credit for improved stewardship
- Program landowners and managers must see how their project fits in to the bigger picture for conservation biodiversity
- Program is sufficiently flexible to accommodate new information and ideas
- Program should be well monitored

#### *2.1.2. State Programs.*

**Appendix F, Attachment H, Table 1**. lists the various incentive programs available within each of the 5 UMRS states. Website addresses are given as a source of additional program information.

## 3. CONCEPT OF ADAPTIVE MANGEMENT.

There are a number of definitions of adaptive management. The following is provided from the British Columbia Ministry of Forests:

> "Adaptive management is a formal, systematic, and rigorous approach to learning from the outcomes of management actions, accommodating change and improving management. It involves synthesizing existing knowledge, exploring alternative actions, and making explicit forecasts about their outcomes. Management actions and monitoring programs are carefully designed to generate reliable feedback and clarify the reasons underlying outcomes. Actions and objectives are then adjusted based on this feedback and improved understanding."

Simply put, adaptive management is an iterative process whereby management actions are initiated and their effects monitored at regular intervals (Block, et al, 2001). In adaptive management, information from monitoring is used to continually evaluate and adjust management relative to predicted responses, management objectives, and predetermined thresholds of acceptable change (Kessler, et al. 1992).

Because adaptive management and adaptive assessment are often used interchangeably, Ogden (2000) clarified adaptive management as a designated process for testing hypotheses, versus adaptive assessment which provides a protocol for collecting and interpreting new information for the purpose of improving the design of an action plan. In this context the adaptive management component may be thought of as the "what", and the assessment component is the "how" with respect to the implementation of selected management actions. Assessment and management are actually highly interdependent, and form the overall framework for the adaptive management approach as depicted in Figure 1.

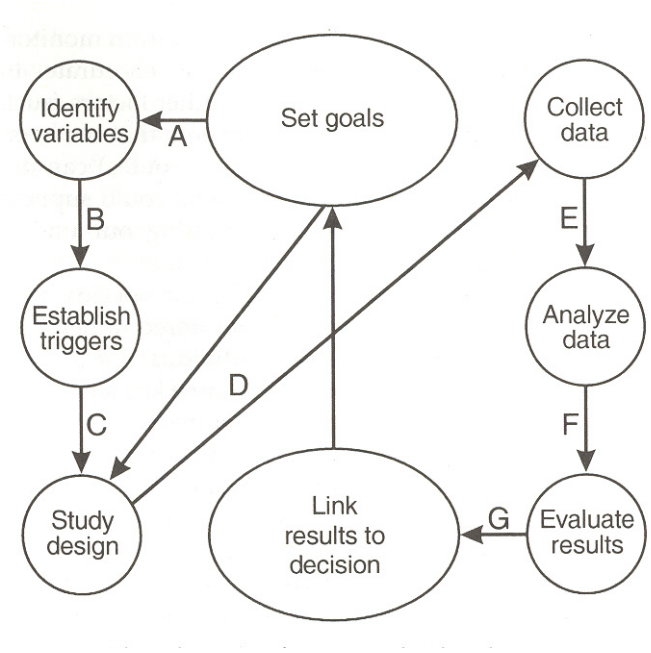


Figure 1. Flow diagram from Block, et al 2001, representing the steps in a monitoring program designed as an adaptive management process.

Adaptive assessment and management have come to exist as the ecologists' parallel to the economist's Shewhart Cycle (U.S.D.A. 1939) developed in the 1920s to address quality control in manufacturing and later championed by Deming and others as Quality Circle or Total Quality Management (TQM). Industrial and engineering concerns routinely practice adaptive management (Holling, 1978). The Department of Defense has embraced TQM and that influence has suffused the Corps of Engineers, which has successfully applied principles of TQM to address difficulties in current planning processes (DMMP Process Action Team, 2000).

## 4. CONCEPT OF INTEGRATED MANAGEMENT.

In January 1997, Delft Hydraulics published a report commissioned by the Upper Mississippi, Illinois and Missouri Rivers Association (UMIMRA) entitled "A Balanced Management for the Upper Mississippi, Illinois and Missouri Rivers". Within this report was discussed the concept of integrated river management. The following description of this concept is based on that report.

Integrated river management means that in river management the following relationships should be taken into account:

- the interactions between the abiotic and biotic part of a water system and the relationships between different water systems;
- the relationships between all involved interests: both sector interests such as navigation, industry, agriculture, recreation, etc., and aspects such as safety, the environment, the economy and physical planning; and
- the relationships between the many public bodies which have authority and a say in water management.

The UMRS-EMP is an example of comprehensive river management. It is based on a cooperative approach, enhancing the navigation system on the Mississippi by authorizing construction of a second lock at Mel Price Locks and Dam, while establishing at the same time the EMP. That program included five elements: Habitat Restoration and Enhancement Projects, Long Term Resource Monitoring, Recreation Projects, Economic Impacts of Recreation Study, and Navigation Monitoring.

A balanced river management plan consists of both structural and administrative measures, while taking into account the river's resources. Both the costs and the benefits of proposed actions to river users must be thoroughly weighed. The entire process of collecting data, building models, designing, assessing impacts, evaluating and communicating results to the public and decision makers should be captured by the planning process.

Delft hydraulics team arrived at the following 10 main conclusions:

**1. Leadership.** A governmental agency with strong mandates to initiate and coordinate integrated river management could enhance the development of the Basin, while ensuring that environmental conditions will not degrade. USACE or some independent entity.

**2. Funding.** USACE could be provided with an annual budget for river basin management.

**3. River Resources.** The planning process should be steered towards one in which stakeholders actively participate with an attitude of willingness to reach compromises.

**4. Benefit/Cost Relationship.** The present estimation method for future benefits undervalues economic development.

**5. Farming Concerns.** The interests of bottomland farmers needs to be better taken into account, i.e. flood management, river navigation, and seepage/drainage issues.

**6. River Basin Development Plan.** A balanced river basin development plan is needed that will improve the understanding of the complex interrelationships between the environment, resources use, and floodplain development. The plan should not be static, but should serve as a foundation to be revised according to new conditions and insights.

**7. Decision Support System.** An interactive Decision Support System (DSS) would be of help in discussions within and between interest groups. The DSS should include a combination of a Geographic Information System and Data Base and dynamic river models of the river system.

**8. Navigation.** Delft expressed the opinion that further expansion of the navigation system is justified.

**9. Flood Management.** Benefits analysis should consider not just existing but also future benefits of FDR measures. Flood damages to all sectors should be included, i.e. housing, industry, transportation, etc.

**10. Environment.** The existing river conditions should be considered as a given, i.e. the navigation pools, upstream reservoirs, and agricultural land use. Against this backdrop, it should be decided which ecosystem values could potentially develop. A comprehensive inventory of the river's natural resources is incomplete. Restoration should concentrate on the rehabilitation of river processes. A consistent approach should be used to establish environmental targets, and to evaluate the environmental benefits.

## Chapter 1, Attachment H, Table 1. States Ecosystem Restoration Incentive Programs

| Program Source | Program Name | Website Location for Detailed Program Description |
|---|---|---|
| | **STATE PROGRAMS** | |
| Illinois | The Conservation 2000 Ecosystems Program | www.biodiversitypartners.org/pubs/CinAReport/State/IL.shtml |
| | The Save Illinois Topsoil Program | |
| | The Private Land Wildlife Habitat Program | |
| | The Rural Forest Landowner Assistance Program | |
| | Free Shrubs and Seedlings Program | |
| | The Forest Management Assistance Program | |
| | The Streambank Stabilization and Restoration Program | |
| | The Illinois Natural Resources Enhancement Program | |
| | The Private Waters Program | |
| | The Natural Heritage Landmark Program | |
| | Incidental Take Permits and Conservation | |
| | Conservation Easements | |
| | The Natural Areas Preservation Act | |
| | The Register of Land and Water Reserves | |
| Missouri | The Landowners Assisting Wildlife Survival Program | www.biodiversitypartners.org/pubs/CinAReport/State/MO.shtml |
| | The Landowner Cost Share Program | |
| | The Economic Diversification and Afforestation Act | |
| | The Landowner Assistance Program | |
| | Incentives for Forest Land Management | |
| | Conservation Easements | |
| Wisconsin | The Wisconsin Forest Landowner Grant Program | www.biodiversitypartners.org/pubs/CinAReport/State/WI.shtml |
| | The Turkey and Pheasant Stamp Programs | |
| | County Land and Water Resource Management Plan Implementation | |
| | Assistance for Endangered and Threatened Species Habitat Conservation | |
| | Technical Assistance for Land Management for Wildlife | |
| | The Landowner Contact Program | |
| | The Natural Areas Program | |
| | The Managed Forest Law | |
| Minnesota | Pheasant and Wild Turkey Habitat Improvement Programs | www.biodiversitypartners.org/pubs/CinAReport/State/MN.shtml |
| | The Reinvest in Minnesota Program | |
| | The Deer Habitat Improvement Program | |
| | Project CORE (Cooperative Opportunities for Resource Enhancement) | |
| | The Roadsides for Wildlife Program | |
| | Cost-Sharing for Soil and Water Conservation | |

## Chapter 1, Attachment H, Table 1. States Ecosystem Restoration Incentive Programs (Continued)

| Program Source | Program Name | Website Location for Detailed Program Description |
|---|---|---|
| **STATE PROGRAMS (Continued)** | | |
| Minnesota | The Minnesota Sustainable Forest Resource Management Incentive Program | www.biodiversitypartners.org/pubs/CinAReport/State/MN.shtml |
| | Conservation Reserve Program | |
| | Purchase of Conservation Easements | |
| | The Heritage Forests Incentive | |
| | Conservation Easements | |
| | Covenants for Wetlands Preservation | |
| | The Native Prairie Tax Exemption Program | |
| | The Wetland Tax Exemption Program | |
| Iowa | The Native Prairie Seed Harvest Program | www.biodiversitypartners.org/pubs/CinAReport/State/IA.shtml |
| | The Iowa Private Land Partnership (PLP) Program | |
| | The Wildlife Habitat on Private Lands Promotion Program | |
| | Incentives for Erosion Control and Water Quality Protection on Agricultural Lands | |
| | Technical Assistance for Grasslands Creation or Restoration | |
| | Technical Assistance for Wetlands Restoration | |
| | Conservation Easements | |
| | Property Tax Benefits for Native Prairie and Wildlife Habitat | |
| | Property Tax Benefits for Forest or Woodland | |
| | Property Tax Benefits for Conservation Easements | |
| | The Protected Waters Area Program | |

## Chapter 1, Attachment H, Table 2.
## Federal Ecosystem Restoration Incentive Programs

| Program Source | Program Name | Website Location for Detailed Program Description |
|---|---|---|
| | | |
| FSA | Conservation Reserve Program (CRP) | http://cfpub.epa.gov/fedfund |
| | Conservation Reserve Enhancement Program (CREP) | http://www.fsa.usda.gov/dafp/cepd/crep.htm |
| NRCS | Forestry Incentives Program (FIP) | http://www.nal.usda.gov/wqic/funding.html |
| | Environmental Quality Incentives Program (EQIP) | http://cfpub.epa.gov/fedfund |
| | Wildlife Habitat Incentives Program (WHIP) | http://cfpub.epa.gov/fedfund |
| | Wetland Reserve Program (WRP) | http://cfpub.epa.gov/fedfund |
| USACE | UMRS—Environmental Management Program | http://www.mvr.usace.army.mil/emp/ |
| | UMR-IWW Navigation Study Ecosystem Restoration Program | http://www2.mvr.usace.army.mil/umr-iwwsns/<br>http://www.mvr.usace.army.mil/ |
| | Section 1135 Program | http://www.saj.usace.army.mil/pd/envprot2.htm |
| | Section 206 Program | http://www.mvp.usace.army.mil/environment/default.asp?pageid=113 |

# CHAPTER 1—ATTACHMENT I

# FEDERAL AGENCY AUTHORITIES FOR UMRS MANAGEMENT

| ATTACHMENT I, TABLE 1 FEDERAL AGENCY AUTHORITIES FOR UMRS MANAGEMENT. | | |
|---|---|---|
| **Agency** | **Authority** | **Purpose** |
| U.S. Army Corps of Engineers | 9-foot Channel Project (Rivers and Harbors Act 1927) | Maintain commercial waterway |
| | Section 306 – General Investigation Studies for Environmental Restoration (WRDA 1990) | Environmental restoration |
| | Section 1135 Projects (WRDA 1986) | Modifications of existing civil works projects for environmental improvement |
| | Section 204 Projects (WRDA 1992) | Environmental restoration in connection with construction or maintenance dredging |
| | Section 206 Projects (WRDA 1996) | Aquatic ecosystem restoration |
| | Flood Plain Management Services (Sec. 206 Flood Control Act of 1960) | Education, technical assistance, planning guidance |
| | Planning Assistance to States (Sec. 22 WRDA) | Water and land resource planning |
| | Section 205 – Small Projects (WRDA 1948) | Flood control |
| | Section 14 – Emergency Streambank and Shoreline Protection (Flood Control Act 1946) | Protect public and non-profit infrastructure |
| | Section 208 – Clearing and Snagging of Waterways (Flood Control Act 1954) | Flood damage reduction |
| | Aquatic Plant Control (Sec. 104, River and Harbor Act of 1958) | Control noxious plants |
| | Emergency Readiness and Response (PL 84-99) | Provide immediate and effective response and recovery assistance during emergencies and disasters |
| | National Pollution Discharge Elimination System (NPDES) | Measure and regulate pollutant discharge |
| | Flood Plain Management (Exec. Order 11988) | Negate adverse effects to floodways |
| | Protection of Wetlands (Exec. Order 11990) | Minimize wetland destruction |
| | Indian Sacred Sites (Exec. Order 13007) | Accommodate access and avoid damage |
| | Hazardous, Toxic, and Radioactive Wastes (ER 1165-2-132) | Avoid HTRW sites |
| | Mitigation Banks for Civil Works Projects Fed. Register 60:228, 11/28/95 | Compensate for damaged wetlands |
| | Flood Control Act of 1944 | Recreation |
| | Federal Water Project Recreation Act of 1965 (PL 89-72) | Recreation |
| | Section 906, WRDA 1986 | Environmental mitigation |
| | Section 907, WRDA 1986 | Environmental improvements in water resources projects |
| | Section 908, WRDA 1986 | Environmental mitigation |
| | Section 1103, WRDA 1986 | Environmental Management Program |
| | Section 307(a), WRDA 1990 | Wetlands Protection |
| | Section 313, WRDA 1990 | Recreation |
| | Section 203, WRDA 1992 | Recreation |
| | Section 203, WRDA 1992 | Habitat protection in O&M activities |

| ATTACHMENT I, TABLE 1 FEDERAL AGENCY AUTHORITIES FOR UMRS MANAGEMENT (Continued) | | |
|---|---|---|
| **Agency** | **Authority** | **Purpose** |
| U.S. Fish and Wildlife Service | Refuge Management (numerous authorizations) | Fish and wildlife habitat management |
| | Fish and Wildlife Coordination Act | Provide mechanism for USFWS and state environmental interest's involvement and coordination during water resources planning |
| U.S. Environmental Protection Agency | Section 309 – Clean Air Act and National Environmental Policy Act (PL 91-190, 42 USC 4321 et seq.) | Prevent environmental damage resulting from Federal action, establish Council on Environmental Quality |
| | Section 404 – Clean Water Act | Regulate the discharge of dredged and fill material into waters, including wetlands |
| | Section 402(p) – Clean Water Act (1972) | Stormwater discharge permits |
| | Section 319 – Clean Water Act (1972) | Nonpoint pollution control |
| | Coastal Zone Act Reauthorization Amendments – 1990 (CZARA – Section 6217) | Nonpoint pollution control |
| | State Revolving Funds (Clean Water Act amendments 1987) | Wastewater treatment |
| | Spill Prevention Control and Countermeasures | Oil spill prevention |
| U.S. Department of Agriculture (2002 Farm Bill) | Conservation Reserve Program (CRP) | Increases acreage cap from 36.4 million to 39.2 million acres. Retains priority areas. Expands wetlands pilot to 1 million acres with all states eligible |
| | Wetlands Reserve Program (WRP) | Increases acreage cap to 2.275 million acres |
| | Grasslands Reserve Program (GRP) | A new program to enroll up to 2 million acres of virgin and improved pastureland. Program would be divided 40/60 between agreements of 10, 15, or 20-years and agreements and easements for 30-years and permanent easements. |
| | Farmland Protection Program (FPP) | Since 1996, the program has provided $53.4 million to protect 108,000 acres. The new funding is a nearly 20-fold increase over amount committed to this program since the last farm bill. |
| | Wildlife Habitat Incentives Program (WHIP) | Since 1996, approximately $62.5 million has been spent through this program to provide cost-share payments on 1.6 million acres. The new funding is greater than a 10-fold increase over amount committed to this program since the last farm bill. |
| | Environmental Quality Incentives Program (EQIP) | Phased up to achieve a $1.3 billion annual funding level. Priority areas are eliminated. Funds are split 60/40 between livestock and crop producers |
| | Water Conservation Program | Water Conservation Program provides cost-share incentives and assistance for efforts to conserve ground and surface water. Fifty million dollars is reserved specifically to assist producers in the Klamath Basin. |
| | Conservation Security Program (CSP) | A new national incentive payment program for maintaining and increasing farm and ranch stewardship practices. |
| | Small Watershed Rehabilitation Program | Provides essential funding for the rehabilitation of aging small watershed impoundments that have been constructed over the past 50 years. |
| | Underserved States | Continues program begun in Agricultural Risk Protection Act of 2000 |