ILLINOIS RIVER BASIN RESTORATION
COMPREHENSIVE PLAN
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

FINAL

EXECUTIVE SUMMARY

The Illinois River, described by early explorers as a "boundless marsh", has long been characterized by the productivity of its extensive backwater and floodplain complexes. However, over time the ecological health of the system has declined significantly due to the combined effects of sedimentation, altered hydrology, and other modifications to the basin. Despite these declines, the Illinois River Basin represents one of the most productive resources in the Midwest and has high potential for restoration. The National Research Council identified the Illinois River as one of three large-floodplain river systems in the lower 48 states with the potential to be restored to an approximation of their outstanding biological past.

This report represents a final response to the Comprehensive Plan portion of the Illinois River Basin Restoration authority required by Section 519(b) of the Water Resources Development Act (WRDA) 2000 and to the Illinois River Ecosystem Restoration Feasibility Study conducted under Section 216 of the 1970 Flood Control Act as a review of the completed 9-Foot Channel Navigation Project. Section 519 also provides ongoing authority to evaluate and implement Critical Restoration Projects. This report assesses the total basin restoration needs and makes recommendations regarding continuing implementation under the existing authority and conducting some further evaluations of ways to improve implementation. The Corps of Engineers and Illinois Department of Natural Resources (sponsor) worked in close coordination with numerous other state and Federal agencies in developing the plan.

This Comprehensive Plan provides the vision, goals, objectives, desired future, and identifies the preferred alternative plan to restore the ecological integrity of the Illinois River Basin System. This plan documents the need for and potential scope of the four components called for in Sec 519 (b)(3): a restoration program; a long-term resource monitoring program; a computerized inventory and analysis system; and a program to encourage sediment removal technology, sediment characterization, sediment transport, and beneficial uses of sediment. An implementation framework and criteria are also presented to guide the identification, selection, study and implementation of restoration projects, monitoring and adaptive management activities, and further system investigations.

SIGNIFICANCE OF THE ILLINOIS RIVER BASIN

The Illinois River's significance was recognized by Congress in WRDA of 1986 as a "nationally significant ecosystem" as part of the Upper Mississippi River System. A 1995 report by the U.S. Department of the Interior lists large streams and rivers as an endangered ecosystem in the United States, with a documented 85 to 98 percent decline since European settlement. The Illinois River is one of a small number of world-class river floodplain ecosystems; where biological productivity is enhanced by annual flood pulses that advance and retreat over the floodplain and temporarily expand backwaters and floodplain lakes.

The predevelopment Illinois River floodplain was a complex mosaic of prairies, forests, wetlands, marshes, and clear water lakes. In the main stem river floodplain, the main channel threaded through a variety of connected and isolated backwater lakes, bottomland forests, prairies, marshes, and swamps.

The productivity of the predevelopment system was demonstrated by the millions of migratory birds that stopped to rest and feed on their migrations or stopped to nest in the floodplain marshes. The fishery was reputed to be vast and exceptionally large fish catches were common. At the turn of the century, the river produced 10 percent of the nation's catch of freshwater fish. The Illinois River system also supported more freshwater mussels per mile than any other river on the continent. The forests supported a higher diversity of trees, many that produced fruit and seeds. Today's flora and fauna are but a remnant of these historic levels, but they still include some of the richest habitat in the Midwest, even some unique in North America.

Despite the ecological damage and degradation, the landscape and river system remain surprisingly diverse and biologically productive. The Illinois River basin is a critical mid-migration resting and feeding area of the internationally significant Mississippi River Flyway, utilized by 40 percent of all North American waterfowl and 326 total bird species, representing 60 percent of all species in North America. A survey conducted by the Illinois Natural History Survey in the fall of 1994 found that 81 percent of the fall waterfowl migration in the Mississippi flyway utilized the Illinois River. Twenty-six avian species are state listed as threatened or endangered; one of which is federally-threatened, the Bald Eagle, and four others are Federal species of concern. Many of these species are associated with wetlands or grasslands, and are also sensitive to landscape fragmentation.

The Illinois River system is home to approximately 35 mussel species, representing 12 percent of the freshwater mussels found in North America. Five mussel species are listed by the State of Illinois as threatened or endangered, one of which is a candidate for Federal listing. Fish diversity is similarly high, with 115 fish species found, 95 percent of which are native species. Many of these species require riverine, backwater, and floodplain habitat as part of their life cycle. Eighteen fish species are listed by the state of Illinois as threatened or endangered. Many of these species are endemic to the basin and/or intolerant of high silt levels. A group of aquatic organisms that is particularly representative of the Illinois River is the "Ancient Fishes" such as the paddlefish and sturgeon. The majority of these fish are migratory by nature and utilize a diversity of river habitats, flowing channel habitats, side channels, and backwater areas.

The Illinois River has long been a significant resource to the nation and the State of Illinois. It supported large Native American populations and provided a route for European explorers and settlers, and helped make the Midwest agricultural economy viable as early as the nineteen century. This waterway provides navigation from Lake Michigan and Chicago to the Upper Mississippi River, linking the inland waterway system with the Great Lakes. In 2004, 45 million tons of commodities were transported on the Illinois Waterway. The river and its tributaries provided water for residential and industrial users and also assimilated the wastes of burgeoning metropolitan communities. In Illinois, 90 percent of the state's population, more than 11 million people, reside in the basin.

The State of Illinois has demonstrated tremendous commitment to the restoration of the Illinois River System for many years. The State of Illinois initiated, developed, adopted and implemented an *Integrated Management Plan for the Illinois River Watershed (1997)* working with multiple local, state, and Federal groups and enacted the Illinois River Watershed Restoration Act (1997). In 2000, the Governor of Illinois set the vision for Illinois Rivers 2020, a proposed $2.5 billion, 20-year state and Federal restoration program to restore the Illinois River Basin. This plan was the first of many steps leading to the development of the goals and objectives for this comprehensive plan. In addition, Illinois leads the nation in the number of acres currently enrolled in the Conservation Reserve

Enhancement Program (CREP) at 110,000 in the Federal program, and the most acres permanently protected (92 of the 73,000 acres enrolled, in the state portion of the program). Local communities, counties, and non-governmental organizations have demonstrated commitment to the Illinois River, by implementing approximately 40 management plans calling for restoration of all or a portion of the Illinois River Basin. The Nature Conservancy and The Wetlands Initiative have both made major investments purchasing more than 11,000 acres of Illinois River floodplain and adjacent habitats for the purpose of restoration in recent years, adding to the approximately 135,000 acres already in State and Federal ownership in the basin. However, many of the restoration efforts have focused only on small components of the basin without considering the broader basin context, which is the focus of this comprehensive plan.

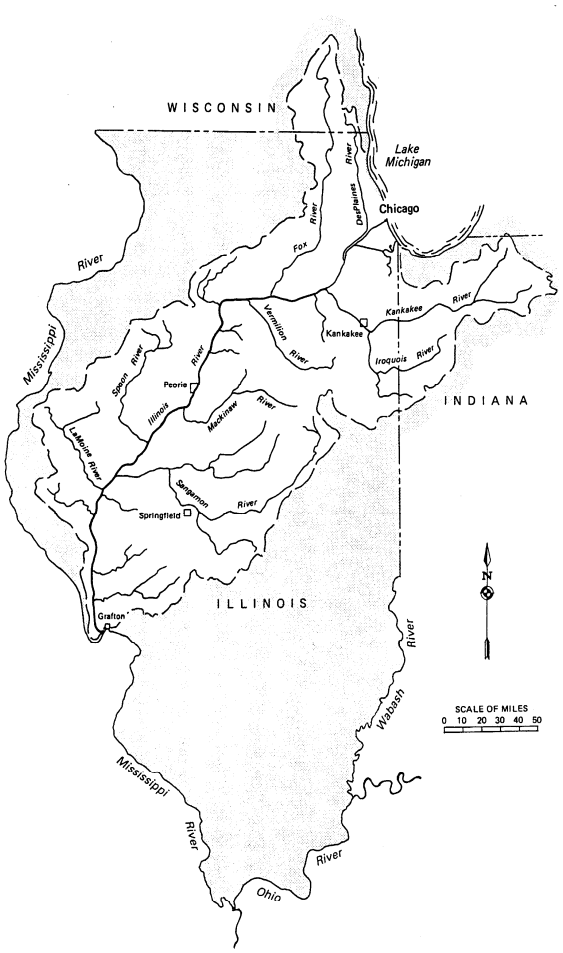

Figure ES-1. Location of Illinois River Basin

STUDY AREA

The study area encompasses the entire Illinois River Basin, defined as the Illinois River, its backwaters and side channels, and all tributaries, including their watersheds (figure ES-1). The entire Illinois River Basin includes 30,000 square miles (19 million acres), and includes 1,000 square miles in Wisconsin (upper Fox and Des Plaines Rivers), and 3,200 square miles in Indiana (Kankakee and Iroquois Rivers). In Illinois, the basin includes 44 percent of the land area, 46 percent of the state's agricultural land, 28 percent of its forests, 37 percent of its surface waters, and 95 percent of its urban areas.

SPONSORSHIP AND COLLABORATIVE PLANNING

The Illinois Department of Natural Resources (DNR) is the non-Federal sponsor. Illinois River Ecosystem Restoration activities were conducted on a 50/50 percent cost sharing basis, while efforts under the Illinois River Basin Restoration authority were cost shared 65 percent Federal and 35 percent non-Federal. Although the Illinois DNR has served as the only non-Federal sponsor to date, the Indiana DNR and the Kankakee River Basin Commission have submitted letters expressing interest in sponsoring projects in their jurisdictions. In addition, the State of Wisconsin and numerous

other state and Federal agencies participated in this collaborative planning process. Section 6, identifies the organizational structure and proposed roles of the other agencies in implementation.

Proposed restoration efforts under this plan would be closely coordinated with two ongoing Corps of Engineers Restoration Programs the Upper Mississippi River – Environmental Management Program (EMP) and the Navigation and Ecosystem Sustainability Program (NESP). The EMP established in 1986 is comprised of two elements—Habitat Rehabilitation and Enhancement Projects (HREPs) and the Long Term Resource Monitoring Program (LTRMP). The NESP effort encompasses the subsequent planning and design efforts related to the Upper Mississippi River - Illinois Waterway System Navigation Feasibility Study completed in September 2004. While some planning and design activities are ongoing, the NESP is not currently authorized. Restoration activities under both programs would include features called for in this Comprehensive Plan including backwater, side channel, island, and floodplain restoration, but they would be limited to the main stem rivers and adjacent floodplains.

Most restoration activities undertaken under Section 519 authority would be located in the watersheds of the Illinois River, these areas are not covered by the EMP and NESP authorities. While this comprehensive plan identifies the need and estimates the costs for significant main stem restoration it is anticipated that most of the implementation work in these areas (approximately 75 percent or more) would actually be funded and conducted through the existing EMP and potentially NESP if authorized. A similar breakdown of efforts is planned for main stem system monitoring and adaptive management activities. The existing Long Term Resource Monitoring Program of the EMP which monitors the LaGrange Pool will be relied on to continue to provide information of the health of the Lower Illinois River. Additional monitoring effort undertaken as part of Illinois River Basin Restoration and NESP will be integrated with and expand on the existing EMP monitoring.

Finally, in regards to EMP, NESP, and Illinois River Basin Restoration coordination activities all efforts will utilize the same multi-agency coordination structures, including the River Resources Coordination Team (RRCT), River Resources Forum (RRF), and River Resources Action Team (RRAT). This joint coordination will help to ensure efficiency among restoration and monitoring activities and a forum for interagency comment and discussion on the collective efforts.

PROBLEMS AND SYSTEM LIMITING FACTORS

The Illinois River Basin has and continues to experience a loss of ecological integrity due to sedimentation of backwaters and side channels, degradation of tributary streams, increased water level fluctuations, reduction of floodplain and tributary connectivity, and other adverse impacts caused by intensive human development over the last 150 years. While many of the original plant and animal species are still present in the basin, but at reduced levels, the physical habitats (structure) and the processes that create and maintain those habitats (function) have been greatly altered. In total, these alterations have led to a decline in the ecological health to the point where aquatic plants beds have been virtually eliminated from the lower river; macro-invertebrate numbers have declined significantly; the loss of backwaters areas with sufficient depth for spawning, nursery and overwintering habitat is now considered limiting for many native fish; and floodplain, riparian, and aquatic habitat loss and fragmentation is a threat to the population viability of State and federally listed species in the basin. The following areas have been identified as the physical factors that limit system

ecological integrity: excessive sedimentation; loss of productive backwaters, side channels, and islands; loss of floodplain, riparian, and aquatic habitats and functions; loss of aquatic connectivity (fish passage) on the Illinois River and its tributaries; altered hydrologic regime; water and sediment quality, and invasive species.

There are numerous opportunities for restoration. Figure ES-2 illustrates how projects formulated addressing these system limiting factors collectively, can improve ecosystem integrity to the point where higher levels of function are restored. Monitoring and adaptive management, at both the system and individual project level, would provide the vital feedback loop needed to ensure success and increase understanding of the Illinois River Basin ecosystem. Adaptive management requires that all ecosystem recovery actions be viewed, implemented, and monitored as tests of hypotheses about ecosystem responses to restoration actions. Under adaptive management, reducing uncertainty becomes an objective of management, the ecological effects of restoration are monitored, and policies are adapted depending on observations. Adaptive management has the added benefit of integrating science and resource management, ensuring applied science is well directed and scientific advances are transferred to managers.

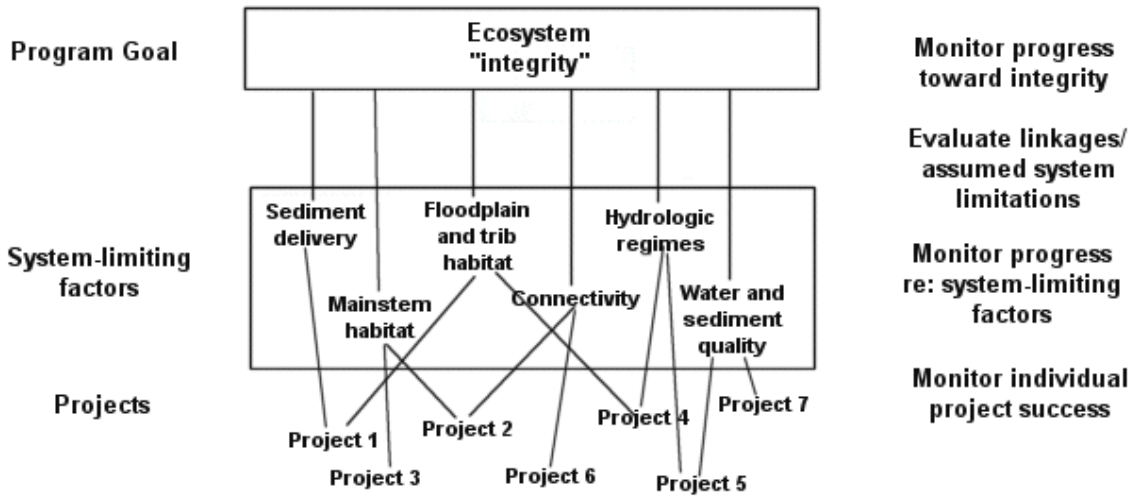

Figure ES-2. Conceptual Model of Illinois River Basin Restoration Project and Monitoring

VISION AND GOALS

The vision for the Illinois River Basin, accepted by the Federal, State and local stakeholders involved in the development of the Illinois River Basin Restoration Program, is:

> *A naturally diverse and productive Illinois River Basin that is sustainable by natural ecological processes and managed to provide for compatible social and economic activities.*

The interagency study team developed the Illinois River Basin system wide ecosystem restoration goals and objectives in direct response to the widely identified system limiting factors. Also included are proposed measures to address the limiting factors and their expected outputs. These goal categories are interrelated and improvements in all areas are needed to substantively improve ecological integrity. As efforts are undertaken across several goal categories, the restoration activities would reverse complex, systemic declines that have degraded the system below some critical thresholds.

Overarching Goal: Restore and maintain ecological integrity, including habitats, communities, and populations of native species, and the processes that sustain them

Objectives

A. Identify and address system wide limiting factors to ecological integrity (structure and function) described in the previous section

B. Restore and conserve natural habitat structure and function, including, but not limited to:
   1. Concentrations of flora and fauna or areas that are high in biodiversity; especially vulnerable to disturbance; and/or important in fulfilling a life-history requirement of the species present.
   2. Specific suitable habitat for Federal and State endangered and threatened species, or other species of concern, that is capable of supporting long-term sustainable populations at the site and protect additional acres of the identified suitable habitat as appropriate.
   3. Representative examples of all community types in the Illinois River Basin, best of kind or as needed, to protect and restore habitat structure and function at the system level.

C. Establish existing and reference conditions for ecosystem functioning and sustainability against which change can be measured; monitor and evaluate actions to determine if goals and objectives are being achieved, at both the project and system level.

System Limiting Factors

1. Excessive Sedimentation. Increased sediment loads from the basin have severely degraded environmental conditions along the main stem Illinois River by increasing turbidity and filling backwater areas, side channels, and islands. Similar problems can be seen throughout the basin where excessive sediment has degraded tributary habitats. The average amount of sediment delivered to the Illinois River each year is approximately 12.1 million tons; of which 6.7 million tons (55 percent) is deposited within the river, its bottomlands, and backwater lakes.

Goa1: Reduce sediment delivery to the Illinois River from upland areas and tributary channels with the aim of eliminating excessive sediment load (Goal 1)

Objectives

A. Reduce total sediment delivery to the Illinois River by at least 10 percent by 2025 (reduction from an average of 12.1 to 10.9 million tons per year above Valley City, based on Illinois State Water Survey (ISWS) estimate of delivery for water year (WY) 1981 to 2000)

B. Reduce total sediment delivery to the Illinois River by at least 20 percent by 2055 (reduction to an average of 9.7 million tons per year above Valley City, based on ISWS estimate of delivery for WY 1981to 2000)

C. Eliminate excessive sediment delivery to specific high-value habitat both along the main stem and in tributary areas

Measures. Incising channels would be treated with rock riffle structures, if possible, otherwise using sheet-pile grade control structures. The preferred method of treating bank erosion was assumed to be stone barbs, then stone toe (photograph ES- 1), or finally a stone armor blanket if necessary; bioengineering was incorporated in most of the bank erosion stabilization measures. Finally, upland sediment control measures include the construction of dry basins.

Photograph ES-1. Example Before and After Stream Restoration With Stone Toe Protection

Outputs. Anticipated project outputs related to Goal 1 include: reducing sediment delivery to the Illinois River, reducing turbidity in the tributaries and Illinois main stem and backwaters, increasing the life of existing and restored backwaters as critical habitats for native species. These effects would benefit system aquatic plants, mussels, invertebrates, fish, and other native species.

2. Loss of Productive Backwaters, Side Channels, and Islands. A dramatic loss in productive backwaters, side channels, and islands due to excessive sedimentation is limiting ecological health, connectivity to the river, and altering the character of this unique floodplain river system. The Illinois River has lost much of its critical spawning, nursery, and overwintering areas for fish, habitat for waterbirds (including diving ducks), aquatic species, and backwater aquatic plant communities. On average, the backwater lakes along the Illinois River have lost 72 percent of their capacity.

Goal: Restore aquatic habitat diversity of side channels and backwaters, including Peoria Lakes, to provide adequate volume and depth for sustaining native fish and wildlife communities (Goal 2)

Objectives

A. Restore, rehabilitate, and maintain up to19,000 acres of habitat in currently connected areas (1989 data shows approximately 55,000 acres of backwaters during summer low water). Restoration should result in a diversity of depths. For restored backwaters, a general target would be to have the following distributions of depths during summer low flow periods: 5 percent >9 feet; 10 percent 6 to 9 feet; 25 percent 3 to 6 feet; and 60 percent <3 feet

B. Restore and maintain side channel and island habitats

C. Maintain all existing connections between backwaters and the main channel. (connections at the 50 percent exceedance flow duration)

D. Identify beneficial uses of sediments

E. Compact sediments to improve substrate conditions for aquatic plants, fish, and wildlife

Measures. The measures evaluated for backwater restoration included various configurations and levels of sediment removal and placement. For side channels and island protection, various measures were evaluated including island protection, dredging, seed islands, and instream structures for habitat (photograph ES-2), and restoration of depth and flow.

Photograph ES-2. Example of Instream Rock Pile Structure

Outputs. Anticipated project outputs include immediately addressing critically limited off-channel aquatic habitat. These effects would benefit the system fish, invertebrates, aquatic plants, mussels, and other native species. At a completed side channel and backwater restoration project a comparison of pre- and post-project construction monitoring data showed a dramatic increase in the number and diversity of fish and waterfowl species as well as an increased total number of individuals. This success is anticipated for similar projects.

3. Loss of Floodplain, Riparian, and Aquatic Habitats and Functions. Land-use and hydrologic change has reduced the quantity, quality, and functions of floodplain, riparian, and aquatic habitats. Flood storage, flood conveyance, habitat availability, and nutrient exchange are some of the critical aspects of the floodplain environment that have been adversely impacted. Habitat loss and fragmentation are widespread problems that, in the long term, could limit attempts to maintain and enhance biodiversity. In addition, habitat forming disturbance regimes have been altered, affecting habitat and species diversity. An analysis of the main stem Illinois River floodplain cover types reveals a loss of approximately 75 percent of the forest, 81 percent of the grassland, and 70 percent of the wetlands. In addition, nearly 50 percent of the floodplain has been isolated from the river. A similar analysis of the tributary floodplains reveals approximate losses of 16 percent of the forest, 36 percent of the grassland, and 70 percent of the wetlands. Channelization is estimated to impair approximately 1,400 miles of perennial stream within the Illinois River Basin.

Goal: Improve floodplain, riparian, and aquatic habitats and functions (Goal 3)

Objectives

A. Restore up to an additional 150,000 acres of isolated and connected floodplains along the Illinois River main stem to promote floodplain functions and habitats

B. Restore up to 150,000 acres of the Illinois River Basin large tributary floodplains

C. Restore and or protect up to 1,000 additional stream miles of riparian habitats

Measures. Potential measures for implementation cover a wide range of practices designed to improve floodplain, riparian, and aquatic habitats, including riffle structures, channelization remeandering, gated levees, wetland restoration including temporary ponds (photograph ES-3), plantings (wetland, forest, prairie), and invasive species management.

Photograph ES-3. Before and After Floodplain Wetland Restoration

Outputs. A healthy functioning floodplain, riparian and aquatic systems in the Illinois River Basin would result in ecological benefits due to connectivity of the river and floodplain habitats critical to the life stages of numerous native species. In addition, restored riparian and floodplain corridors provide one of the best opportunities for landscape scale restoration and

connectivity of remaining resource rich areas in the highly modified Midwestern landscape, improving the viability of sensitive populations and species.

4. Loss of Aquatic Connectivity (fish passage) on the Illinois River and Its Tributaries. Construction of dams on the main stem and tributaries alters the temperatures, flow regime, sediment transports, chemical concentrations, and isolates biotic communities. As a result, aquatic organisms do not have sufficient access to diverse habitat such as backwater and tributary habitats that are necessary at different life stages. Lack of aquatic connectivity (fish passage) slows repopulation of stream reaches following extreme events such as flooding, drought, and pollution and reduces genetic diversity of aquatic organisms. There are seven dams on the Illinois waterway and approximately 467 within the basin where fish passage could be implemented.

Goal: Restore aquatic connectivity (fish passage) on the Illinois River and its tributaries, where appropriate, to restore or maintain healthy populations of native species (Goal 4)

Objectives

A. Restore main stem to tributary connectivity, where appropriate, on major tributaries

B. Restore within tributary connectivity

C. Restore passage for large-river fish at Starved Rock, Marseilles, and Dresden Lock and Dams where appropriate

Measures. Fish passage can be accomplished through a variety of techniques. These options include dam removal; rock ramp on the downstream face of the dam to provide a relatively flat 3 to 5 percent gradient (photograph ES-4); bypass channels; and Denil fishways, rectangular chutes or flumes with baffles extending from the sides and bottoms.

Photograph ES-4. Before and After Rock Ramp Fish Passage at a Low Head Dam

Outputs. The dams found throughout the Illinois River Basin block fish movement, but most dams are partially passable under some conditions. For native fish species, fish passage must be available during the appropriate times of the year or life stages, which is often not the case. Expected outputs would include improved fish access to spawning, nursery, and overwintering

areas at appropriate times. Connectivity also allows for recolonization and improved genetic diversity of populations of native fish and mussels.

5. Hydrology and Water Levels. The biotic composition, structure, and function of aquatic, wetland, and riparian ecosystems depend largely on the hydrologic regime. The flow regime (magnitude, frequency, duration, timing, rate of change) affects water quality, energy sources, physical habitat, and biotic interactions, which, in turn, affect ecological integrity. Historical basin changes and river management have altered the water level regime along the main stem Illinois River, stressing the natural plant and animal communities along the river and its floodplain. The most critical changes include an increased incidence of water level fluctuations, especially during summer and fall low water periods, and the lack of drawdown in areas upstream of the navigation dams. Approximately 32 significant water level fluctuations occur during the growing season, severely limiting plant germination, growth or survival.

Goal: Naturalize Illinois River and tributary hydrologic regimes and conditions to restore aquatic and riparian habitat (Goal 5)

Objectives

A. Reduce low water fluctuations along the main stem Illinois River where possible, concentrating on the months of May through October and using pre 1900 water level records as a reference

B. Reduce peak flows from the major Illinois River tributaries by 2 to 3 percent for 2- to 5-year recurrence storm events by 2023. This will help to reduce peak flood stages and reduce high-water fluctuations along the river. Long term, reduce tributary peak flows by at least 20 percent for these events

C. Reduce the incidence of low-water stress throughout the basin by increasing tributary base flows by 50 percent

D. Remove the dramatic water level fluctuations associated with the operation of wicket dams at Peoria and La Grange

E. At an appropriate resolution (approximately 1 square mile in urban areas, 10 square miles in rural areas) identify and quantify the land and drainage alterations that contribute to unnatural fluctuations and flow regimes

F. Draw the pools at Peoria and La Grange down for at least 30 consecutive days at least once every 5 years

Measures. Reducing peak flows and increasing base flows on the tributaries will be accomplished by increasing the volume of storm water storage in the watershed (through the use of various measures including: tile management, detention structures, and extended riparian areas) and directing storm water runoff to areas where it can infiltrate the soil and recharge groundwater (through the use of various measures including: tile management, filter strips, and grassed fields enclosed with a berm). Many of the detention and riparian areas will function as wetlands. Reducing fluctuations on the mainstem will be accomplished through the following measures including: performing pool drawdowns (photograph ES-5), installing automated dam gates, and installing new gates at existing dam sites were evaluated.

Outputs. In regard to tributary flows, regimes with reduced peaks and increased baseflows would provide more desirable levels of ecosystem function than currently occur. Within the tributaries, improved aquatic species survival is anticipated including, fish and macroinvertebrate populations. Like the tributary systems, two types of benefits were identified for the main stem: reduced fluctuations and area exposed by drawdown. In particular, the reductions in sudden water level rises in the summer is considered a critical element in restoring aquatic plant populations and reductions in rapid winter drops would protect native fish and other aquatic organism populations.

Photograph ES-5. Before and After Pool Drawdown in Backwater Area

6. Water and Sediment Quality. Water clarity is the primary factor limiting submersed aquatic plants. During periods of high turbidity, aquatic plant growth is limited, since suspended sediments interfere with light penetration into the water. In addition to turbidity, the quality of the sediments, particularly in the main stem, may limit macroinvertebrates such as fingernail clams. Water resources in the Illinois River Basin are also impaired due to a combination of point and non-point sources of pollution.

Goal: Improve water and sediment quality in the Illinois River and its watershed (Goal 6)

Objectives

A. Achieve full use support for aquatic life in all surface waters, as defined in 305(b) of the Clean Water Act, of the Illinois River Basin by 2025

B. Achieve full use support for all uses on all surface waters of the Illinois River Basin in 2055

C. Encourage remediation of sites with contaminant issues that affect habitat

D. Achieve state EPA nutrient standards by 2025, following standards to be established by 2008

E. Work to minimize sedimentation as a cause of impairment as defined by 305(b) of the Clean Water Act by 2035

F. Maintain waters that currently support full use.

Measures. Separate measures were not identified for the sole purpose of water and sediment quality restoration. However, benefits would result from reductions in sediment, nutrient processing in restored floodplain and riparian areas.

Outputs. It is expected that water quality would continue to improve somewhat in the future because of improved waste and storm water treatment practices and local conservation efforts, and that improved water quality would translate into improvements in other ecosystem components. However, future gains would be less dramatic than in the past without also working on the other limiting factors.

CONCLUSIONS

The Comprehensive Plan identified that collaborative implementation of the Illinois River Basin Restoration project with other state and Federal agencies would contribute to National Ecosystem Restoration (NER) goals consistent with the Corps policy and guidance by increasing the net habitat quality and quantity of the aquatic ecosystem within the Illinois River Basin Restoration.

The Comprehensive Plan found that over the next 50 years the Illinois River Basin Restoration Program, authorized in Section 519 of WRDA 2000, should be continued and expanded to more fully address the restoration needs of this nationally significant resource. Since Section 519 provides the necessary authority to begin implementation, no further activities are planned under Section 216 at this time. While this report presents a Comprehensive Plan in response to Congressional direction, additional authority to implement the Comprehensive Plan is not being recommended nor requested at this time. To comply with Congressional direction contained in Section 519(b)(5) of WRDA 2000, the Secretary is requested to submit the Comprehensive Plan to Congress. It is further recommended that critical restoration projects continue to be pursued under existing Section 519(c) authority though the normal budget process. This decision may be revisited at a time when implementation of Section 519(c) Tier I and Tier II work has progressed sufficiently that their effectiveness and need for further action and authority can be evaluated.

Plan Formulation

Alternatives were formulated in coordination with State and Federal agencies to address the total additional restoration needs beyond the existing and expected future without project restoration funding levels. The evaluation of system restoration needs was not specific to just Corps of Engineers and Illinois Department of Natural Resources activities, and instead identified the total restoration costs including a relatively large portion of work for other agencies.

A series of eight alternatives were examined in the comprehensive plan study (seven action alternatives and the no-action alternative). All action alternatives would provide regional habitat and ecological integrity benefits by slowing, stabilizing or reversing the decline of ecological integrity in the Illinois River Basin. Alternatives 1, 2, 3, and 4 represent gains in ecological integrity, although system-wide ecological integrity would continue to decline over the 50-year period of analysis.

Alternatives 5, 6, and 7 represent a range of gains that reverse the declining ecological trend, and provide system-wide improvements in ecological integrity over the 50-year period of analysis. In addition to restoration planning and implementation, all alternatives included a Technologies and Innovative Approaches Component and management costs. The Technologies and Innovative Approaches Component addresses the other components called for development and implementation under Section 519(b)(3) including development and implementation of: sediment removal technology, sediment characterization, sediment transport, and beneficial uses of sediment; long term resource monitoring; and a computerized inventory and analysis system.

Three types of outputs (acres benefited, stream miles benefited, and percent attainment of the objectives) were evaluated and utilized to conduct cost effectiveness and incremental cost analysis. Only Alternatives 6 and 7 were best buy plans under all three analyses. Alternative 6 was selected as the preferred Comprehensive Plan alternative, since it was more cost effective while still significantly addressing the key system limiting factors.

Alternative 6, if fully implemented over the next 50 years, would provide benefits to approximately 225,000 acres and 33,000 miles at a cost of $7.44 billion in funding from various Federal, state, and local partnering agencies. Other specific outputs include:

- provide a measurable increase in system ecological integrity
- reduce systemic sediment delivery by 20 percent
- restore 12,000 acres of backwaters
- restore 35 side channels
- protect 15 islands
- restore 75,000 acres of main stem floodplain
- restore 75,000 acres of tributary floodplain and riparian areas
- restore 1,000 stream miles of aquatic habitat
- provide fish passage along the Fox, DuPage, Des Plaines, Kankakee, Spoon, and Aux Sable Rivers
- produce an 11 percent reduction in the 5-year peak flows in tributaries
- increase tributary base flows by 20 percent
- reduce water level fluctuations along the main stem during the growing season by 65 percent
- provide system level improvements in water quality.

Fully implemented, the anticipated benefits of Alternative 6 include reaching a number of key thresholds that are currently limiting ecological integrity. These include:

- Reducing water level fluctuations and turbidity to levels that allow for reestablishment of aquatic plants beds in the lower Illinois River
- Increasing macro-invertebrate numbers as a food base for the system
- Increasing depth diversity in backwaters areas providing spawning, nursery, and overwintering habitat for native fish populations
- Providing critical habitat for the return of diving ducks
- Increasing connectivity of riparian and aquatic habitats providing improved species and population viability of state and federally-listed species

Tiered Implementation

Given the magnitude of the restoration needs, a collaborative and tiered implementation approach is proposed. The Corps of Engineers cost-shared restoration efforts should begin with $131,200,000 ($85,280,000 Federal funds) in restoration funds through 2011 (Tier I) with the potential to expand to $345,640,000 ($224,670,000 Federal funds) in restoration efforts through 2015 (Tier II). The funding and activities would begin significant restoration consistent with eventual implementation of Alternative 6 (preferred Comprehensive Plan alternative). These initial phases are proposed to demonstrate the benefits of the various practices and project components prior to seeking additional funding. If Tier I and Tier II efforts are successful additional tiers could be developed based on increased understanding of system responses to the initial restoration projects and consideration of further developments regarding interagency funding and partnerships.

Tier I efforts would result in the completion of 16 critical restoration projects cost shared 65 percent Federal ($85.28 million) and 35 percent non-Federal ($45.92 million). This funding level would provide approximately $122.3 million for planning, design, construction, and adaptive management of restoration projects; $3.5 million for site specific pre and post project monitoring, and $2.6 for additional studies and analysis including refinement of a technologies and innovative approaches component; and $2.75 million for system management. The estimated annual Operation and Maintenance cost, of the Tier I projects completed by 2011, is estimated to be $125,000. If funding is available, a report to Congress will be submitted in the 2011 timeframe, documenting the project successes and the results from Tier I restoration efforts.
The following sections describe these aspects of the initial restoration efforts in greater detail. Funding would address three major areas with funding at approximately the level indicated.

Restoration Projects. The majority of the funding, roughly 93.2 percent or $122.3 million (including $3.1 million in adaptive management if required) of the initial $131.2 million, would be targeted to address component (b)(3)(B) of Section 519 (WRDA 2000) calling for the development and implementation of a program to plan, design, and construct restoration projects.

Initial restoration efforts would focus on tributaries to the upper watershed and, in particular, the Peoria Pool and tributaries and the Kankakee River Basin. Within these areas, the focus will be on addressing excess sediment delivery, altered hydrologic regimes, and critical habitats and connectivity. These initial focus areas were chosen, since the most likely near term success is to start in the upstream reaches working on the most critical issues and then working down stream in future Tiers. In combination, these screening criteria provide considerable focus in the selection of initial projects. In addition, a few other restoration projects are also proposed in order to maintain critical habitat needs throughout the basin such as backwater, side channel, and island restoration.

The initial Critical Restoration Projects include eight small watershed projects: Waubonsie Creek, Senachwine Creek, Crow Creek West, Tenmile Creek, Yellow River, Iroquois River, Blackberry Creek, and McKee Creek; two major tributary projects on the Kankakee River and Fox River; and six main stem projects, including backwater restorations, Peoria Riverfront – Upper Island and Pekin Lake – Southern Unit and a main stem floodplain restoration at Pekin Lake – Northern Unit, and side channel and island projects in Starved Rock, LaGrange, and Alton Pools.

Based on the large study area, complexity of the ecosystem restoration and the opportunities for increased cost effectiveness, adaptive management is recommended to be included within restoration funding. An incremental process is required for the Illinois River Basin Restoration Program because of the large and complex nature of the ecosystem and its problems, and because of the uncertainties regarding the ecological responses that will occur as more natural hydrological and sediment conditions are established. These uncertainties are inherent where major alterations in the region's spatial scale and landscape have substantially changed ecological relationships among species, habitats, and communities throughout the region. If an unexpected response occurs, it becomes the basis for reviewing and revising the operating set of hypotheses, which results in an ever-improving focus on the actions required to meet the ultimate restoration objectives.

Site Specific Project Monitoring and Additional Studies and Analyses. Approximately 2.7 percent or roughly $3.5 million would be used to perform pre and post project monitoring at the initial critical restoration projects. In addition, approximately 2.0 percent or roughly $2.6 million of the $131.2 million authority would be utilized to conduct additional studies and analyses. A major focus of the additional studies and analysis will be to address areas of risk and uncertainty and to continue to refine a Technologies and Innovative Approaches Component (TIA). For example, additional studies related to the TIA Component could better define ways to combine, consolidate, and build upon existing monitoring data sets (e.g. attempt further consolidation of existing State, Federal, and local monitoring data to further leverage existing data); refine the monitoring plan to seek the most efficient approaches to gathering additional necessary data; better define representative system metrics (e.g. evaluate the use of various species/processes to serve as system indicators); and conduct special studies to collect data to increase our understanding of various processes that could reduce future restoration costs (e.g. detailed study of fish use of tributaries throughout the year and selected evaluations of sediment technologies and applications). A final area of activity would be monitoring of key focus areas to establish pre-project data for use in more completely evaluating problems, opportunities, and project success.

System Management. Approximately 2.1 percent or $2.75 million of the $131.2 million authority would be utilized to manage the restoration efforts. Management funds would include funding for both the Corps of Engineers Districts and non-Federal Sponsors for project management and coordination activities.

While the sustainability of critical restoration projects would be highest with full implementation of Alternative 6, the individual projects implemented under Tier I and Tier II will be formulated to remain sustainable on their own, even if further restoration efforts do not continue. However, these projects will require some operation and maintenance as estimated in the report. We anticipate that the sustainability of the mainstem projects would continue to improve as additional tributary projects are undertaken.

Risk and Uncertainty

As a comprehensive plan for an area of over 30,000 square miles looking at a 50 year planning horizon, there are a number of risks and uncertainties. Some of the major uncertainties relate to the lack of existing models and scientific data to relate sediment reductions to system habitat improvement and sustainability gains and defining the most effective approaches to restore a more natural hydrologic regime. A particular area of uncertainty is defining the specific amounts of restoration

required to improve these system limiting factors to the point were necessary biological thresholds are exceeded and significant ecosystem recovery occurs. Some other areas of risk and uncertainty include development patterns, agricultural programs/practices, and climate change. The recommended Tier I and Tier II projects along with additional studies and analysis activities will provide valuable information needed to better understand and address these risks should further implementation of the comprehensive plan be undertaken in the future..

Areas for Additional Investigation

While Section 3 documents a large number of potential additional studies that would be beneficial to restoration efforts, some of the key issues relate to continued development and refinement of a systemic monitoring report card, improved models, and information on the ability of restoration projects to provide systemic sediment and hydrologic restoration. A particular need is the opportunities to naturalize hydrology and restore native aquatic vegetation. While existing programs have worked to define methods to sample large rivers, a critical need is to determine the best methodology and approach for monitoring large tributaries and small watersheds. These specific areas are proposed for additional study and analysis concurrent with the implementation of Tier I to help reduce the risk and uncertainty over time. If a long term program was undertaken these additional studies and activities would be pursued as part of the Technology and Innovative Approaches (TIA) component working to continually reduce the risk and uncertainty in the program. Should further implementation of the comprehensive plan occur in the future, additional studies related to the TIA component could provide valuable information toward such implementation. The TIA component would also prove useful in implementing the Tier I and Tier II projects.

Implementation Framework and Roles of Other Federal, State and Local Agencies

The proposed assessment and implementation process described in Section 6 seeks to create a systemic, comprehensive approach that is transparent and accessible to project partners and stakeholders. The ecological merits of proposed projects will be the most important factor. Other factors to be considered will include goal-specific factors, presence of threats, sustainability, public interest and acceptability, and administrative issues. It is important to emphasize that project implementation will not proceed rigidly in strict order of numerical rankings. Flexibility is essential, and the Corps of Engineers, sponsor, and program partners, will need to exercise reasonable judgment to resolve unexpected issues, respond to opportunities, and ensure efficient program execution. Due to the watershed approach being taken during implementation, regulatory agencies will be included in the assessment and feasibility phases to better identify areas of concern.

In order for the project to succeed, collaboration and funding for a number of other agencies and programs will need to be strengthened and increased using the implementation framework provided in this report. In recognition of the technical expertise of the other Federal, state, and local partner agencies; the continued limitations on the Federal budget; and the requirements of Section 519 (e), we have worked collaboratively with our partners to evaluate the various programmatic authorities of each agency and investigate opportunities for synergy in implementing the proposed Illinois River Basin restoration initiatives. While the process of full multiple agency implementation will continue to be refined over the initial years of the program, based on collaboration to date, the following breakdown of work is anticipated:

U.S. Army Corps of Engineers (USACE). The Corps of Engineers could take the lead role in Illinois River main stem restoration utilizing the existing EMP program and proposed NESP programs to fund the majority. These programs are estimated to address approximately 75%, of main stem work and much of the main stem system monitoring activities. The Section 519 authority could focus primarily on watershed restoration addressing approximately 40% of the identified need for work in the tributaries, riparian, and floodplain areas with a focus on restoring the structure and function of aquatic and wetland areas, but would also provide a mechanism to conduct some additional main stem work,. The Section 519 authority could be utilized to develop and implement an integrated system

monitoring program utilizing existing data collected by other Corps programs, other Federal agencies, and state and local groups.

U.S. Department of Agriculture (USDA). The USDA has a number of programs and experience and history in restoration throughout the basins. It is estimated that roughly 40% of the identified watershed and floodplain work could be addressed by existing and expanded USDA programs.

U.S. Environmental Protection Agency (USEPA). The USEPA has some restoration funding available. It is estimated that roughly 15-20% of the watershed work could be addressed by USEPA with a particular focus on water quality related issues. The USEPA also has active monitoring programs that could be integrated and help serve as a basis for future systemic monitoring.

U.S. Fish and Wildlife Service (USFWS). The USFWS has some limited restoration authorities and funding. It is estimated that up to 5% of the watershed work could be addressed by USFWS using existing and expanded programs, with a particular focus on private lands habitat restoration projects.

U.S. Geological Survey (USGS). The USGS Illinois Water Science Center (IWSC) performs various monitoring and study activities in the Illinois River Basin, and could serve as a key partner agency in the development and implementation of any long term monitoring.

State Agencies. The Illinois Department of Natural Resources, Illinois Environmental Protection Agency, Illinois Department of Agriculture, Indiana Department of Natural Resources, Wisconsin Department of Natural Resources would be looked to continue and expand their ongoing restoration efforts as well as serve as sponsors providing the required matching for many of the Federal programs.

Local Agencies. Local governments and non-governmental organizations are critical to future restoration efforts. In particular, they could play key roles in ensuring proper zoning and protection of sensitive areas, storm water management, land owner interaction, and protection and restoration of habitat areas. They also have the ability to match Federal funding sources.

Potential Amendments to Section 519 of the Water Resources Development Act (WRDA) of 2000, Public Law 106-541. The current authorization provides ongoing authority to evaluate and implement Critical Restoration Projects, conduct associated project-specific monitoring, and conduct additional studies and analyses. The current authority does limit some types of restoration due to the per project cost limits (e.g. not able to perform some larger backwater restorations and watershed efforts, etc.). The technologies and innovative approaches component could not be implemented without further authority, which currently limits the collection and analysis of systemic monitoring and evaluation of dredging technologies and beneficial use. In addition, collaboration could be improved if non-profit organizations were authorized to act as non-Federal sponsors for these projects. Finally, rather than following normal procurement laws and regulations, there is the potential for improved implementation efficiency with the use of methods similar to the NRCS. The NRCS is authorized to provide funding directly to landowners to undertake certain structural and land management conservation practices. In addition, NRCS assistance is often tied to shorter term measures. No recommendation is being provided at this time on whether to seek similar authority for the Corps. In summary, although the existing authorization provides adequate authority to implement much of the restoration plan, additional authority may be sought in the future to improve the efficiency of program implementation.

The following bullets highlight some potential legislative updates identified in the study process as areas of consideration to improve the future efficiency in implementing Section 519. These potential opportunities for legislative updates to Section 519 were developed in cooperation with the State of Illinois Department of Natural Resources, other Federal and State agencies, local governments, and various non-governmental organizations and are discussed more fully in the conclusions section.

- Increasing the per project Federal cost limit for Critical Restoration Projects from $5 million to $20 million. Section 5071 of the Water Resources Development Act of 2007, which became law on November 8, 2007, provides for this increase in the maximum per project Federal cost limit for Critical Restoration Projects.

- Authorize implementation of a Technologies and Innovative Approaches Component as a component of the Comprehensive Plan that complements the Critical Restoration Project activities. Activities would include initiatives called for in Section 519 (b).(3).(A) development and implementation of sediment removal technology, sediment characterization, sediment transport, and beneficial uses of sediment; (C) long term resource monitoring; and (D) and a computerized inventory and analysis system.

- Authorization allowing the development of cooperative agreements and fund transfers between the Corps of Engineers and the State of Illinois; State of Indiana; State of Wisconsin; scientific surveys at the University of Illinois; and units of local government: counties, municipalities, and Soil and Water Conservation Districts to facilitate more efficient partnerships.

- Authorization to allow the Corps of Engineers to deviate from normal procurement laws and regulations and to provide funding directly to landowners to undertake shorter-term structural and land management conservation practices. No decision has been made on whether to seek such authority. If in the future the Corps decides to pursue, and Congress provides, such authority, it is likely that the Corps would work closely with the NRCS in the provision of such assistance. The practicality and policy implications of this approach will be evaluated during more detailed feasibility studies.

- Expand the authorization to allow non-profit organizations to serve as sponsors and sign Project Cooperation Agreements for restoration projects implemented under the Illinois River Basin Restoration program.

RECOMMENDATIONS

This comprehensive plan was prepared in response to congressional directive contained in Section 519(b) of the Water Resources Development Act of 2000. The plan was developed for the purposes of restoring, preserving, and protecting the Illinois River Basin for submission to Congress as required by Section 519(b)(5). While this report presents a Comprehensive Plan in response to Congressional direction, additional authority to implement the Comprehensive Plan is not being recommended nor requested at this time. To comply with Congressional direction contained in Section 519(b)(5) of WRDA 2000, the Secretary is requested to submit the Comprehensive Plan to Congress. It is further recommended that critical restoration projects

continue to be pursued under existing Section 519(c) authority though the normal budget process. This decision may be revisited at a time when implementation of Section 519(c) Tier I and Tier II work has progressed sufficiently that their effectiveness and need for further action and authority can be evaluated.

The 16 Tier I critical restoration projects identified in the Comprehensive Plan would produce independent, immediate and substantial restoration, preservation and protection benefits. As such, upon approval by the Secretary, these projects could be implemented under existing authority, subject to the availability of funds and execution of a PCA. Implementation of the Tier I projects would follow established implementation guidance and project cost sharing would be in accordance with Section 519(g), 65-percent Fedeeral/35-percent non-Federal. Each project proposed under Tier I would be supported by a feasibility level decision document. To date the Secretary has approved implementation of the Pekin Lake Northern Unit and Peoria Riverfront Upper Island critical restoration projects at a combined estimated total cost of $12,641,100 to be cost shared $8,216,715 Federal and $4,424,385 non-Federal. Implementation of the Tier I projects would begin significant restoration consistent with the preferred Comprehensive Plan alternative.

In addition, as Tier I planning efforts are completed, it is recommended that Tier II efforts be initiated following Assistant Secretary of the Army (Civil Works) approval to proceed with any additional critical restoration projects. This would allow for a seamless transition from Tier I to Tier II projects. Currently 45 potential projects have been identified. Specific projects for Tier II would be selected utilizing the process and criteria described in section 6 of this document. Each project proposed under Tier II would be supported by a feasibility level decision document.

Finally, it is recommended that additional studies and analyses be pursued in accordance with Section 519(b)(6). Pursuant to Section 519(b)(6) the Secretary shall continue to conduct such studies and analyses related to the comprehensive plan as are necessary. Potential areas for additional studies include further refinement to the Technologies and Innovative Approaches component and potentially additional monitoring to address the critical needs to determine the best methodology and approach for monitoring large tributary and small watersheds.

If fully implemented, Tier I efforts would result in the completion of 16 critical restoration projects and critical additional studies and analyses at an estimated total cost of $131.2 million, cost shared $85.3 million Federal and $45.9 million non-Federal. The estimated annual Operation and Maintenance cost, of the Tier I projects completed by 2011, is estimated to be $125,000. These operation, maintenance, rehabilitation, and replacement costs would be the responsibility of the non-Federal project sponsors.

The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They reflect neither the program and budgeting priorities inherent in the formulation of the national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before transmittal to Congress as proposals for authorization and implementation funding.