

**GENERAL INVESTIGATION RECONNAISSANCE STUDY
ILLINOIS RIVER, PEORIA RIVERFRONT DEVELOPMENT
(ENVIRONMENTAL/ECOSYSTEM RESTORATION)**

Section 905(b) Reconnaissance Analysis

1. STUDY AUTHORITY. Specific authority for conducting this reconnaissance study is contained in Resolution 2500 of Committee on Transportation and Infrastructure adopted May 9, 1996:

Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, That, the Secretary of the Army is hereby requested to review the report of the Chief of Engineers on the Peoria Lake and La Grange Pool, Illinois River, Henry to Naples, Illinois, and other pertinent reports, with a view to determining whether the recommendations contained therein should be modified at this time, with particular reference to that portion of the Illinois River between Henry and Naples that flows next to, or directly impacts, the downtown Peoria Riverfront Development project, to determine potential flood control or other water resources impacts, if any, that may affect the development efforts, to include but not be limited to a study of the siltation problem caused by sediment deposition from Farm Creek into the Illinois River, as well as the potential use of suitable dredged material for nearby development of a public beach.

Complementary authority for conducting this investigation is contained in Section 216 of the 1970 Flood Control Act. Under this authority, an Initial Appraisal entitled, *Illinois Waterway System Ecosystem Restoration and Sedimentation, Illinois*, was prepared and approved in August 1996. The conclusions from this appraisal were that significant changes to the physical and economic conditions have occurred in the Illinois River since the navigation projects were built and that there is an opportunity for improving the quality of the environment. According to the Initial Appraisal,

...Substantial evidence exists indicating significant physical and economic changes have occurred in the study area. The significance of the resources and of the changes experienced indicates the necessity to further evaluate the sedimentation and degradation of the system and to identify ecosystem restoration efforts which could address issues. Based on this information, I recommend undertaking a reconnaissance study under Section 216 of the 1970 [FCA] authority.

The Rock Island District of the U.S. Army Corps of Engineers received funds in Fiscal Year 1997 to conduct the reconnaissance phase of study and develop a Project Study Plan for the feasibility phase.

2. STUDY PURPOSE. The purpose of this expedited reconnaissance study is to:
(1) determine if there is a Federal interest consistent with Army policies, costs, benefits and environmental impacts in reducing sedimentation impacts in the Illinois River at Peoria Lake; restoring fish and wildlife habitat; and/or providing flood damage reduction measures as they relate to riverfront development near Peoria, Illinois; (2) prepare a Project Study Plan; and

(3) assess the level of interest and support from non-Federal entities in cost-sharing for the feasibility phase and project construction. Specific attention was given to identifying opportunities for flood damage reduction and restoring degraded ecosystem structures and functions, including the ecosystem's hydrology and plant and animal communities, to a less degraded condition.

3. LOCATION OF STUDY AREA. The Illinois River is part of the Illinois Waterway System. The Illinois Waterway System is comprised of the Chicago Sanitary Ship Canal, the Calumet Sag Channel, the Illinois-Michigan Canal, and the Chicago, Des Plaines, Kankakee and Illinois Rivers, and extends from Lake Michigan at Chicago, Illinois, to the Mississippi River at Grafton, Illinois, a distance of approximately 327 miles. The Illinois River, draining 40 percent of the State of Illinois, begins at approximate River Mile (RM) 272.0 of the Illinois Waterway System, just upstream of Dresden Island Lock and Dam. The width of the river's floodplain ranges from 2 to 12 miles, and the watershed area at the Peoria Boatyard is 14,165 square miles. The Peoria pool of the Illinois River extends from approximate RM 231 to 158 and includes Upper Peoria Lake, Lower Peoria Lake, and Peoria Lock and Dam. Peoria Lake covers nearly 14,000 acres and is subdivided into Upper and Lower Peoria Lakes by a natural constriction occurring at approximate RM 166.5. Twelve tributaries drain directly into Peoria Lake.

The boundary for this reconnaissance study is from Illinois RM 181 near Chillicothe, Illinois, to Peoria Lock and Dam at approximate RM 158. Within this reach are the urban areas of Chillicothe, Rome, Mossville, Peoria Heights, Peoria, and East Peoria, Illinois. Attachment 1 is the study area map. The study area is located within the Illinois 18th Congressional District.

4. PRIOR STUDIES AND REPORTS. In conducting this study, a number of documents were consulted that were prepared by the U.S. Army Corps of Engineers, the Illinois Department of Natural Resources, the Illinois State Water Survey, the Tri-County Riverfront Action Forum, the Heartland Water Resources Council, and the Peoria Riverfront Development Commission. Listed in chronological order, the most notable of these were:

a. Letter Report for Local Flood Protection on the Illinois River at Peoria, Illinois, June 1970 (Revised 10 May 1971), U.S. Army Corps of Engineers, Chicago District, prepared under the authority contained in House Document No. 472, 87th Congress, 2nd Session. Report recommended construction of a system of floodwalls and levees at a benefit-to-cost ratio of 1.3 to 1.0.

b. *Sediment Yield of Streams in Northern and Central Illinois*, Adams, J. Roger, *et al.*, Illinois State Water Survey, December 1984. This report quantifies sediment yields in Illinois streams.

c. *Peoria Lake Sediment Investigation*, prepared for the U.S. Army Corps of Engineers by the Illinois Department of Energy and Natural Resources, State Water Survey Division, January 1986. This report includes bathymetric profiles, results of core samples, and impacts of human activities on sedimentation. Potential solutions to sedimentation of Peoria Lake include controlling sediment input, managing in-lake sediment, hydraulically manipulating the Illinois River through Peoria Lake, creating artificial islands, selective dredging, and creating marshy areas.

d. U.S. Army Corps of Engineers Reconnaissance Study, *Illinois River from Henry to Naples, Illinois, Peoria Lake and La Grange Pool, Illinois River Basin*, March 1987. This is a study authorized in Section 109 of Section 1304 of the Supplemental Appropriations Act that includes

making a determination of the advisability of the preservation, enhancement, and rehabilitation of Peoria Lake in the vicinity of Peoria, Illinois.

e. *Hydraulic Investigation for the Construction of Artificial Islands in Peoria Lake*, July 1988, Illinois Department of Energy and Natural Resources, State Water Survey Division, Champaign, Illinois. This report discusses the best location for building islands in Upper and Lower Peoria Lakes. The models used determined effects of islands upon water surface elevations, sedimentation patterns, and velocities.

f. U.S. Army Corps of Engineers report, *Upper Mississippi River System Environmental Management Program, Peoria Lake Enhancement*, published in July 1990. This technical publication, complete with National Environmental Policy Act documentation and engineering plans, was the authorizing document by which a 16-acre barrier island was created in Upper Peoria Lake to enhance migratory waterfowl habitat value and provide for more ideal fish spawning environment and establishment of mussel communities. Preliminary reports that monitor the success of the barrier island feature of the Peoria Lake Environmental Management Program project indicate that there is an increase in absolute numbers and diversity of waterbird species using the project site.

g. *The Illinois River: Working for Our State*, Laurie McCarthy Talkington, Illinois State Water Survey, January 1991. This document includes descriptions of the past, current, and projected future conditions of the Illinois River. Specific portions related to this study include flora and fauna descriptions, the significance of its working role, and the many roles of the river.

h. *Erosion and Sedimentation in the Illinois River Basin*, Demissie, Misganaw, *et al.*, Illinois State Water Survey, June 1992. This report performed sediment yield calculations for Illinois River tributaries and used those relationships to construct an approximate sediment budget for the Illinois River Valley. The report also discusses the effect of changed crop practices upon sediment loads.

i. *Source Monitoring and Evaluation of Sediment Inputs for Peoria Lake*, Bhowmik, Nani G., *et al.*, Illinois State Water Survey, February 1993. The objectives of this report were to determine the sediment sources to Peoria Lake and to evaluate sediment loads from local tributaries to determine best management practices for the tributaries. This report also estimated the sources of sediment in Peoria Lake and what percentages of sediment in the lake are from local tributaries or the Peoria Lake.

j. *Heartland Riverfront Master Plan*, April 1994. This document describes existing and planned development of the riverfront and central business district in downtown Peoria, Illinois. The document and architectural drawings were prepared by Phillips Swager Associates, Architects; EDAW, Inc., Planners; Hammer, Siler, George Associates, Economists; and Farnsworth and Wylie, Engineers.

k. *Peoria Lakes Water Depth Changes, 1988-1996*, project direction of Heartland Water Resources Council, graphic art by Caterpillar Image Lab, and Preliminary Depth Survey Database provided by the U.S. Army Corps of Engineers, Rock Island District. Attachment 2 hereto is the sedimentation map showing water levels contrast over the 8-year period.

l. Section 216 Initial Appraisal, *Illinois Waterway System Ecosystem Restoration and Sedimentation, Illinois*, August 1996, U.S. Army Corps of Engineers, Rock Island District. This

document recommends further study of the Illinois Waterway Ecosystem in light of changed physical and economic conditions since the 9-foot navigation channel was constructed.

m. *Integrated Management Plan for the Illinois River Watershed*, prepared by the Illinois River Strategy Team in cooperation with nearly 150 participants, chaired by Lt. Governor Bob Kustra, January 1997. The plan contains 34 recommendations divided into six sections: In the Corridor, Soil and Water Movement, Agricultural Practices, Economic Development, Local Action, and Education.

n. Proposal by Mr. John C. Marlin, Waste Management and Research Center, to U.S. Department of Agriculture on *Illinois River Characterization for Restoration and Beneficial Use of Sediment*, April 1997.

o. *Land Management System Research and Development Program* of the U.S. Army Corps of Engineers Waterways Experiment Station. In response to an increasing need for integrated approaches in management of natural resources, the Corps' Research and Development Program will be developing better tools to provide hindcasting and forecasting capabilities in a quantitative framework for use in decision making regarding natural resource management. This effort will rely heavily upon modeling. Discrete locations on the Illinois, Minnesota, and Upper Mississippi Rivers have been selected for study. Problems will be evaluated, such as backwater filling, poor water quality, habitat loss, etc., related to sediment transport and deposition, as well as the ecological consequences of these problems.

The Land Management System (LMS) research is independent of the Peoria Riverfront Development Environmental Restoration project. The length of time for the study and subsequent monitoring is estimated to be 6 to 10 years. However, the Rock Island District has coordinated with the Waterways Experiment Station on how the LMS will "fit in" to this feasibility study. The LMS will be providing some interim products to the feasibility study that are identified in the PSP (i.e., bathymetric surveys and sediment rate analysis).

One objective of the LMS is to do a predictive model on sedimentation in the Peoria Lake area. An important aspect of LMS is that it will look at future management needs and scenarios in the uplands and in the tributaries in order to reduce future sedimentation to the Illinois River. These data will complement this and other projects and will help to identify problems and opportunities that should be undertaken by the State and local entities—including items that the Corps of Engineers may not have the authority to do.

o. *Conservation Reserve Enhancement Program*. On 30 March 1998, Dan Glickman, U.S. Secretary of Agriculture, came to Peoria, Illinois, to announce a \$250 million effort to improve the Illinois River with a Conservation Reserve Enhancement Program (CREP). In attendance were U.S. Senators Richard Durbin and Carole Moseley-Braun, U.S. Congressmen Ray La Hood and Lane Evans, and Jim Edgar, Governor of the State of Illinois. The CREP initiative will help preserve up to 100,000 acres of sensitive river basin land surrounding bordering Illinois rivers and Peoria Lake. The Peoria Riverfront Development feasibility study was referenced at the meeting as part of the "grand plan" of collaborative actions by Federal agencies to address resource problems in the Illinois River.

5. PLAN FORMULATION. To initiate the study, the Rock Island District formed an interdisciplinary study team, and several internal meetings took place from April 1997 to the present.

These meetings allowed for exchange of information, development of solutions, evaluation of alternatives, and sharing of professional expertise. Early in the investigation, external contact was also made with the Peoria Riverfront Development Commission, the Heartland Water Resources Council, and several local agencies and groups so that a broad perspective partnership could be formed and used throughout the study process.

A coordination meeting was held on July 22, 1997, to discuss study focus and alternatives for consideration and to assess the potential for continued involvement at the non-Federal level. At the meeting, a task force was formed that is composed of representatives from the following organizations:

- Congressional and State representatives
- Elected and appointed county officials
- City of Peoria officials
- Peoria Riverfront Development sponsors
- Heartland Water Resources Council
- Illinois Department of Natural Resources
- Natural Resources Conservation Service
- Environmental Protection Agency
- Riverfront Action Forum
- Nature Conservancy
- Tri-County Regional Planning Commission
- Illinois Office of Resource Conservation
- Waste Management and Research Center
- Illinois State Water Survey
- University of Illinois Cooperative Extension Service
- U.S. Army Corps of Engineers, Rock Island District

On August 26, October 7, November 20, and December 11, 1997, the task force met in Peoria to discuss related studies within each agency's purview, potential alternatives, and cost-sharing responsibilities. Areas of concern discussed were sedimentation in Peoria Lake, the loss of valuable aquatic and terrestrial habitat, reducing flood damages, and the prohibitive cost of hydraulic dredging. The task force members also provided input to the reconnaissance analysis and are willing to assist in developing the Project Study Plan for a feasibility study.

a. Identified Problems and Opportunities - Illinois River usage includes navigation, recreation, water supply, irrigation, and fish and wildlife habitat. Amid this diversity of uses, there is the potential for competing interests and in setting priorities for solutions to short- and long-term resource management problems. As stated in the study authority, opportunities were explored to address sediment deposition, reduce flood damages, and restore environmental conditions, especially those that relate to the downtown Peoria Riverfront Development Project. The Peoria Riverfront Development Project is a public and private cooperative effort to revitalize the downtown area of the city. Development includes a visitor's center, city park, community center, riverboat landing, sports complex, entertainment centers, and retail development. Since 1995, a total of \$75.0 million in public and private funds has been invested in riverfront development and another \$100.0 million is planned. The following paragraphs discuss the existing and expected future conditions within the study area, as well potential areas where Federal participation is warranted in solving the problem.

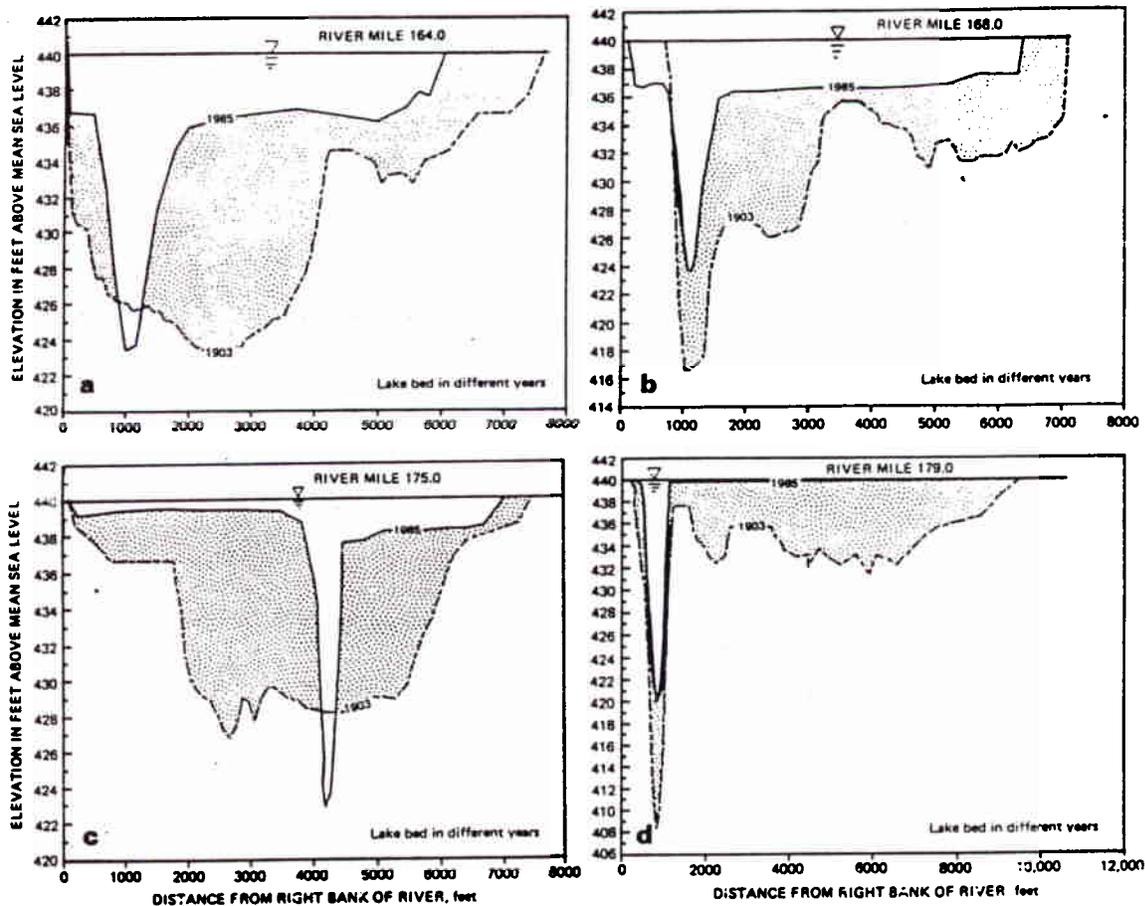
b. Existing Conditions -

(1) Hydraulic/Hydrologic - The Corps of Engineers maintains a system of locks and dams on the Illinois River Waterway to facilitate inland navigation. Through the use of dredging, the Corps maintains a 9-foot channel in the Peoria navigation pool and Peoria Lake. This is a 100 percent Federal responsibility as part of the O&M commitment to the 9-Foot Navigation Channel Project on the Illinois River.

The Illinois River is divided into two sections—the upper river from Chicago to the town of Hennepin and the lower river from Hennepin to Grafton, Illinois. The hydraulic characteristics of the Illinois River downstream of Starved Rock (RM 231.0) are complex because the river gradient is very flat. While the river's elevation drops 38 feet between its beginning in Joliet (RM 287) to Hennepin (RM 207), Illinois, the river slopes down only 21 more feet in the remaining 207 river miles. This equates to a slope of approximately 0.5 foot per mile in the upper river and 0.1 foot per mile in the lower river section. Peak flood flows also decrease between Starved Rock and Peoria, even though the drainage area increases by 3,500 square miles. This demonstrates the extreme attenuation of the flow by reach storage through Upper and Lower Peoria Lakes between Starved Rock and Peoria Lock and Dam.

The river has been impacted significantly by the diversion of water, combined with the discharge of domestic and industrial waste into the Illinois River, construction of levees, agricultural practices, urbanization, and the introduction of navigation structures. Resource managers of the Illinois River are in agreement that sedimentation in Peoria Lake is a major problem. In fact, the Peoria Lake has lost 66 to 70 percent of its 1903 volume below elevation 440 feet mean sea level (msl) (ILENR/RE-WR-88/15 Report, July 1988) and has the highest sedimentation rate among all the large lakes and reservoirs in Illinois. Three major tributary streams contribute significant sediment loads into Peoria Lake—Richland, Partridge, and Farm Creeks. Deltas have formed where these and other streams enter the Illinois River and have grown quite large over the years.

The Illinois State Water Survey estimates that nearly 14 million tons of sediment travel through the watershed each year. Of this, more than one-half, or 8.2 million tons, of the sediment transported remains in the Illinois River Valley. The combined volume of Upper and Lower Peoria Lakes has been reduced from 120,000 acre-feet in 1903 to 38,300 acre-feet in 1985. Based upon sediment transport monitoring to Peoria Lake for two years, the Illinois State Water Survey found that in drought years 25 percent of the sediment delivered to the Peoria Lake was contributed by local tributaries. In an average year, 50 percent of the sediment delivered to the Peoria Lake came from the local tributaries, whereas in a wet year the sediment load from the local tributaries to the lake would probably exceed 50 percent. While recent surveys have not been recorded, the cross sections on the next page compare the 1903 and 1985 lakebed profiles for Peoria Lake. According to Dr. Nani Bhomik, Ph.D., of the Illinois State Water Survey, who is a noted expert on Illinois River sedimentation, the cross section for these same four locations would be substantially smaller in 1996 based on projected sedimentation rates. Attachment 2 is a color depiction of water depth changes from 1988 to 1996.



Comparison of 1903 and 1985 lake bed profiles for Peoria Lake. "Hydraulic Investigation for the Construction of Artificial Islands in Peoria Lake," ILENR/RE-WR-88/15 Report, July 1988.

The flood of record in Peoria occurred in 1943. This flood was estimated in 1970 to have a recurrence interval of once in 33 years. Along the Illinois River in this area, urban development, levees, berms, drainage ditches, ponding areas and wetlands populate the floodplain. Communities and levee and drainage districts have experienced only moderate flood impacts during recent flood events. The East Peoria Levee and Drainage District, Illinois, has an existing structural flood protection system and, in the next few years, will raise its levee to withstand a flood with a 0.5 percent chance of occurrence. This project is being accomplished through the Section 205 Continuing Authorities Program. Table 1 compares the elevations for the floods of record at the Peoria Boatyard (RM 164.0).

**TABLE 1: Floods of Record, Illinois River at Peoria, Illinois
(Approximate River Mile 164.0)**

Year	Crest Elevation		Crest Date	Stage Duration Period – At or Above (Days)*		
	NGVD**	Feet		Weather Bureau 446.4 = 18.0'	CEMVR Cat. "C" 451.0 = 22.6'	CEMVR Cat. "A" 454.4 = 26.0'
1943	457.2	28.8	24 May	34 days	20 days	10 days
1979	457.1	28.7	23 Mar	71 days	46 days	18 days
1982	455.8	27.4	09 Dec	33 days	12 days	4 days
1982	455.5	27.1	22 Mar	65 days	20 days	7 days

* Consecutive days during peak flood
 ** National Geodetic Vertical Datum

(2) Demographic - Ninety percent of the State of Illinois population lives in the Illinois River watershed, which meanders through 55 of the 102 counties in Illinois. The City of Peoria Riverfront Development Study area is located in Peoria County, Illinois, within the Peoria-Pekin Metropolitan Statistical Area (MSA). As the table below shows, the MSA population declined in the 1980s, has stabilized, and is projected to be stable into the next decade. Employment was historically dominated by manufacturing, but is now more balanced, primarily among manufacturing, wholesale/retail trade, and service sectors.

TABLE 2: Population and Employment Trends (1)

	1980	1990	Projected 2000
Population	366,100	339,800	349,500
Employment:			
Farming & Agricultural Services	5,900	5,800	6,000
Mining & Construction	9,600	10,700	11,700
Manufacturing	52,200	34,700	32,200
Transportation & Utilities	7,900	8,000	10,300
Wholesale/Retail Trade	40,200	40,400	46,300
Finance, Insurance, Real Estate Services	12,900	11,900	12,800
Federal Government	37,300	54,400	68,200
State & Local Government	3,100	3,400	3,300
State & Local Government	15,400	15,600	16,400
Total Employment	184,500	184,900	207,200

(1) Woods & Poole Economics, Inc., 1995

(3) Environmental Resources - Due to the presence of several Corps of Engineers projects on and along the Illinois River, a substantial amount of information is available about Peoria Lake and its natural resources. Diverse aquatic and terrestrial vegetation communities are found in backwater lakes, marshes, and mudflats and on the margin of the pool. Wildlife resources include common furbearers such as muskrat, beaver, raccoon, and mink. Many small mammals and birds, including owls, woodpeckers, pheasants, and songbirds, inhabit what is left of the bottomland hardwoods found in the area. Other birds of interest that can be found there include shorebirds, gulls, terns, herons, egrets, and cormorants. Waterfowl such as ducks and geese are most abundant in the

spring and fall, but they can be found on the lake year round. The Illinois River Valley is also considered to be an important breeding ground for the wood duck.

Two federally listed endangered or threatened species are present in the lake area. The bald eagle (*Haliaeetus leucocephalus*) frequents the Illinois River Valley in winter, feeding on fish in open, ice-free areas and roosting in protected ravines leading away from the river. The Indiana bat (*Myotis sodalis*) prefers small stream corridors with well-developed riparian forests and an enclosed tree canopy. It roosts under the loose bark of dead or decaying trees.

Peoria Lake also has a diverse fish population that is dominated by carp, gizzard shad, buffalo, carpsuckers, sunfish, largemouth bass, freshwater drum, and white and black crappie. More recently, with the increase in water quality, game fish species like sauger, walleye, and smallmouth bass have been able to reestablish and even make population gains during high river flow.

Loss of aquatic vegetation and sedimentation over the past several years has led to the reduction of abundance and diversity of the invertebrate fauna in the area. The two dominant invertebrates most commonly found are midge larvae and aquatic worms. Sedimentation is also considered to be a factor in the decline of the mussel population in Peoria Lake. Twenty-three species of mussels occur in the pool, with the most common being three-ridge, maple-leaf, pimple-back, and floater.

Attachment 5 is a list species associated with wetlands and mussel and fish species located in the Peoria, Woodford, Marshall, and Stark County area.

(4) Historic Properties - An archival search for historic properties that was conducted using the Corps' Illinois Geographic Information Systems site file data base revealed a high density of architectural and buried (archeological) historic properties within and surrounding the project area. The high density of historic properties may be associated with the long-term occupation of the Peoria Lake area as a significant hydrological, topographical, and geomorphological feature, unique to the Illinois River Valley.

b. Expected Future Condition - Except for the 9-foot channel navigation route on the Illinois River, continued sedimentation in the Peoria Lake area will surely deteriorate the natural aquatic resources in the area, as well as increase the potential for maintenance dredging of the navigation channel. The severity of the sedimentation problem in Peoria Lake is growing more alarming each year. The net result of this sedimentation pattern is the shrinking of the deep parts of the lake from an estimated 8 feet in 1903 to 1.2 feet in recent years. If the current filling rate continues, the lake will probably exist as a very shallow water body outside of the navigation channel by the early 21st century. As sedimentation continues unchecked, much of the lake will be transformed into a mudflat. The transformation of Peoria Lake into a narrow navigation channel with bordering mudflats will not only reduce aesthetic values, but will negatively impact on fish and wildlife habitat, terrestrial habitat, recreation, and real estate values.

With respect to the expected future environmental condition of Peoria Lake, decline in populations of fish and wildlife, as well as flora and fauna, is imminent. At the turn of the century, the Illinois River Valley was famous for its hunting and fishing areas, supporting over 2,000 commercial operations. Islands, backwaters, side channels, lakes, and bottomland forests allowed fish and game to flourish. In fact, in 1908, the U.S. Department of Commerce and Labor reported that the Illinois River provided 10 percent of all freshwater fish caught in the United States. Over time, the Illinois River's increasing sediment load, diminished water quality, resuspension of sediment, and resultant elevated

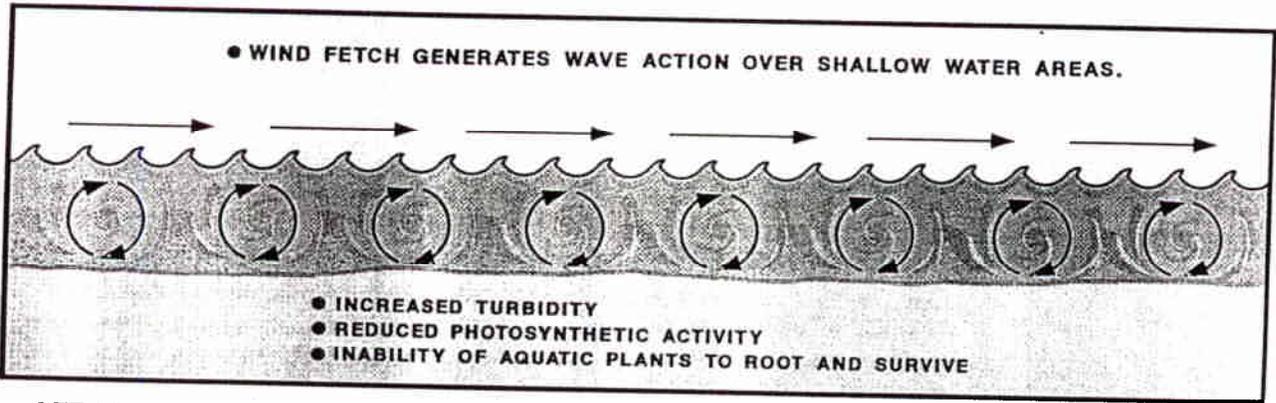
turbidity levels will ultimately lead to a more drastic decline in economically important fish and wildlife populations and submergent and emergent aquatic vegetation.

Finally, the city of Peoria participates in the National Flood Insurance Program and is subject to Federal Emergency Management Agency floodplain management restrictions. Existing and future flood damages will be reduced if zoning controls continue at a local level. However, without formal flood protection, structures and lands in low-lying areas will continue to be vulnerable to flood damages during high water periods.

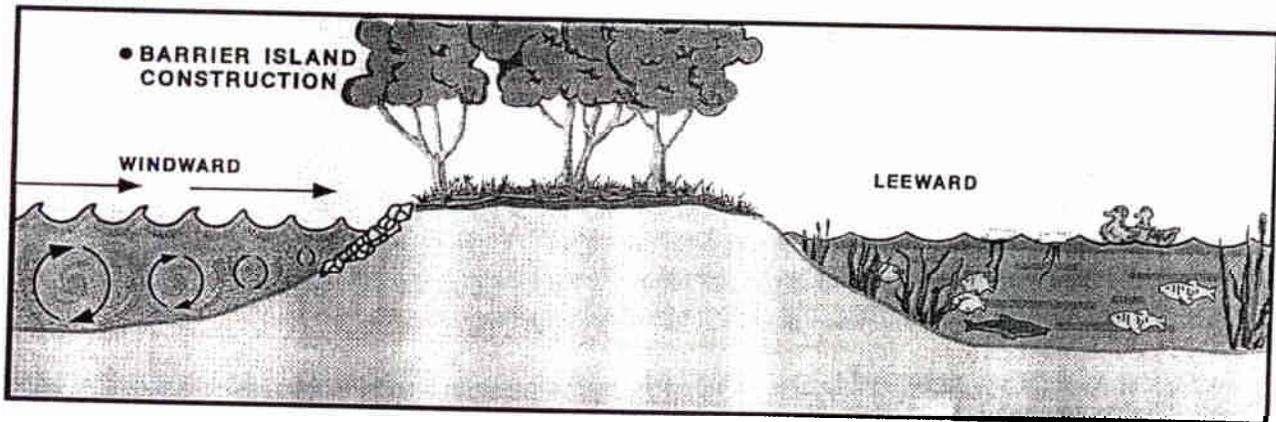
c. Alternative Plans - Short-, intermediate-, and long-term potential measures related to reducing flood impacts, decreasing sedimentation, and providing environmental restoration opportunities were considered in this reconnaissance analysis. Several restorative measures were discussed and evaluated by study team members, resource managers, and task force members attending coordination meetings from April to December 1997. Potential measures ranged from doing nothing to creating sediment traps, undertaking bank stabilization measures, excavating existing sediment, introducing flow control structures, conducting education programs, and building floodwalls, berms and levees. During scoping meetings, task force members discussed alternative plans for excavating existing sediment, reducing future sedimentation rates, providing flood control for existing properties and planned future development, and balancing engineering solutions with environmentally acceptable initiatives. The focus of the task force was on measures that provided for diversity in fish and wildlife habitat, restoration of riverine environments, and reduction in flood damages along the Peoria riverfront.

The current quality of the habitat in Lower Peoria Lake is considered low due to lack of aquatic vegetation, and also because of the shallowness and turbidity of the water. If anything can be done to the lower lake that would change this situation, it would almost certainly be considered an improvement. Dredging to remove sediments would create deep-water habitat and would be recognized as an improvement for fisheries in the area by expanding their shrinking environment. Creating an island, even a small one, would provide additional nesting and wading habitat for area waterfowl. Island habitat also has the added benefit of isolating species from non-swimming predators that those species might encounter on land. The potential for developing a transitional or "edge" habitat between two very different habitat types is also greatly increased (although not guaranteed). In this case, the deep-water aquatic habitat and the terrestrial habitat could form shallow aquatic habitat around the island. However, shallow aquatic habitat around the barrier island at the upper Peoria Lake Environmental Management Program project has not developed and there are indications that it may not develop in the future without direct intervention. A typical island creation project is shown on the next page.

BEFORE



AFTER



Typical Island Creation Project

e. Evaluation of Alternatives - In evaluating the reconnaissance study alternatives, consideration was given to providing solutions using existing Corps of Engineers authorities, those that are considered to be the responsibility of participating agencies involved with the problems, and measures preferred by local legislators and interest groups. Preliminary analysis was conducted using available technical, economic, environmental and social information, and each suggestion was ranked.

Four broad categories of measures were considered to be most important as they affect riverfront development at Peoria: (1) measures to reduce existing sedimentation in the Upper and Lower Peoria Lakes in order to create and restore aquatic habitat; (2) measures to reduce future sediment deposition in the Farm Creek Delta and Lower Peoria Lake; (3) measures that include restoration of the aquatic and terrestrial conditions within Peoria Lake to a less degraded condition; and (4) initiatives that provide flood protection along the downtown Peoria riverfront. The study team investigated potential impacts to existing authorized projects that will continue to ensure balance in future determinations. Finally, alternatives were weighed against the potential for National

Economic Development benefits and/or the likelihood of producing quantifiable increases in fish and wildlife habitat units and positive environmental restoration outputs.

The recommended plan includes three components that provide the most cost-effective output, are environmentally acceptable, and are preferred by the non-Federal sponsors: (1) sedimentation reduction/excavation to create or restore island(s) in Peoria Lake; (2) environmental/ecosystem restoration to create a more diverse aquatic and terrestrial habitat for fish and wildlife resources; and (3) flood damage reduction measures for an area downstream of the Peoria riverfront.

f. Benefits of Recommended Plan - The following paragraphs explain the benefits of each component of the recommended plan:

(1) Sedimentation Reduction - The recommended plan to correct the sedimentation problems in Peoria Lake involves the commitment of resource management agencies, farmers, property owners, and urban developers to ameliorate the problem. In 1992, the Corps of Engineers and the Illinois Department of Conservation undertook an example of this partnership. Under the authority contained in the 1985 Supplemental Appropriations Act (Public Law 99-88) and Section 1103 of the Water Resources Development Act of 1986 (Public Law 99-662), the Rock Island District conducted an Environmental Management Program study of Peoria Lake. The outcome of this investigation was a cost-sharing partnership with the Illinois Department of Conservation to construct an artificial island from sediment in Upper Peoria Lake. Innovative methods of island construction were researched and used for this project, and the island has been very stable in its five years of existence. The island building technology employed for this project provides a solid knowledge base for island construction elsewhere in the Peoria Lakes. Moreover, a 1934 United States Geological Survey quadrangle map of Lower Peoria Lake actually shows that one large and two small islands formerly existed at this location. This means that restoring these islands could complement the former, existing, and future hydraulic regime.

To further explain the relationship and value of island aeration in Peoria Lake, historical survey data collected (1920-1930 timeframe) show that one large and two small islands formerly existed in Lower Peoria Lake. These three islands are estimated to be 1 mile, 1/2 mile, and 1/2 mile long, respectively. One item that will be investigated further in the feasibility study is to restore one or more of the original islands in the locations where they once existed.

(2) Environmental/Ecosystem Restoration - The main source of habitat restoration derived from island creation in Peoria Lake will come from the creation of aquatic and terrestrial habitat, which could then be developed for wetland and deep-water functions. The degraded backwater areas could be constructed to conform to more native habitat conditions such that the planting of trees and grasses and other bioengineering activities on the island would increase the reliable food production and nesting area for waterfowl, neotropical migrants, and a myriad of other species. Bioengineering enhancement on the shore of the island would increase the diversity and total area of submergent and emergent vegetation to create an "edge" effect for various wildlife. Additional habitat value-based enhancement would result from new side channel aquatic habitat areas, which would provide deep water for numerous over-wintering fish species.

Engineering activities utilizing dredged material to restore or create an island or islands in the lake would replace the more plentiful shallow water habitat now located there with more desirable deep water and terrestrial island habitat. As an example, experience with the Environmental Management Program shows that three "units" of the lake's shallow water habitat in the form of dredged sediment

are needed to create a minimum of one “unit” of terrestrial habitat built upon one “unit” of shallow water habitat. The dredging process would leave behind three units of deep-water habitat. The island creation process thus results in a tradeoff that changes four units of relatively lesser value shallow water habitat into four units of a more desirable habitat, three units of deep water and one unit of terrestrial habitat. Depending upon the area dredged and the site(s) selected for construction actions (such as an island or series of islands created), the restoration gained from the project could provide for greater diversity and quantitative increases to the region’s aquatic habitat and increase the value of the ecological resources in the area.

We can estimate from Corps EMP projects that the cost to create one acre of deep-water habitat (aquatic) or one acre of nesting bird habitat (terrestrial) is in the neighborhood of \$50,000. When project construction is completed and monitoring has begun, we may then consider measuring, after a period of time, what has developed.

One way to “measure” habitat is with the Habitat Unit (HU), which we get from using the Habitat Evaluation Procedures, or HEP. In HEP, the HU is equal to habitat **quantity** (area) multiplied by habitat **quality**. In this case, quality is expressed in the form of a Habitat Suitability Index or HSI. This index varies from zero (0) to one (1) and indicates how suitable we have determined the habitat to be for a selected species when compared to that species’ *optimum* habitat. If the HSI model determines that we have developed 100% optimum habitat for a chosen species, then our HSI value is 1 for that species.

If \$50,000 is spent to develop the 1-acre habitat as stated previously, then we could assume that our 1-acre habitat has a value of \$50,000 as related to the one selected target species. The cost to create an acre of a particular habitat type can be measured. However, the number of species that will eventually utilize that acre of created habitat and the quality of habitat that develops over time on any created acre of habitat are difficult to ascertain.

While the location, size, and volume of sediment used will be determined in the next phase of study, for purposes of estimating values and costs, it is probable that 2.2 million tons of sediment will be excavated and used for building the island(s). The approximate cost of construction, including Engineering and Design, Construction Management, and Project Management, is approximately \$23,550,000, as shown below.

Preliminary Cost Estimate

Construction Costs for 1 Large and 2 Small Islands and Adjacent Channels	\$19,550,000
Engineering and Design	750,000
Planning and Real Estate Costs	300,000
Construction Management	300,000
Contracting	50,000
Program and Project Management	170,000
Contingencies	<u>2,430,000</u>
 Total	 \$23,550,000

(3) Flood Damage Reduction - Although the downtown riverfront development area of the city of Peoria has experienced minimal flood damages during the past several Illinois River flood

events, future potential flood damages could be reduced with additional flood control measures. The Corps of Engineers' *Illinois River Water Surface Profiles*, published in 1992, shows water surface elevations along the Illinois River for different frequency floods. These profiles were developed using an unsteady flow model. Refinements in this modeling technology, as well as continuing model calibration, have been made since these profiles were developed. Improvements to the published profiles can be expected in the future, which may impact upon any flood damage reduction studies undertaken as part of this effort.

In June 1970, the Chicago District of the U.S. Army Corps of Engineers conducted a study of local flood protection at Peoria, Illinois. Recommendations in this investigation included constructing a series of floodwalls and levees extending from approximate RM 163.7 to 159.5 near the southerly corporate limits of Peoria. At that time, the benefit-to-cost ratio of the recommended plan was estimated to be 1.3 to 1.0. Although this flood damage reduction project was not initiated, the city of Peoria has indicated a renewed interest in a segment of the original plan in a letter dated November 20, 1997. Since this letter requests initiating a Section 205 reconnaissance study and not pursuing flood damage reduction measures under HR 2500, adopted May 9, 1996, the Rock Island District recommends continuing the restudy under Section 205. A letter to this effect was sent to the city of Peoria on January 29, 1998.

6. FEDERAL INTEREST AND APPLICABLE GUIDANCE AND REGULATIONS. Based on a reconnaissance-level assessment of the problems and opportunities and in the professional judgment of those involved, there appears to be a Federal interest in environmental restoration activities and in flood damage reduction at Peoria, Illinois. Optimization and incremental cost and benefit analyses will be developed in the cost-share feasibility phase of study.

On December 9, 1992, at a meeting on the Upper Mississippi River and Illinois Waterway System Navigation Study, the Acting Assistant Secretary of the Army for Civil Works told the State of Illinois and other Federal agencies that the Corps of Engineers is willing to partner and cost-share environmental/ecosystem restoration projects to assure and enhance the future of our Nation's natural resources. In addition, a provision contained in Section 306 of the Water Resources Development Act of 1990 (WRDA) authorizes the Secretary of the Army to include environmental protection as one of the primary missions of the Corps of Engineers. Other complementary programs and initiatives which corroborate Federal involvement include Section 206, Aquatic Ecosystem Restoration; Section 516(a), Sedimentation Management, of the 1996 WRDA; and Section 1135 of the 1986 WRDA. Providing for flood damage reduction measures along the Peoria riverfront is also consistent with Corps of Engineers policy, and authority is granted in Section 205 of the 1948 WRDA. Applicable regulatory guidance is contained in ER 1105-2-100, ER 200-2-2, EC 1105-2-214, and Planning Guidance Letters relating to environmental restoration initiatives and flood damage reduction measures. In the judgment of the study team and task force members, negative environmental impacts associated with these measures are not anticipated.

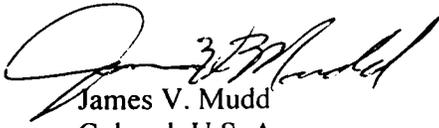
7. PRELIMINARY FINANCIAL ANALYSIS. The Illinois Department of Natural Resources has agreed to act as the non-Federal cost-sharing partner in the environmental restoration feasibility study for this project. The Illinois Department of Natural Resources' letter of intent, dated September 5, 1997, is included as Attachment 3. The city of Peoria has also provided a letter of intent to cost-share a flood damage reduction feasibility study along the west bank of the Illinois River and the north bank of the Kickapoo Creek. The city's letter is dated November 20, 1997, and is included as Attachment 4.

8. POTENTIAL ISSUES AFFECTING INITIATION OF FEASIBILITY PHASE. Consensus of the resource management agency project participants, the non-Federal sponsor, and the Corps of Engineers has been reached for the recommended plan. Along with potential contributions from regional and local agencies and special interest groups, the State of Illinois has agreed to provide funding for the environmental restoration initiative. Funding for the flood damage reduction project will come from the city of Peoria. The Project Study Plan will include the costs of a public workshop/open house so that public agreement/opposition can be evaluated.

9. RECOMMENDATIONS. I hereby recommend that this Section 905(b) Reconnaissance Analysis be approved, that permission be given to develop the Project Study Plan, and that negotiation of the Feasibility Cost-Sharing Agreements with the State of Illinois and the city of Peoria begin.

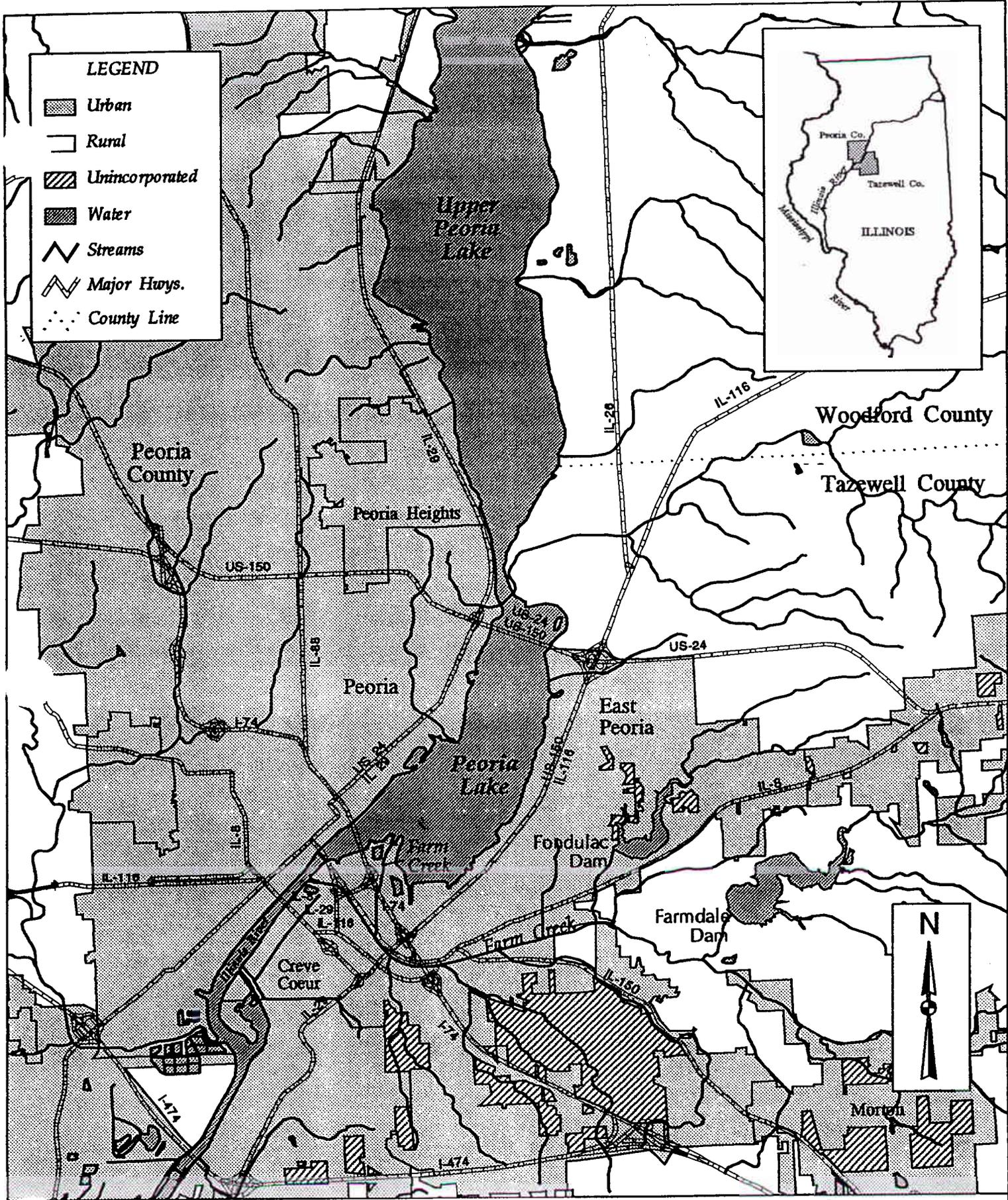
10. PROJECT AREA MAP. The project area map is included as Attachment 1.

14 MAY 1998
(Date)


James V. Mudd
Colonel, U.S. Army
District Engineer

Attachments:

1. Project Location Map
2. Sedimentation Map
3. Illinois DNR Letter of Intent
4. City of Peoria Letter of Intent
5. List of Species



LEGEND

-  Urban
-  Rural
-  Unincorporated
-  Water
-  Streams
-  Major Hwys.
-  County Line



0 1000 Metres

0.5 0 0.5 1 Miles

**Peoria Riverfront Development, Illinois
Project Map**

ATTACHMENT 1



US Army Corps
of Engineers
Rock Island District

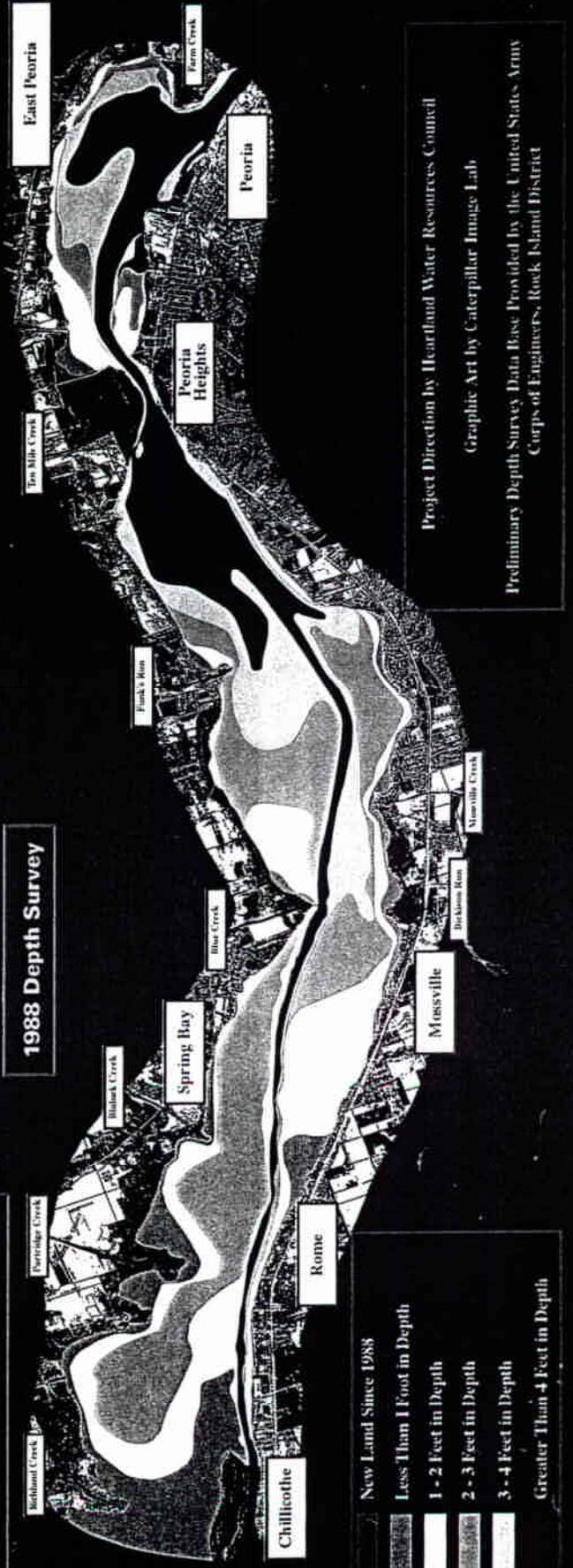
PEORIA LAKES WATER DEPTH CHANGES 1988 - 1996



- A. State of Illinois
- B. Woodford County Conservation Area
- C. USACE Upper Peoria Lake "Island Project"
- D. Spindler Marina - Fondulac Park District
- E. Eastport Marina - City of East Peoria
- F. United States Coast Guard
- G. The Riverfront - City of Peoria
- H. Dotwiller Marina - Peoria Park District
- I. Illinois Waterway Projects Office
- J. United States Army Corps of Engineers
- K. Galena Marina - Peoria Park District
- L. Chillicothe Boat Ramp - City of Chillicothe

ON AVERAGE THE PEORIA LAKES HAVE LOST ONE FOOT OF DEPTH BETWEEN 1988 - 1996

SCALE
1 Inch = 2,333 Feet



- New Land Since 1988
- Less Than 1 Foot in Depth
- 1 - 2 Feet in Depth
- 2 - 3 Feet in Depth
- 3 - 4 Feet in Depth
- Greater Than 4 Feet in Depth

Project Direction by Heartland Water Resources Council
Graphic Art by Caterpillar Image Lab
Preliminary Depth Survey Data Base Provided by the United States Army Corps of Engineers, Rock Island District



ILLINOIS
DEPARTMENT OF
NATURAL RESOURCES

524 South Second Street, Springfield 62701-1787

Jim Edgar, Governor ● Brent Manning, Director

September 5, 1997

Mr. Dudley M. Hanson, P.E.
Chief, Planning Division
Department of the Army
Rock Island District, Corps of Engineers
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Mr. Hanson:

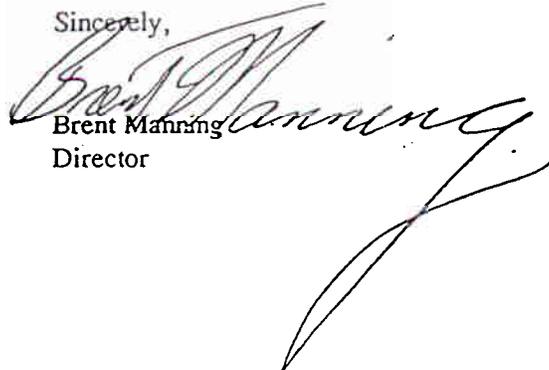
The State of Illinois, Department of Natural Resources wishes to express their support for, and willingness to participate with, the U.S. Army Corps of Engineers in their studies of the Illinois River, in particular, the Peoria Riverfront Development Project. The Illinois River is one of Illinois' greatest natural resources and continues to be seriously impacted by excessive siltation. Impacts to drinking water supplies, losses of personal property and damages to natural resource values are devastating to the local communities, as well as the State of Illinois.

Under the Corps basin study process, the reconnaissance phase would be paid for in total by the Corps, but in subsequent phases (feasibility, design/engineering and construction phases) non-federal cost-sharing must be provided by the State of Illinois in order to complete the Illinois River-Peoria Lakes Project. Should the initial reconnaissance phase study indicate that additional feasibility studies are warranted and needed to investigate the problems and solutions in greater detail and if economically and environmentally feasible structural measures are identified, the State of Illinois, Department of Natural Resources and other appropriate state agencies will give serious consideration to providing all or a portion of the required non-federal cost-share.

The Department of Natural Resources (DNR) has identified Mr. Jim Mick as the "point of contact" for the Corps Recon Study. Mr. Mick will coordinate the DNR's support for the study. He can be reached in Havana at AC 309/543-3316 or by fax AC 309/543-6914.

I look forward to the successful completion of the recon study and the initiation of the feasibility phase of the Illinois River-Peoria Riverfront Development Project.

Sincerely,



Brent Manning
Director

BM:MC:JM:nsr

cc: Distribution List



November 20, 1997

District Engineer
U.S. Army Engineer District, Rock Island
Attn: Planning Division
Clock Tower Bldg. - P.O. Box 2004
Rock Island, IL 61204-2004

Dear Sir:

In accordance with the provisions of Section 205 of the Flood Control Act of 1948, as amended, which authorizes the federal government to initiate investigations and studies to be made in the interest of flood control, the City of Peoria hereby makes formal application for a study of the Illinois River, Peoria County, State of Illinois.

Specifically, it is requested that the Corps of Engineers conduct a reconnaissance survey to determine whether a feasibility study is justified to study a proposed levy along the west bank of the Illinois River and the north bank of the Kickapoo Creek. The upper end of the proposed levy is perceived to begin at approximately Mile Marker 160.7 and extend downstream to the mouth of the Kickapoo Creek which is at or near Mile Marker 159.65 (or roughly 1 mile). The levy would then proceed along the north bank of the Kickapoo Creek until it terminates at the fill for I-474. It is envisioned that this levy would protect approximately 1 square mile of property, most of which is underdeveloped and zoned industrial. A similar study for this proposed levy was conducted by the Corps of Engineers in the early 1970's.

The City of Peoria can provide 50 percent of the cost of the second phase, the feasibility study, and one-half of our share may consist of in-kind service. The City of Peoria can provide the following local cooperation and participation:

1. Provide without cost to the United States all land, easements and rights-of-way necessary for the construction of the project.
2. Provide without cost to the United States all necessary relocations and alterations of buildings, utilities, highways, bridges, sewers and related and special facilities.
3. Hold and save the United States free from damages due to the construction and subsequent maintenance of the project, except damages due to the fault or negligence of the United States or its contractors.



November 20, 1997

Page 2

4. Maintain and operate the project works after completion without cost to the United States in accordance with regulations prescribed by the Secretary of the Army.
5. Prevent future encroachment which might interfere with proper functioning of the project for flood control.
6. Assume responsibility for all costs in excess of federal cost limitations of \$5 million.
7. Provide guidance and leadership in preventing unwise future development of the flood plain by use of appropriate flood plain management techniques to reduce flood loss.
8. Provide a minimum cash contribution of 5 percent of the project cost.
9. If the value of the sponsor's contribution above does not exceed 25 percent of the project cost, provide a cash contribution to make the sponsor's's total contributions equal to 25 percent.

Very truly yours,



Stephen N. Van Winkle
Public Works Director

SVW/pl

TABLE L-4. List of Species Found in the Four-County Area Which Are Associated With Wetlands.

*AMBLEMA Plicata	THREE-RIDGE
*FUSCONAIA FLAVA	WABASH PIGTOE
*QUADRULA PUSTULOSA	PIMPLEBACK
*QUADRULA QUADRULA	MAPLELEAF
*TRITOGONIA VERRUCOSA	BUCKHORN
*ALASMIDONTA VIRIDIS	SLIPPERSHELL
*ALASMIDONTA MARGINATA	ELKTOE
*ANODONTA IMBECILLIS	PAPER POND SHELL
*ANODONTIDES FERUSSACIANUS	CYLINDRICAL PAPER SHELL
*LASMIGONA COMPLANATA	WHITE HEELSPLITTER
*LASMIGONA COMPRESSA	CREEK HEELSPLITTER
*LASMIGONA COSTATA	FLUTED SHELL
*STROPHITUS UNDULATUS	SQUAWFOOT
*ACTINONAIAS ELLIPSIIFORMIS	ELLIPSE
*LEPTODEA FRAGILIS	FRAGILE PAPER SHELL
*POTAMILUS ALATUS	PINK HEELSPLITTER
*TOXOLASMA PARVUS	LILLIPUT
*CAECIDOTEA INTERMEDIUS	ISOPOD
*CAECIDOTEA KENDEIGHI	ISOPOD
*HYALELLA AZTECA	AMPHIPOD
*BACTRURUS MUCRONATUS	AMPHIPOD
*CRANGONYX GRACILIS	AMPHIPOD
*PROCAMBARUS ACUTUS	CRAYFISH
*PROCAMBARUS GRACILIS	CRAYFISH
*ORCONECTES IMMUNIS	CRAYFISH
*ORCONECTES PROPINQUUS	CRAYFISH
*ORCONECTES VIRILIS	CRAYFISH
*CAMBARUS DIOGENES	CRAYFISH
*ICHTHYOMYZON CASTANEUS	CHESTNUT LAMPREY
*ICHTHYOMYZON UNICUSPIS	SILVER LAMPREY
*POLYODON SPATHULA	PADDLEFISH
*LEPISOSTEUS OSSEUS	LONGNOSE GAR
*LEPISOSTEUS PLATOSTOMUS	SHORTNOSE GAR
*AMIA CALVA	BOWFIN
*ANGUILLA ROSTRATA	AMERICAN EEL
*ALOSA CHRYSOCHLORIS	SKIPJACK HERRING
*DOROSOMA CEPEDIANUM	GIZZARD SHAD
*HIODON ALOSOIDES	GOLDEYE
*UMBRA LIMI	CENTRAL MUDMINNOW
*ESOX LUCIUS	NORTHERN PIKE
*CAMPOSTOMA ANOMALUM	CENTRAL STONEROLLER
*CARASSIUS AURATUS	GOLDFISH
*CYPRINUS CARPIO	COMMON CARP
*HYBOGNATHUS NUCHALIS	MISSISSIPPI SILVERY MINNO
*HYBOPSIS STORERIANA	SILVER CHUB
*NOCOMIS BIGUTTATUS	HORNYHEAD CHUB
*NOTEMIGONUS CRYSOLEUCAS	GOLDEN SHINER
*NOTROPIS ATHERINOIDES	EMERALD SHINER
*NOTROPIS BLENNIUS	RIVER SHINER
*NOTROPIS BUCHANANI	GHOST SHINER
*NOTROPIS CHRYSOCEPHALUS	STRIPED SHINER
*NOTROPIS DORSALIS	BIGMOUTH SHINER
*NOTROPIS EMILIAE	PUGNOSE MINNOW

TABLE L-4 (Cont'd)

*NOTROPIS LUTRENSIS	RED SHINER
*NOTROPIS RUBELLUS	ROSYFACE SHINER
*NOTROPIS STRAMINEUS	SAND SHINER
*NOTROPIS UMBRATILIS	REDFIN SHINER
*PHENACOBIOUS MIRABILIS	SUCKERMOUTH MINNOW
*PHOXINUS ERYTHROGASTER	SOUTHERN REDBELLY DACE
*PIMEPHALES NOTATUS	BLUNTNOSE MINNOW
*PIMEPHALES PROMELAS	FATHEAD MINNOW
*PIMEPHALES VICTRAN	BULLHEAD MINNOW
*RHINICHTHYS ATRATULUS	BLACKNOSE DACE
	CREEK CHUB
*CARPIODES CARPIO	QUILLBACK
*CARPIODES CYPRINUS	HIGHFIN CARPSUCKER
*CARPIODES VELIFER	WHITE SUCKER
*CATOSTOMUS COMMERSONI	CREEK CHUBSUCKER
*PERCZYON OBLONGUS	W. THORN MUD SUCKER
*HYDENTELIUM NIGRICANS	SMALLMOUTH BUFFALO
*ICTIOBUS BUBALUS	BIGMOUTH BUFFALO
*ICTIOBUS CYPRINELLUS	BLACK BUFFALO
*ICTIOBUS NIGER	SILVER REDHORSE
*MOXOSTOMA ANISURUM	BLACK REDHORSE
*MOXOSTOMA DUQUESNEI	GOLDEN REDHORSE
*MOXOSTOMA ERYTHRURUM	SHORTHEAD REDHORSE
*MOXOSTOMA MACROLEPIDOTUM	WHITE CATFISH
*ICTALURUS CATUS	BLACK BULLHEAD
*ICTALURUS MELAS	YELLOW BULLHEAD
*ICTALURUS NATALIS	BROWN BULLHEAD
*ICTALURUS NEBULOSUS	CHANNEL CATFISH
*ICTALURUS PUNCTATUS	STONECAT
*NOTURUS FLAVUS	TADPOLE MADTOM
*NOTURUS GYRINUS	FRECKLED MADTOM
*NOTURUS NOCTURNUS	TROUT-PERCH
*PERCOPSIS OMISCOMAYCUS	BLACKSTRIPE TOPMINNOW
*FUNDULUS NOTATUS	MOSQUITOFISH
*GAMBUSIA AFFINIS	BROOK SILVERSIDE
*LABIDESTHES SICCULUS	WHITE BASS
*MORONE CHRYSOPS	YELLOW BASS
*MORONE MISSISSIPPIENSIS	ROCK BASS
*AMELOPLITES RUPESTRIS	GREEN SUNFISH
*LEPOMIS CYANELLUS	PUMPKINSEED
*LEPOMIS GIBBOSUS	WARMOUTH
*LEPOMIS GULOSUS	ORANGESPOTTED SUNFISH
*LEPOMIS HUMILIS	BLUEGILL
*LEPOMIS MACROCHIRUS	LONGEAR SUNFISH
*LEPOMIS MEGALOTIS	SMALLMOUTH BASS
*MICROPTERUS DOLOMIEUI	LARGEMOUTH BASS
*MICROPTERUS SALMOIDES	WHITE CRAPPIE
*POMOXIS ANNULARIS	BLACK CRAPPIE
*POMOXIS NIGROMACULATUS	MUD DARTER
*ETHEOSTOMA ASPRIGENE	BLUNTNOSE DARTER
*ETHEOSTOMA CHLOROSOMUM	FANTAIL DARTER
*ETHEOSTOMA FLABELLARE	JOHNNY DARTER
*ETHEOSTOMA NIGRUM	ORANGETHROAT DARTER
*ETHEOSTOMA SPECTABILE	BANDED DARTER
*ETHEOSTOMA ZONALE	YELLOW PERCH
*PERCA FLAVESCENS	LOGPERCH
*PERCINA CAPRODES	BLACKSIDE DARTER
*PERCINA MACULATA	SAUGER
*STIZOSTEDION CANADENSE	WALLEYE
*STIZOSTEDION VITREUM	FRESHWATER DRUM
*APLODINOTUS GRUNNIENS	MUD PUPPY
*NECTURUS MACULOSUS MACULOSUS	EASTERN TIGER SALAMANDER
*AMBYSTOMA TIGRINUM TIGRINUM	CENTRAL NEWT
*NOTOPHTHALMUS VIRIDESCENS LOUISIANENSIS	FOWLER'S TOAD
*BUFO WOODHOUSEI FOWLERI	

TABLE L-4 (Cont'd)

*ACRIS CREPITANS BLANCHARDI	BLANCHARD'S CRICKET FROG
*HYLA VERSICOLOR	GRAY TREEFROG
*HYLA CRUCIFER CRUCIFER	NORTHERN SPRING PEEPER
*RANA BLAIRI	PLAINS LEOPARD FROG
*RANA CATESBEIANA	BULLFROG
*RANA PAPIENS	NORTHERN LEOPARD FROG
*RANA SYLVATICA	WOOD FROG
*CHELYDRA SERPENTINA SERPENTINA	COMMON SNAPPING TURTLE
*MACROCLEMYS TEMMINCKI	ALLIGATOR SNAPPING TURTLE
*STERNOTHERFUS ODORATUS	STINKPOT
*KINOSTERNON FLAVESCENS	ILLINOIS MUD TURTLE
*KINOSTERNON SUBRUBRUM	EASTERN MUD TURTLE
*EMYDOIDEA BLANDINGI	BLANDING'S TURTLE
*PSEUDEMYX SCRIPTA ELEGANS	POND SLIDER
*GRAPTEMYS GEOGRAPHICA	MAP TURTLE
*TRIONYX MUTICUS MUTICUS	MIDLAND SMOOTH SOFTSHELL
*TRIONYX SPINIFERUS SPINIFERUS	EASTERN SPINY SOFTSHELL
*LAMPROPELTIS TRIANGULUM TRIANGULUM	EASTERN MILK SNAKE
*NERODIA RHOMBIFERA RHOMBIFERA	DIAMONDBACK WATER SNAKE
*NERODIA ERYTHROGASTER FLAVIGASTER	YELLOWBELLY WATER SNAKE
*NERODIA SIPEDON SIPEDON	NORTHERN WATER SNAKE
*REGINA SEPTEMVITTATA	QUEEN SNAKE
*THAMNOPHIS PROXIMUS PROXIMUS	WESTERN RIBBON SNAKE
*SISTRURUS CATENATUS CATENATUS	EASTERN MASSASAUGA
*PODILYMBUS PODICEPS	PIED-BILLED GREBE
*PHALACROCORAX AURITUS	DOUBLE-CRESTED CORMORANT
*BOTAURUS LENTIGINOSUS	AMERICAN BITTERN
*ARDEA HERODIAS	GREAT BLUE HERON
*CASMERODIUS ALBUS	GREAT EGRET
*EGRETTA THULA	SNOWY EGRET
*EGRETTA CAERULEA	LITTLE BLUE HERON
*BUBULCUS IBIS	CATTLE EGRET
*BUTORIDES STRIATUS	GREEN-BACKED HERON
*NYCTICORAX NYCTICORAX	BLACK-CROWNED NIGHT-HERON
*NYCTICORAX VIOLACEUS	YELLOW-CROWNED NIGHT-HERO
*AIX SPONSA	WOOD DUCK
*LOPHODYTES CUCULLATUS	HOODED MERGANSER
*CORAGYPS ATRATUS	BLACK VULTURE
*PANDION HALIAETUS	OSPREY
*HALIAETUS LEUCOCEPHALUS	BALD EAGLE
*BUTEO PLATYPTERUS	BROAD-WINGED HAWK
*BUTEO JAMAICENSIS	RED-TAILED HAWK
*RALLUS ELEGANS	KING RAIL
*RALLUS LIMICOLA	VIRGINIA RAIL
*PORZANA CAROLINA	SORA
*ACTITIS MACULARIA	SPOTTED SANDPIPER
*SCOLOPAX MINOR	AMERICAN WOODCOCK
*LARUS DELAWARENSIS	RING-BILLED GULL
*STERNA CASPIA	CASPIAN TERN
*BUBO VIRGINIANUS	GREAT HORNED OWL
*STRIX VARIA	BARRED OWL
*EMPIDONAX VIRESCENS	ACADIAN FLYCATCHER
*EMPIDONAX TRAILLII	WILLOW FLYCATCHER
*EMPIDONAX MINIMUS	LEAST FLYCATCHER
*TACHYCINETA BICOLOR	TREE SWALLOW
*RIPARIA RIPARIA	BANK SWALLOW
*CERTHIA AMERICANA	BROWN CREEPER
*POLIOPTILA CAERULEA	BLUE-GRAY GNATCATCHER
*CATHARUS FUSCESCENS	VEERY
*VIREO GRISEUS	WHITE-EYED VIREO
*VIREO GILVUS	WARBLING VIREO
*VERMIVORA PINUS	BLUE-WINGED WARBLER
*DENDROICA PETECHIA	YELLOW WARBLER
*DENDROICA DOMINICA	YELLOW-THROATED WARBLER
*SETOPHAGA RUTICILLA	AMERICAN REDSTART

TABLE L-4 (Cont'd)

*WILSONIA CITRINA	HOODED WARBLER
*SPIZELLA PUSILLA	FIELD SPARROW
*DOLICHONYX ORYZIVORUS	BOBOLINK
*ICTERUS SPURIUS	ORCHARD ORIOLE
*BLARINA BREVICAUDA	NORTHERN SHORT-TAILED SHREW
*CRYPTOTIS PARVA	LEAST SHREW
*MYOTIS LUCIFUGUS	LITTLE BROWN BAT
*MYOTIS KEENII	KEEN'S BAT
*EPTESICUS FUSCUS	SIG BROWN BAT
*LASIURUS BOREALIS	RED BAT
*LASIURUS CINEREUS	HOARY BAT
SPERMOPHILUS FRANKLINII	FRANKLIN'S GROUND SQUIRREL
*REITHRODONTOMYS MEGALOTIS	WESTERN HARVEST MOUSE
*PEROMYSCUS LEUCOPUS	WHITE-FOOTED MOUSE
*MICROTUS PENNSYLVANICUS	MEADOW VOLE
*ONDATRA ZIBETHICUS	MUSKRAT
*SYNAPTOMYS COOPERI	SOUTHERN BOG LEMMING
*CANIS LATRANS	COYOTE
*VULPES VULPES	RED FOX
*UROCYON CINEREOARGENTEUS	GRAY FOX
*MUSTELA NIVALIS	LEAST WEASEL
*MUSTELA FRENATA	LONG-TAILED WEASEL
*LUTRA CANADENSIS	RIVER OTTER

209 SPECIES

TABLE L-5. Mussel and Fish Species Collected in the Four-County Area.

Table L-5

Mussel and fish species collected in the four county area.

*AMBLEMA PLICATA	THREE-RIDGE
*FUSCONATA FLAVA	WABASH PIGTOE
*QUADRULA PUSTULOSA	PIMPLEBACK
*QUADRULA QUADRULA	MAPLELEAF
*TRITOGONIA VERRUCOSA	BUCKHORN
*PLEUROBEMA CORDATUM	OHIO RIVER PIGTOE
*ALASMIDONTA VIRIDIS	SLIPPERSHELL
*ALASMIDONTA MARGINATA	ELKTOE
*ANODONTA GRANDIS	COMMON FLOATER
*ANODONTA GRANDIS GRANDIS	COMMON FLOATER
*ANODONTA GRANDIS CORPULENTA	STOUT FLOATER
*ANODONTA IMBECILLIS	PAPER POND SHELL
*ANODONTOIDES FERUSSACIANUS	CYLINDRICAL PAPERSHELL
*LASMIGONA COMPLANATA	WHITE HEELSPLITTER
*LASMIGONA COMPRESSA	CREEK HEELSPLITTER
*LASMIGONA COSTATA	FLUTED SHELL
*STROPHITUS UNDULATUS	SQUAWFOOT
*ACTINONAIAS ELLIPSIFORMIS	ELLIPSE
*LAMP SILIS SILIOUOIDEA	FATMUCKET
*LAMP SILIS TERES	YELLOW SANDSHELL
*LAMP SILIS VENTRICOSA	PLAIN POCKETBOOK
*LEPTODEA FRAGILIS	FRAGILE PAPERSHELL
*POTAMILUS ALATUS	PINK HEELSPLITTER
*POTAMILUS LAEVISSIMA	PINK PAPER SHELL
*TOXOLASMA PARVUS	LILLIPUT
*ICHTHYOMYZON CASTANEUS	CHESTNUT LAMPREY
*ICHTHYOMYZON UNICUSPIS	SILVER LAMPREY
*POLYODON SPATHULA	PADDLEFISH
*LEPISOSTEUS OSSEUS	LONGNOSE GAR
*LEPISOSTEUS PLATOSTOMUS	SHORTNOSE GAR
*AMIA CALVA	BOWFIN
*ANGUILLA ROSTRATA	AMERICAN EEL
*ALOSA CHRYSOCHLORIS	SKIPJACK HERRING
*DOROSOMA CEPEDIANUM	GIZZARD SHAD
*HIODON ALOSOIDES	GOLDEYE
*UMBRA LIMI	CENTRAL MUDMINNOW
*ESOX LUCIUS	NORTHERN PIKE
*CAMPOSTOMA ANOMALUM	CENTRAL STONEROLLER
*CARASSIUS AURATUS	GOLDFISH
*CYPRINUS CARPIO	COMMON CARP
*HYBOGNATHUS NUCHALIS	MISSISSIPPI SILVERY MINNO
*HYBOPSIS STORERIANA	SILVER CHUB
*NOCOMIS BIGUTTATUS	HORNHEAD CHUB
*NOTEMIGONUS CRYSOLEUCAS	GOLDEN SHINER
*NOTROPIS	
*NOTROPIS ATHERINOIDES	EMERALD SHINER
*NOTROPIS BLENNIUS	RIVER SHINER
*NOTROPIS BUCHANANI	GHOST SHINER
*NOTROPIS CHRYSOCEPHALUS	STRIPED SHINER
*NOTROPIS DORSALIS	BIGMOUTH SHINER
*NOTROPIS EMILIAE	PUGNOSE MINNOW
*NOTROPIS HUDSONIUS	SPOTTAIL SHINER

TABLE L-5 (Cont'd)

*NOTROPIS RUBELLUS	ROSTRATE SHINER
*NOTROPIS STRAMINEUS	SAND SHINER
*NOTROPIS UMBRATILIS	REDFIN SHINER
*NOTROPIS CHRYSOCEPHALUS HYBRID	
*PHENACOBIOUS MIRABILIS	SUCKERMOUTH MINNOW
*PHOXINUS ERYTHROGASTER	SOUTHERN REDBELLY DACE
*PIMEPHALES NOTATUS	BLUNTNOSE MINNOW
*PIMEPHALES PROMELAS	FATHEAD MINNOW
*PIMEPHALES VIGILAX	BULLHEAD MINNOW
*PIMNICTHYS ATRATULUS	BLACKNOSE DACE
*SEMOTILUS ATROMACULATUS	CREEK CHUB
CARPIODES CARPIO	RIVER CARPSUCKER
CARPIODES CYPRINUS	QUILLBACK
CARPIODES VELIFER	HIGHFIN CARPSUCKER
CATOSTOMUS COMMERSONI	WHITE SUCKER
CERIMYZON OBLONGUS	CREEK CHUBSUCKER
HYPENTELIUM NIGRICANS	NORTHERN HOG SUCKER
*ICTIOBUS	
*ICTIOBUS BUBALUS	SMALLMOUTH BUFFALO
*ICTIOBUS CYPRINELLUS	BIGMOUTH BUFFALO
*ICTIOBUS NIGER	BLACK BUFFALO
*MOXOSTOMA ANISURUM	SILVER REDHORSE
*MOXOSTOMA DUQUESNEI	BLACK REDHORSE
*MOXOSTOMA ERYTHRURUM	GOLDEN REDHORSE
*MOXOSTOMA MACROLEPIDOTUM	SHORTHEAD REDHORSE
*ICTALURUS CATUS	WHITE CATFISH
*ICTALURUS MELAS	BLACK BULLHEAD
*ICTALURUS NATALIS	YELLOW BULLHEAD
*ICTALURUS NEBULOSUS	BROWN BULLHEAD
*ICTALURUS PUNCTATUS	CHANNEL CATFISH
*NOTURUS FLAVUS	STONECAT
*NOTURUS GYRINUS	TADPOLE MADTOM
*NOTURUS NOCTURNUS	FRECKLED MADTOM
*PERCOPSIS OMISCOMAYCUS	TROUT-PERCH
*FUNDULUS NOTATUS	BLACKSTRIPED TOPMINNOW
*GAMBUSIA AFFINIS	MOSQUITOFISH
*LABIDESTHES SICCULUS	BROOK SILVERSIDE
*MORONE CHRYSOPS	WHITE BASS
*MORONE MISSISSIPPIENSIS	YELLOW BASS
*AMBLOPLITES RUPESTRIS	ROCK BASS
*LEPOMIS CYANELLUS	GREEN SUNFISH
*LEPOMIS GIBBOSUS	PUMPKINSEED
*LEPOMIS GULOSUS	WARMOUTH
*LEPOMIS HUMILIS	ORANGESPOTTED SUNFISH
*LEPOMIS MACROCHIRUS	BLUEGILL
*LEPOMIS MEGALOTIS	LONGEAR SUNFISH
*MICROPTERUS DOLOMIEUI	SMALLMOUTH BASS
*MICROPTERUS SALMOIDES	LARGEMOUTH BASS
*POMOXIS ANNULARIS	WHITE CRAPPIE
*POMOXIS NIGROMACULATUS	BLACK CRAPPIE
*ETHEOSTOMA ASPRIGENE	MUD DARTER
*ETHEOSTOMA CHLOROSOMUM	BLUNTNOSE DARTER
*ETHEOSTOMA FLABELLARE	FANTAIL DARTER
*ETHEOSTOMA NIGRUM	JOHNNY DARTER
*ETHEOSTOMA SPECTABILE	ORANGETHROAT DARTER
*ETHEOSTOMA ZONALE	BANDED DARTER
*PERCA FLAVESCENS	YELLOW PERCH
*PERCINA CAPRODES	LOGPERCH
*PERCINA MACULATA	BLACKSIDE DARTER
*PERCINA PHOXOCEPHALA	SLENDERHEAD DARTER
*STIZOSTEDION CANADENSE	SAUGER
*STIZOSTEDION VITREUM	WALLEYE
*APLODINOTUS GRUNNIENS	FRESHWATER DRUM