# WETLAND MATTERS

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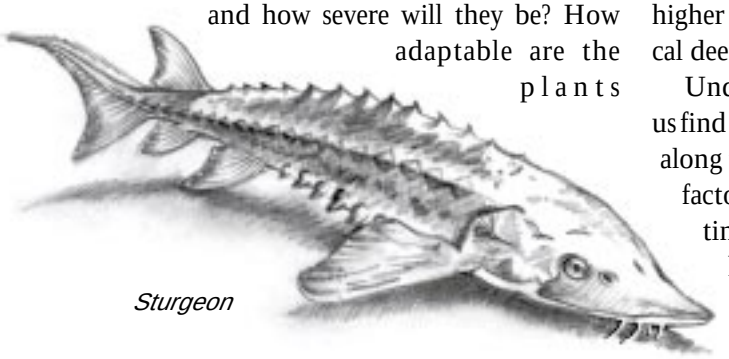
## LAND USE CHANGES AFFECT FISH HABITAT ON THE ILLINOIS

BY WAYNE HERNDON, JR.

Like all things in nature, the Illinois River is in transition, influenced by all human and natural activity that occurs in its massive watershed. As we continue to develop and alter the land in the watershed to our own liking, we will continue to change the river. The questions remain: How many changes may yet occur and how severe will they be? How adaptable are the plants and animals—native and non-native—that are found in the river? Specifically, if we focus our lens on the Illinois' fishery of the past century, what can we learn about the changes—and the future promise—of this riverine ecosystem? These questions are particularly timely as The Wetlands Initiative and others strive to reverse the past century of abuse to the riverine ecosystem by restoring the river's backwater lakes, wetlands, and associated uplands.



*Sturgeon*

It is difficult to comprehend the magnitude of the problems facing the restoration of such a river system. Changes in the navigation structure of the river (e.g., locks, dams, deep channels) and land use of the river's watershed have severely restructured the fish populations, eliminated entire species of aquatic insects from some reaches of the river, and completely eliminated submergent aquatic vegetation from the river and adjacent backwaters. Hydrologic components of the fishery habitat have changed drastically as well. The river no longer cycles through seasonal high and very low stages. Flood durations and frequencies are much higher and longer. Siltation is filling in critical deep water habitat.

Understanding these problems will help us find direction for current restoration work along the river. Knowing the history of the factors that shaped the river—and continue to shape it—will help us know how species, particularly fish, respond in this dynamic ecosystem.

### THE WAY IT WAS

The Illinois River once hosted one of the most diverse and productive ecosystems in the world. Even though its headwaters are in the glacial lakes of the upper Midwest, it is a product of one of the world's most fertile watersheds.

The presettlement river was far more

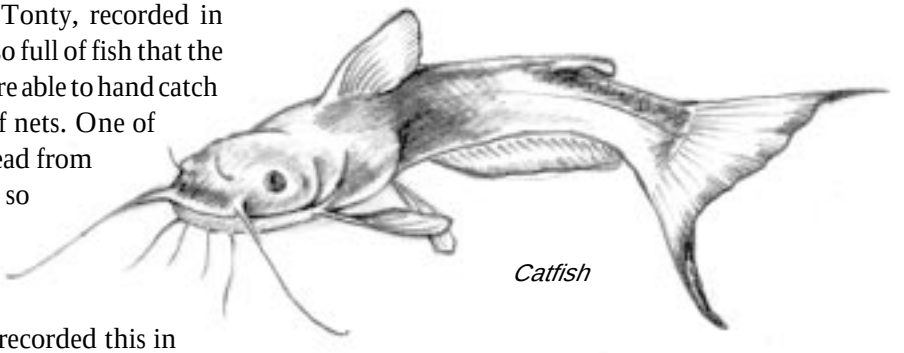
hospitable to a broad range of native species than the river is today. Although very limited information of fish population characteristics is available from the Illinois River during the early days of exploration, the following were found in journal accounts.

Anastasius Douay, a Jesuit priest traveling with La Salle and Tonty, recorded in 1687 that the river was so full of fish that the expedition members were able to hand catch them without the aid of nets. One of their men took a fish head from the Indians which was so large that it was a load for one man to carry.[1]

Peter Pond, an early trapper and fur trader, recorded this in 1765:

> We put our hook and lines into the water and let them lie all night. In the morning we perceived that there was fish at the hooks and hauled on our line. At length we had one ashore that weighed a hundred and four pounds, a second that weighed one hundred pounds and a third of seventy-five pounds. The men were glad to see this for they had not ate meat for some days or fish for a long time.…The fish was what was called a catfish. It had a large flat head, sixteen inches between the eyes.[2]

Back in the days when Tom and Huck were an imaginary part of Mark Twain's childhood, the Illinois was a much different waterway and a kinder, gentler habitat for all native fish species. The U.S. Army Corps of Engineers, composed of a few excellent engineering officers—Robert E. Lee among them—was primarily interested in opening the upper Mississippi to steamboat traffic. The great levee districts along the Illinois had not yet been laid out. The navigation locks were not yet built. Lake Michigan water had as yet to be diverted down the not-yet built Sanitary and Ship Canal. Waters flowing down the Des Plaines, Du Page, Kankakee, Mazon, Fox, Vermilion, Mackinaw, Spoon, Sangamon, and the La Moine flowed truly unvexed to the sea, empty of the silt loads to come in future years from poor land use practices. Farmers used teams of horses and oxen to plant rye, oats, and hay, rather than the current horizon-to-horizon crops of corn and soybeans. Broad riparian corridors of native trees and grasses bordered stream courses. Rainfall moved particles of silt, but at a much slower rate than they are moved today. Streambanks were not undercut, but held together by well developed root structures. Stream velocities were slower because vegetation in the natural waterways held back water, and meanders lengthened the stream course over the rate of fall.



*Catfish*

The Illinois at that time had an overall gentle rate of fall—about 3.3 inches per mile. The character of the river changed tremendously as it traveled its full 270 miles. From the juncture of the Des Plaines and the Kankakee rivers, the Illinois flowed westward more swiftly than it did further downstream. This portion of the Illinois was geologically young and down-cutting its bed.

At the "Great Bend" the river turned southwest and became a much different stream. Currents slowed and floodwaters were able to spill out into a broad valley, cutting side channels and creating numerous marshes, lakes, and sloughs. Before Eu-

ropean settlement, the river's floodplain area of about 400,000 acres held the most productive, lateral freshwater marshes of any river in the United States. Early researchers described huge populations of game fish and countless thousands of waterfowl. In the spring, when spawning and nesting took place, the marshes adjacent to the river supplied nursery areas for young fish, insects, and birds.

From the days of the early explorers through the settlement period in the early 1900s, the Illinois River was an unlimited supplier of fish. The early settlers depended upon the river and its backwaters to provide needed animal protein. The subsistence farming of the early years was not sufficient to provide necessary food sources to the frontier.

The *Reports of the Illinois Fish Commissioner* around the turn of the 19th century give accounts of largemouth bass fishing in the backwater lakes of the Illinois including Hennepin, Thompson and Quiver lakes. Largemouth bass grew in such numbers that it was not unusual to catch 100 to 200 fish in a day of pole and line fishing. A fish not needed for consumption by the fishermen could be sold at one of the many markets along the river. Fish were often hauled by the train-car load from riverside towns such as Beardstown, Havana, Peoria, and Henry to be sold at more distant, big city markets.

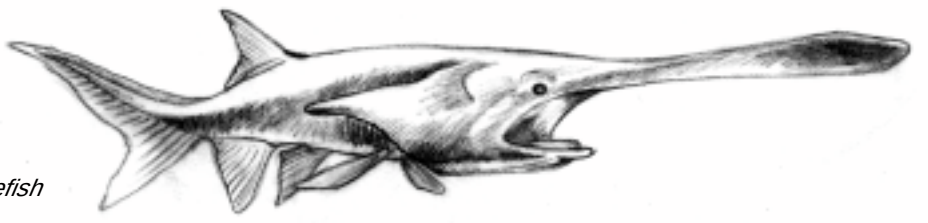
The fishery of the Illinois River was not documented scientifically until the mid-19th century. At that time, a fledgling university community was taking wing in Illinois. Led by the Illinois State Normal School in Bloomington, and later followed by the University of Illinois, the public's interest in nature, taxonomy, and natural history was growing. As a result of this scientific interest, natural history societies were founded and nurtured. Some of these societies targeted the Illinois River and its complex ecosystems for research. The study was timely; the system was already influenced by man, but this baseline information has proven invaluable in restoration efforts.

Two early researchers on the river were able to catalog species diversity before multiple changes were wrought by man. These two, Forbes and Richardson, marked the beginning of aquatic ecology study in Illinois and pioneered the understanding of the dynamics of flood and drought in Illinois River fish communities.

State agencies during this time, however, were primarily concerned with rescuing stranded fish during low water events. It is ironic that state resource agencies could not forecast the catastrophic effect of the multiple changes taking place in the river's watershed on its fishery.

## More Shipping, Sewage, and Farming

The fishery habitat of the Illinois River has been influenced dramatically by the phenomenal population growth in the watershed in the past 150 years. In 1850 the population was 500,000; 20 years later the population had more than tripled, reaching 1,629,000. In 1964 the population in the watershed had reached 8,537,900. With the population growth, came growth in the volume of both shipping and sewage.



*Paddlefish*

In 1900 the river was forever altered by the opening of the Sanitary and Ship Canal. This link between Lake Michigan and the Illinois diverted Lake Michigan water down the Illinois in great volume, flushing untreated sewage and industry waste into the river. The additional water volume caused the downstream water levels to rise, flooding low areas permanently and killing bottomland timber. The result of the influx of untreated waste was a plunge in dissolved oxygen levels and a corresponding increase in ammonia. Because of the increase in biological oxygen demand of the sludge, whole species of fish were deselected for survival.

The opening of the Illinois-Michigan Canal, and later the Hennepin Canal, streamlined transportation of regional agricultural products and encouraged the drainage of 200,000 acres of the adjacent wetlands. These new drainage districts were formed in the very locations that held the rich Illinois fishery habitat. The flood and drying cycle of these wetlands provided seasonal spawning areas and planktonic enrichment to the system as a whole.

In addition to the changes wrought by the new canals, new navigation locks and dams altered the fishery habitat. Several locks and dams were built before 1900, affecting the river during low flow events and raising the water level to make steamboat navigation possible. In the 1930s, high dams replaced the low dams and created a series of navigation pools, changing the riverine environment to a more lake-like habitat. The navigation dams were a barrier to fish movement, except during times of high

## The River of My Youth

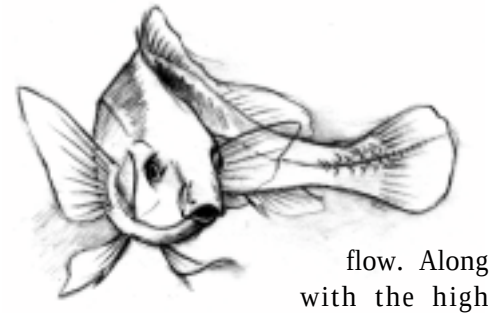
As a boy, I remember trips to Liverpool, Illinois, (a small riverside town) with my father in the 1950s. We would launch a boat and head upstream to an area with an old side channel, a remnant of the old, pre-dam era. We would fish using casting rods in the old channel.

The water was often a grey-brown color with a distinct ammonia odor. Our quarry was channel catfish—which we rarely caught—and a good sprinkling of freshwater drum, carp, and bullheads thrown into the mix. This was all that we ever expected to catch and all that we ever did. Many of the carp we caught were "knotheaded" and slender with eroded fins. We never caught a carp over 5 pounds in weight. All the drum were skinny and under 9 inches in length. Only the bullheads were fat.

I didn't know it at the time, but we were unlucky enough to experience the fishery of the Illinois River at, perhaps, its lowest ebb.

All of the past abuses of man's treatment of the river had come crashing down on its ability to sustain fish life. At that time, almost no oxygen was available for the sustenance of game fish in mid-summer on the lower Illinois River. The Illinois and U.S. EPA were not in control of the effluents of sewage treatment facilities flowing into the river. Secondary treatment of this waste was the rule and many combined storm and waste sewers carried human waste directly to the river when it rained. Under the navigation dams, huge clouds of foam from phosphate detergent would form and flow away in the wind. At that time, most game fish survived in the backwaters during the summer. The river, once a source of life, during the 1950s only saw death.

—*Wayne Herndon, Jr.*



*Drum fish*

flow. Along with the high dams, a new nine-foot navigation channel was maintained.

The changes in agricultural and land use practices of the past 75 years have had the greatest negative impact on fishery habitat. Channelization of tributaries, clearing, urbanization, and row-crop farming all have greatly increased the rate of sedimentation in the river and backwater lakes. The habitat remaining in the adjacent backwaters is so degraded that very little water depth is available for fish during most of the year. Finally, the emergence of non-native fish, benthos, plankton, and plants has complicated the already degraded fishery habitat of the Illinois River.

These changes have brought severe changes in the fish population, the aquatic insects that the fish depend on, and the submergent aquatic vegetation in the backwater lakes that forms their habitat. Other components of the fishery habitat have changed drastically as well, including the hydrological cycle and the level of siltation.

## The Way It Is

Because of the passage of clean water legislation in the 1970s, and stringent water quality standards imposed by the EPA on discharges, more than 99 percent of wastewater treatment facilities in the river's watershed now provide maximum levels of treatment. This improvement has led to dramatic improvements in the amount of dissolved oxygen available for fish and decreases in ammonia and phosphorous.

Now, instead of selecting only those species of fish with low dissolved oxygen tolerances for survival, many far more sensitive species are able to not only survive, but prosper. Many species of minnows, non-game fishes, and commercially valuable fish have benefited from the improvement in water quality.

Since 1987 and 1988 (drought years), the game fish population of the Illinois River has experienced a rebirth. No longer does a fisherman only hope for carp (a non-native), bullhead, drum, and the occasional channel catfish. Now the fishery includes large populations of smallmouth and largemouth bass, sauger, walleye, white bass and the occasional northern pike. During population surveys, biologists have seen shovelnose sturgeon and paddlefish with greater frequency. A marked decrease in numbers of common carp also has been noted in recent population analyses.

What appears to be an excellent opportunity for an improved game fishery, however, carries a down side. Corresponding to great improvement in water quality is a marked and catastrophic decline in fish habitat areas due to sedimentation. Game fish need cover for feeding and protection of young fishes. They also need deeper escapement water to avoid mid-summer temporary water quality problems and to avoid being flushed downstream in mid-winter by floodwaters when low water temperatures make them too lethargic to move. This factor seems to be critical in the establishment of large year classes of channel catfish, largemouth bass, and smallmouth bass. Deeper water, off-channel habitats are critically needed to fill these needs.

As a rule, the largemouth bass, smallmouth bass, and crappie populations found in the Illinois River are dependent on the availability of adequate spawning areas for nest building and of consistent water levels

during egg incubation and hatching. This may only occur at ideal levels in one year out of three or four, resulting in strong year classes every few years. The young fish grow very quickly and enter the fishery within two years. They are, however, subject to severe stress during winter due to lack of deep water habitat. This results in very few older fish surviving. For this reason, it is rare for largemouth bass in the Illinois River to attain 4 years of age. Because of the dynamics of the population and the general young age of individuals, most game fish are unable to achieve trophy size.

From observations of fish collected in population samples in the Illinois River, it is abundantly clear that growth rates for most predators are extremely fast. The abundance of gizzard shad and shiners make food available to all predators throughout the growing year. The fast growth is important in providing fisheries for white bass and crappies and other short-lived fishes. The present invasion of Asian carp, including the bighead carp and silver carp, now constitute a threat to fish populations that feed on plankton. The competition for plankton items, which form the basis of food for gizzard shad and other primary feeders in the Illinois, could lead to reduced shad population densities.

*Minnows*

Walleye and sauger have recently created a tremendous fishery in the Peoria and Starved Rock pools of the river. Walleye fishermen from all over the United States have participated in tournaments on the upper river in the past 10 years. These fish are indicative of improving water chemistry for the upper river. Walleye and sauger are native to big river systems, but were almost eliminated from the Illinois River by the water quality problems of the early part of the 1900s. Their return marks major improvements in water quality and bodes well for other, associated fish gelds.

## The Way It May Be

The future fishery of the Illinois River will be influenced by many dynamic forces. Possibly the one that will be most influential is the globalization of commercial markets and increased world trade. Because of its direct connection with international deep-water ports, the Illinois River will probably be a host to any organism transported in the bilge water of ships. Once in the river, they may colonize, directly affecting native populations of fish and benthos. The danger in this scenario is that the habitat is evolving because of man's influence and these non-natives may be better suited to the resulting environment.

The single most daunting fishery habitat challenge on the Illinois River is the constant and unabated rate of sedimentation, intensified by the lack of the backwater lakes and marshes that once filtered out sediment. Nearly half of the 400,000 acres of wetlands in the Illinois River floodplain have been locked up for close to 100 years, behind high, river-tight levees. They are, in fact, a time capsule waiting to display again the grandeur of the former Illinois River marshes.

When these crown jewels of the Illinois River's former glory can again function as true backwaters, then the Illinois River will no longer bring environmental death from choking sediments, exotic plants and animals, and erratic water level fluctuations. Rather, they will then provide the unlimited aquatic resources of the past. In the meantime, a truly achievable resource manage-

ment goal should be to retire these areas from agriculture and to develop lateral marshes. When, in the future, the Illinois River can be reconnected with these areas, they will be in a proper stage of development.

Such a jewel is the former Hennepin Drainage and Levee District. It is a fine example of a quality backwater wetland in reserve. Since its acquisition by The Wetlands Initiative in 2001, the drainage pumps were stopped and non-native carp were removed from the drainage channels and ditches. Water rapidly filled the former Hennepin and Hopper Lakes that had been drained and farmed for almost 100 years. Within months, aquatic vegetation flourished. As biologists reestablished native fish species, the fish population reproduced and flourished. Today water clarity is exceptional and myriads of aquatic insects are present, providing rich foraging for all animal species present.

If this scenario could be repeated up and down the river, the result would be truly astounding. Restoring a significant portion of the 200,000 acres currently behind levees on the Illinois would benefit the health and vitality of the whole riverine system.

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The Wetlands Initiative is a nonprofit corporation dedicated to restoring the wetland resources of the Midwest to reduce flood damages, improve water quality, and increase wildlife habitat and biodiversity. Our mission is to promote restoration in ways that provide environmental and economic benefits to society and the landowner. Through research, education, public policy analysis, and large-scale demonstration projects, TWI aims to restore one million acres by the year 2010. While this number may seem large, it represents only two percent of the wetlands lost in the Midwest.



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