

ILLINOIS RIVER: FLOODPLAIN NATURAL SYSTEM

Despite alterations, the Illinois River is one of a handful of world-class river-floodplain systems. These include the Nile, the Amazon, the Mekong, and portions of the Mississippi, where biological productivity is enhanced by annual flood pulses that advance and retreat over the floodplain and temporarily expand backwaters and floodplain lakes (Welcomme 1985; Junk, Bayley and Sparks 1989; Bayley 1991; Sparks 1992). The river-floodplain system is much more complex and contributes much more biological diversity and abundance than smaller stream systems, including representatives from some of the most ancient lineages of fishes, such as gars, sturgeons (including the federally-endangered pallid sturgeon), and the paddlefish. Paddlefish feed on plankton and can grow to weights of 150 pounds and lengths up to seven feet.

The entire flora and fauna of the Illinois River are unusually rich for a temperate river; partly because its north-south orientation and connection to the Lower Mississippi River provided a retreat for species during the glacial epochs. The Illinois River's long flood pulse, however, has contributed to a biological productivity that overshadows even the Upper Mississippi River. Just as the prairie is sustained by natural fires, the river-floodplain system and associated plants and animals depend upon the periodic advance and recession of floods. The federally-endangered false decurrent aster (*Boitonia decurrens*), for instance, relies on the exposure of freshly deposited mud flats for regeneration (Schwegman and Nyboer 1985; U.S. Fish and Wildlife Service 1990). The cottonwood, favored for perching by eagles and for nesting by herons and egrets, seems to have similar requirements. The river-floodplain also functions as a corridor for long-distance migrants, mostly birds (raptors, neo-tropical songbirds, shorebirds, ducks, geese, swans and others) but also one species of fish, the American eel, that spawns off the coast of Cuba in the Sargasso Sea. Most aquatic animals, however, use the Illinois river-floodplain system as a permanent home, undertaking short migrations within the system to spawning, rearing or feeding areas in rapids, tributaries, backwaters, or on the floodplain.

The flood pulses in both the Illinois and the Upper Mississippi rivers usually are characterized by two peaks; a major one in spring and a smaller one in fall (Grubaugh and Anderson 1988). During the spring flood, nutrients are released from the newly-flooded soils, stimulating the base of food webs, and the expanded aquatic habitats are utilized as feeding areas by migratory birds and as breeding areas and nurseries by fish and other aquatic life.

The low flow of midsummer exposes mudflats where the soils are stabilized by drying and compaction and are colonized by moist soil plants that provide food for waterfowl on their fall migration. The processes of decomposition and nutrient recycling are accelerated in the moist but well-oxygenated environment of the floodplain, in contrast to the oxygen-depleted sediments of permanently flooded areas. The contracting pools and lakes force the spring production of small fish into the jaws of larger fish and the beaks of herons and egrets that establish rookeries near these rich feeding areas. The floodplain lakes of the natural river thus avoid the "aging reservoir syndrome" that characterizes many man-made impoundments on rivers. Impoundments with static water levels, or inappropriately timed flood pulses, typically show a pulse of production when first flooded, but productivity and the average size of fish subsequently decline, because of the absence of the rejuvenating combination of the spring flood and summer low flow. When small fish find permanent refuge in the vegetated shallow margins of these impoundments, fish populations become stunted because of over-production, poor growth, and lack of culling by predators.

The "little flood" of fall makes the summer's production of seeds and tubers available to the dabbling ducks, such as mallards and teal, that prefer to dabble for food in shallow water rather than walk on land. The gradual advance of the fall flood makes new zones of food available to later migrants. If the water rose suddenly, or remained static, the early migrants would exhaust the food supply. Fish may use the fall flood to find wintering areas with adequate dissolved oxygen levels, water temperatures several degrees higher than in the main channel, and relatively slow currents, so they do not exhaust their energy reserves by swimming. It is probably fortunate for migratory waterfowl that the spring flood usually is greater than the fall flood, providing access to zones of food that were not exploited in the fall. Waterfowl managers have recognized the importance of the summer drawdown and the fall flood, and seek to recreate it on a more predictable basis than occurs naturally, using low levees, gates, and pumps.

SYSTEMS WITHIN THE SYSTEM

The Illinois river-floodplain natural system can be subdivided in both longitudinal (upstream - downstream) and lateral (bluff-to-bluff) dimensions. A typical transect across the Illinois River starts in the middle with the main channel and proceeds toward the bluff, first across islands and side channels, then across the adjacent floodplain with its associated bottomland lakes and backwaters. Backwaters are connected to the river even during low flows while lateral floodplain lakes are isolated during low river stages.

The river formed broad, low natural levees adjacent to the channel where it deposited alluvium during rising river stages. These natural levees developed vegetation that filtered sediment from rising water, thus slowing the rate of sedimentation in the backwaters, lakes, and floodplain. The floodplains generally slope slightly upward toward the top deposits of the bluffs. The topography of the floodplain thus varies in elevation, and hence in the frequency and duration of flooding.

Vegetation patterns in turn are governed by the flood tolerance of the plants and vary from bottomland hardwood forests that included pin oaks and pecans on natural levees and higher ground to wet prairies, beds of submersed aquatic plants, and open water in the deeper lakes. The bluffs along the upper river are spectacular, and several are included in state parks (Starved Rock, Buffalo Rock). The bluffs along the rest of the river are capped with loess, but the limestone bases are increasingly exposed as one proceeds downriver, so that scenic rock formations and hillside prairies are visible from the Great River Road (Route 100) along the lower river from the town of Bluffs south for 60 miles to the complex of public lands at the mouth of the river (Pere Marquette State Park, and waterfowl management areas at the Glades, Stump Lake, Swan Lake, and Calhoun Point).

The modern river is divided longitudinally into 5 reaches by navigation dams, including the Melvin Price Lock and Dam (Dam 26) on the Upper Mississippi River that influences the lower 80 miles of the Illinois River. In contrast to high dams for water storage and power generation in the West, these low dams (10-24 ft) on the Illinois River are designed to maintain adequate depths for navigation during low flows. The Illinois River dams have little effect on floods; indeed, the wicket dams at Peoria and LaGrange fold into the bottom of the river during high flows and boats pass right over them.

The main environmental effect of the navigation dams is to prevent the river from getting as low as it did naturally, during the low part of the flood pulse, so that some islands and portions of the floodplain that were formerly exposed during low flows are now permanently

inundated. The Peoria reach includes upper and lower Peoria lakes which are natural mainstem lakes formed by the damming action of alluvial fans deposited by tributaries, similar to Lake Pepin on the Upper Mississippi River. The Peoria Dam keeps the lakes from getting as low as they once did, permanently inundating a series of islands.

The five reaches defined by the navigation dams in turn fall into three major sections, defined by the natural physiography of the river and by the degree and nature of human alterations. The Dresden, Marseilles, and Starved Rock reaches together form the upper river, characterized by a geologically young channel which has a narrow floodplain between rocky bluffs. This section historically has been heavily influenced by effluents from the Chicago-Joliet area. The LaGrange and Peoria reaches comprise the middle river. Here the river occupies a broad floodplain (two to five miles wide) created by the ancestral Mississippi and Ohio (Mahomet-Teays) rivers.

Approximately half of the floodplain and the natural backwater and lakes remain along this section (Bellrose et al. 1983). In contrast, most of the floodplain and backwaters have been drained for agriculture in the lower river (the Afton reach) and the river channel runs between two levees until it nears the confluence with the Upper Mississippi River (Thompson 1989).