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Fox River Fish Passage Feasibility Study

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There are 15 mainstem dams and numerous tributary dams in the Illinois portion of the Fox River watershed. Many of these dams were originally built in the 1800's to provide mechanical power for grist or lumber mills, but today serve little function except to maintain flat-water pools/impoundments upstream of the dams. The Max McGraw Wildlife Foundation has recently completed a two-year study to determine the effects of dams on fisheries, macroinvertebrates, physical habitat, and water quality in a 100-mile stretch of the Fox River between the Chain of Lakes and Dayton, Illinois. In addition, fish passage options were identified for each of the 15 mainstem dams. Options included complete dam removal and river restoration or retrofitting dams with ramps, fishways, or bypass channels to provide fish and/or canoe passage. Cooperators on this project include the USEPA, the Illinois Department of Natural Resources, and Steve Gephard, a Fish Passage Specialist from Connecticut.

Sampling for the study took place during summer low-flow conditions at 40 sites located in free-flowing river areas directly below dams, impounded river directly above dams, and free-flowing or impounded mid-segment areas between dams. Results convincingly showed that dams are having a detrimental effect on the Fox River by reducing biodiversity of fishes and altering macroinvertebrate communities. Dams appeared to influence these aquatic organisms by degrading habitat and water quality conditions and fragmenting the river by acting as barriers to fish movement.

Following are highlights of the study results, or ten ways dams are impacting the Fox River.

- Dams adversely affect fish communities. Based on fish community index values, free-flowing river reaches (below dam or mid segment free-flowing stations) averaged a "B" rating or highly valued aquatic resource, whereas impounded reaches (above dam and mid segment impounded stations) averaged a "D" rating or limited aquatic resource.
- Free-flowing reaches supported more abundant sport fish communities than impounded reaches.
- Dams were found to restrict distributions of 30 species of fish.
- Dams alter and degrade macroinvertebrate communities. Stations within free flowing reaches of the river had an abundance of mayflies and caddis flies whereas impounded stations had high proportions (>95%) of tolerant midge larvae (chironomids) and benthic worms (oligocheates).
- Dams may be preventing freshwater mussel recolonization of improved sections of river because mussel larvae use fish as a means for dispersal and dams block fish migrations.
- Habitat quality indices indicated good habitat quality in the free-flowing river and severely degraded habitat in impoundments.
- The 15 Fox River dams are impounding 47% of river miles and 55% of surface area in the nearly 100 miles of river between the Chain of Lakes and Dayton, Illinois.
- Nutrient concentrations (total phosphorus and nitrogen) and algal biomass were extremely high in the river during the summer low-flow period.

- Dissolved oxygen concentrations fluctuated widely at impounded stations (2.5 - >20 mg/l), but not at free-flowing stations (5-8 mg/l). Dissolved oxygen fluctuations appear to be driven by daytime photosynthesis (oxygen is produced) and nighttime respiration (oxygen is consumed) of planktonic algae.
- Minimum dissolved oxygen levels fell below the IEPA recognized standard of 5 mg/l at 9 of 11 impounded reaches of river between McHenry and Dayton, Illinois. Substandard oxygen sags occurred throughout impounded reaches not just immediately above the dams, lasted from 1.5 to 16 hours in a 24-hour period, and occurred during periods of low flow and high water temperature or from July through September in 2001.

A project final report will be available in May. In the report, we will summarize all of the data collected during the study and recommend that some form of fish passage be considered at all Fox River dams. Determining the correct passage option for an individual dam is a complicated decision involving many stakeholders (i.e., dam owners, government agencies, local municipalities, organizations, and the public) and a variety of social, economic, and environmental issues. Our data suggest that dam removal is the best option when the ecological health of the river is of prime consideration. Removing dams will eliminate barriers to migration for all types and sizes of fish, restore high quality river habitat, and eliminate lake-like conditions that support high algal biomass and substandard dissolved oxygen levels. Ramps, fishways, and bypass channels will allow fish to get over or around dams but will do little or nothing to improve habitat and water quality conditions in the river. These alternatives should be considered only when dam removal is ruled out as a fish passage option.