ENV Report 33 – *Determination of the Tolerance of Fish in Low-Velocity Habitats to Hydraulic Disturbance at Low Temperatures* by Robert J. Sheehan, Paul S. Wills, Michael A. Schmidt, and Joseph E. Hennessy.

ABSTRACT

Upstream-bound vessels in the Upper Mississippi River-Illinois Waterway and other river systems may displace overwintering fish residing behind wing dams. Displacement flow rates were determined for young-of-the-year bluegill (*Lepomis macrochirus*) and channel catfish (*Ictalurus punctatus*) at 1, 2, and 4 °C in a swimming-ability (swim) tunnel. The velocity change profile simulated that associated with barge passage, with an initial backflow, then an accelerating positive flow toward a predetermined peak flow velocity. Proportion of fish displaced, time to displacement, and displacement flow rate were quantified for each trial. In addition, a sand wave typical of the main channel of a large river was simulated in a flume. Both fish use of the sand wave and displacement were quantified with varying flow and temperatures. As temperatures declined in the swim tunnel experimental trials, displacement typically occurred for both species before peak velocities were reached. Apparently, exhaustion was not the primary mechanism causing displacement. Acceleration of flow as a vessel passes is an important factor. Swimming ability of both species was similar at low temperatures, which counters earlier work demonstrating that channel catfish outperform bluegill at cold temperatures. In the sand wave experiment, both species were typically displaced from sand wave depressions at greater than 0.1 m/s. A low flow eddy was created at the upstream end of the depression, potentially providing flow refuge if a fish remained stationary within the eddy.