

Development of Downstream Passage Facilities for Shortnose Sturgeon



Project Summary

Alden developed computer flow modeling of downstream passage alternatives, conceptual designs and preliminary cost estimates, engineering and biological consultation, biological evaluations of design criteria (exclusion rack and bypass configuration) in a large flume test facility using captive-reared shortnose sturgeon, desktop analyses of entrainment and turbine passage survival rates.

Client

Holyoke Gas and Electric,
City of Holyoke, MA

Location

Connecticut River; Holyoke, MA

Years

2001—2014

FOR MORE INFORMATION,

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Project Overview

Alden's engineers and biologists completed several types of research and design projects to provide the Holyoke Gas & Electric Department (HG&E) with design criteria for the development of downstream passage facilities for shortnose sturgeon (federally-listed endangered species) at the Hadley Falls Project on the Connecticut River. As part of these efforts, Alden performed computer modeling of flow conditions for several alternative designs, developed conceptual designs and preliminary cost estimates for the preferred alternatives, and conducted biological testing in a large flume with various configurations of bar racks and bypass entrance designs with juvenile shortnose sturgeon.

Work Performed

Alden conducted extensive Computational Fluid Dynamics (CFD) modeling for HG&E to evaluate flow conditions in the forebay and below the spillway of the Hadley Falls Project to determine if hydraulic conditions of proposed alternative downstream passage facilities will be acceptable for passing shortnose sturgeon and will allow fish to locate a fish lift entrance at the base of the dam. Biological testing with an exclusion rack (2-inch clear spacing) and various bypass configurations was conducted in Alden's large flume test facility over a three-year period. Entrainment and bypass rates were estimated for each configuration by releasing PIT-tagged sturgeon upstream, recording their movements with the PIT tag system and either underwater video (day tests) or a DIDSON acoustic camera (night tests), and recovering fish from their final location (upstream, entrained, or bypassed) after a 6-hour test period. The results of the flume studies were used to determine appropriate approach velocities (i.e., to minimize entrainment), bypass entrance velocities, and the effect of bypass location relative to the exclusion rack (i.e., perpendicular or parallel to the rack at one end).

Project Highlights

- Alden has prepared conceptual designs for several downstream fish passage alternatives and the addition of a new turbine and powerhouse at the Hadley Falls Project.
- The results of the studies conducted by Alden for the Hadley Falls Project have been provided to the agencies and other stakeholders and have led to concurrence on a recommended approach for resolving downstream passage of shortnose sturgeon and several other diadromous species.