

# ALDEN

## Fish Protection and Passage

Alden's engineers and biologists work closely with our clients and resource agencies to design, model, and test fishways (ladders, lifts, natural channels) and downstream fish passage technologies.

Successful installation of fish passage and protection facilities is dependent on expertise and knowledge of a wide range of biological and engineering parameters. Factors affecting selection, siting, design, construction, and operation of fish passage facilities include:

- Behavior and swimming ability of fish species of interest
- Hydraulic conditions
- Water quality (temperature, turbidity)
- Site configuration
- Economic impacts on project operation
- Maintenance requirements
- Federal and state agency guidelines and regulations
- Potential for barrier removal

Alden has extensive experience in conducting hydraulic model studies for fishways to optimize fish passage designs. Alden also has three-dimensional Computational Fluid Dynamic (CFD) capabilities to solve complex flow problems and simplify physical modeling of alternatives. Alden's engineers and scientists also perform biological field and laboratory evaluations to determine the efficacy of fish passage devices.

Alden staff understands the importance of involving the resource agencies in the process of designing fish passage structures. Based on a history of successful interaction and mutual respect, a long-standing working relationship has been established with FERC, USFWS, NOAA, and many regional, state and local agencies. We are able to obtain rapid and meaningful agency interaction and response to permitting issues. Agency personnel often visit Alden's facilities to witness testing and interact in the process of optimizing hydraulic conditions and physical configuration for fish attraction and passage.

