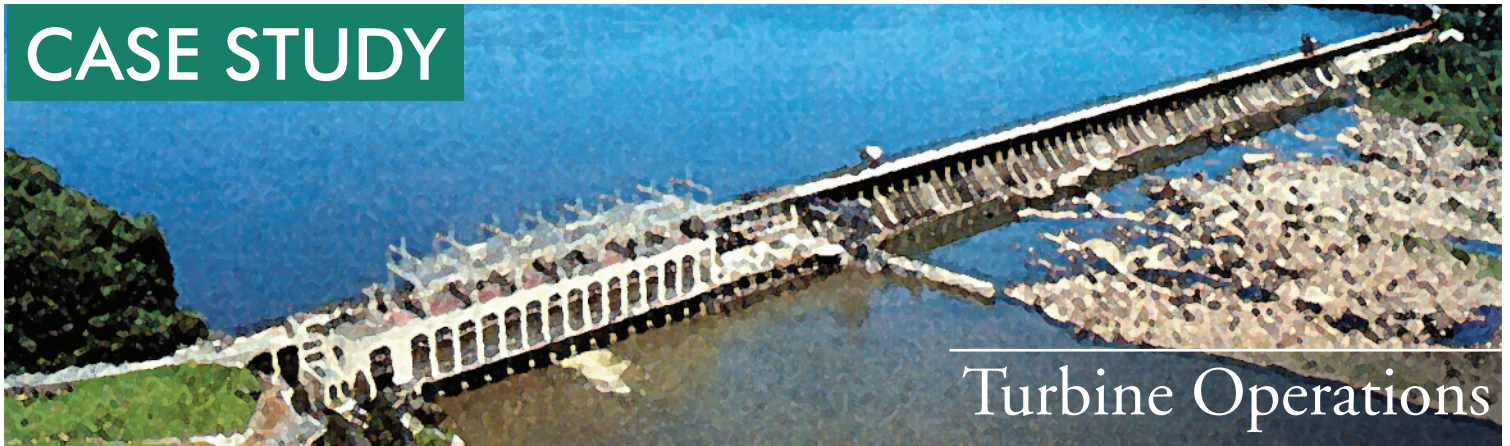


# CASE STUDY



## Turbine Operations

### NATIONWIDE OFFICES

#### Corporate

25 Nashua Road  
Bedford, New Hampshire 03110  
603.472.5191

#### New Hampshire

Hampton  
Westmoreland

#### Delaware

Lewes

#### Maine

Falmouth

#### Massachusetts

Falmouth

#### New York

West Haverstraw

#### Pennsylvania

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[www.normandeau.com](http://www.normandeau.com)

### Preferential Turbine Operations to Safely Pass Juvenile American Shad (1995-present)

#### BACKGROUND

A complex issue in FERC relicensing of hydroelectric projects is safe passage of down-migrating fishes, particularly anadromous species. For hydroelectric projects, equipped with different turbine types, on the Lower Susquehanna River in Pennsylvania and Maryland, numerical turbine passage survival goals (90-95%) were specified for juvenile American shad and river herrings in lieu of exclusionary or diversionary devices. However, decades of research and accumulation of knowledge had established that the exclusionary or diversionary devices are neither 100% effective nor assure 100% safe passage of juvenile clupeids. Consequently, a logical question was whether passage through turbines would meet the stated goal.

#### THE CHALLENGE

A formidable challenge was the acquisition of reliable and precise turbine passage survival estimates for species that are sensitive to transport, handling, and tag-release procedures. Normandeau Associates, Inc., biologists developed novel techniques to economically and rapidly obtain passage survival estimates of juvenile American shad that could be used confidently in further analysis and assessment with little handling mortality.

#### TURBINE PASSAGE SOLUTION

The solution was preferential operation of turbines during the migration season (hours) to meet the prespecified overall passage survival goals of 90-95%. This required integration of site-specific turbine passage survival estimates with run timing, peak hourly migration time, hourly station operations and power demand, and prevailing hydrological conditions. From a range of operational scenarios the most benign was selected to achieve the desired goal. The selection of this operational scenario allowed a quantitative assessment of the magnitude of the difference in survival between turbine passage and passage through non-turbine exit routes. Presently, the projects utilize the recommended turbine preferential operational strategy that is protective of species.