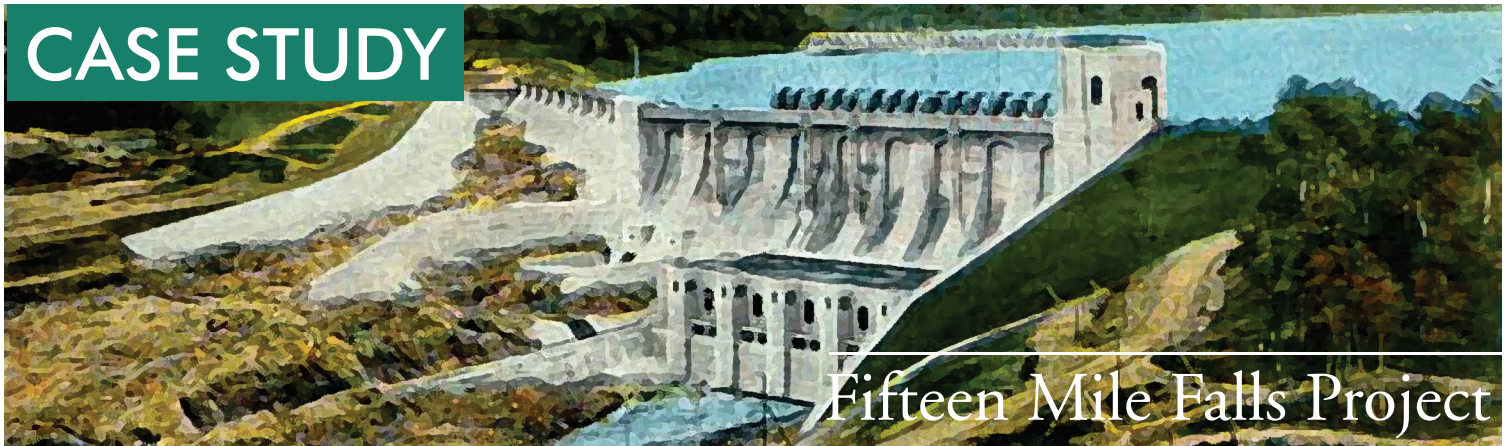


CASE STUDY



Fifteen Mile Falls Project

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Study of the Downstream Migration of Stream-reared Atlantic Salmon Smolts

BACKGROUND

The Fifteen Mile Falls Project (FMF) is a three-development hydroelectric project on the upper Connecticut River owned by TransCanada Hydro Northeast, Inc. (TransCanada). The Federal Energy Regulatory Commission (FERC) license for the project was transferred from USGen NE to TransCanada in July 2005 (FERC Project No. 2077). The three developments comprising the project are the Moore, Comerford, and McIndoes dams. Moore Dam, the upper-most development, is located at river-mile 283.5 on the Connecticut River near the town of Littleton, NH. It includes an 11-mile-long reservoir with a surface area of 3,490 acres and 223,722-acre-ft of gross storage at a normal maximum operating level of 809 ft msl.



Atlantic Salmon

The earthen and concrete gravity dam is 2,920 ft long, 178 ft high. It consists of a 373-foot-long concrete spillway with a sluice gate, four stanchion bays, three Tainter gate bays, and a powerhouse with four Francis-type turbine-generator units.

THE CHALLENGE

The license required TransCanada to file for FERC approval of a plan for the construction, operation, and maintenance of permanent downstream Atlantic salmon (*Salmo salar*) smolt passage facilities at the Moore and Comerford developments. TransCanada had been notified by state and federal agencies that an Atlantic salmon stocking program had been initiated upstream from the Moore Reservoir and that such passage facilities were needed at the developments. TransCanada submitted, and FERC approved, a study plan to evaluate and characterize the timing and season of smolt passage by constructing an inclined-plane sampler in the skimmer gate of the Moore Dam, before filing a fish passage plan.

THE SOLUTION

Normandeau conducted the first year of study in 2004 and evaluations continued through 2006. Primary goals each year were to qualify the seasonal timing of the downstream migration of stream-reared Atlantic salmon smolts and to quantify the number passing the project. These goals were met during each year of study except in 2004. That year the sampler did not open until mid-May when construction was completed. Daily passage numbers through June suggested that the migratory run started before the mid-May opening.

A secondary goal was to evaluate the attractiveness of the sampler as a downstream passage route for salmon smolts. This was studied using mark-recapture techniques in each year of study and radio telemetry tracking in 2005. Hatchery-reared Atlantic salmon smolts were used as proxy to stream-reared fish for these evaluations. During winter 2005 and spring 2006, modifications were made to increase



Moore Reservoir

flow at the skimmer gate entrance and reduce debris loading on the sampler. In 2007, in addition to continuing the qualitative assessment of passage season and quantification of passage numbers, Normandeau assessed smolt behavior in the vicinity of the skimmer gate entrance using acoustic telemetry techniques. This technology provides a three-dimensional (x, y and z coordinates) track of a tagged fish movement within an identified study area.

The Hydroacoustic Technology, Inc. (HTI) Model 290 Acoustic Tag System was used with an array of six hydrophones. The hydrophones were deployed in a roughly 150 foot x 150 foot grid in two horizontal planes. When a tagged fish approached the hydrophone array, the transmitted signal from the tag was detected and arrival time of the signal recorded for each hydrophone.

Data were collected continuously, and hourly raw acoustic tag (RAT) data files automatically created by the system. When a signal was received by four or more hydrophones, the difference in arrival times of signals among hydrophones was used to calculate a three-dimensional position.

About Normandeau Associates

Normandeau Associates, Inc., an employee-owned company, was founded in 1970 as an environmental consulting firm. Today, Normandeau is considered one of the nation's foremost companies in the field. Our deep and broad background as both environmental and public involvement consultants provides a wealth of knowledge and experience in disciplines ranging from environmental assessment and permitting to stakeholder interviews and facilitation.

From offices nationwide, Normandeau's staff of over 170 employees work closely with clients, regulators, and the public to seek solutions that enhance economic development, meet regulatory requirements, protect and restore natural resources, and improve communities.

Our diverse team includes marine, aquatic, wetland, and terrestrial ecologists; environmental planners; fisheries biologists and limnologists; ornithologists and botanists; soil scientists, geologists, and hydrologists; engineers; statisticians and data processing specialists; report production personnel; and public involvement professionals.

Normandeau Associates, Inc., combines experience, continuous training, hard work, and a rigorous commitment to excellence to deliver the highest possible level of service to our clients.

