Concord River Diadromous Fish Restoration

FEASIBILITY STUDY

Concord River, Massachusetts


Talbot Mills Dam


Centennial Falls Dam


Middlesex Falls

FINAL REPORT

DECEMBER 2016

Prepared for:

In partnership with:

Prepared by:

GOMEZ AND SULLIVAN ENGINEERS

Concord River Diadromous Fish Restoration

FEASIBILITY STUDY – DRAFT REPORT

EXECUTIVE SUMMARY

Project Purpose

The purpose of this project is to evaluate the feasibility of restoring populations of diadromous fish to the Concord, Sudbury, and Assabet Rivers, collectively known as the SuAsCo Watershed. The primary impediment to fish passage in the Concord River is the Talbot Mills Dam in Billerica, Massachusetts. Prior to reaching the dam, fish must first navigate potential obstacles at the Essex Dam (an active hydro dam with a fish elevator and an eel ladder) on the Merrimack River in Lawrence, Middlesex Falls (a natural bedrock falls and remnants of a breached dam) on the Concord River in Lowell, and Centennial Falls Dam (a hydropower dam with a fish ladder), also on the Concord River in Lowell.

Blueback herring

Alewife

American shad

American eel

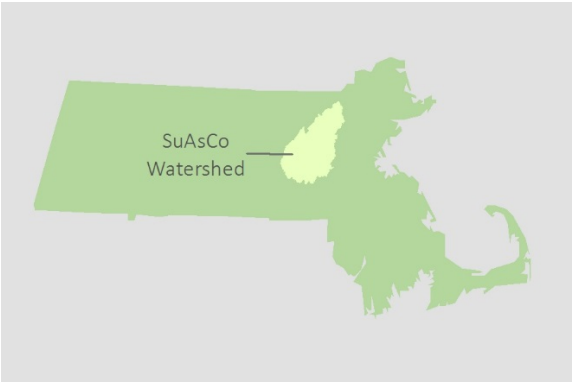
Sea lamprey

Species targeted for restoration include both species of river herring (blueback herring and alewife), American shad, American eel, and sea lamprey, all of which are diadromous fish that depend upon passage between marine and freshwater habitats to complete their life cycle. Reasons for pursuing fish passage restoration in the Concord River watershed include the importance and historical presence of the target species, the connectivity of and significant potential habitat within the watershed, and active public input and support.

The impact of diadromous fish species extends far beyond the scope of a single restoration project, as they have a broad migratory range along the Atlantic coast and benefit commercial and recreational fisheries of other species.

Project Support & Outreach

This project has been led by the Massachusetts Department of Fish and Game (DFG), Division of Marine Fisheries (*MarineFisheries*) with support from the National Oceanic and Atmospheric Administration (NOAA) Restoration Center, the US Fish and Wildlife Service (USFWS), and the Massachusetts Department of Environmental Protection (MassDEP). Gomez and Sullivan Engineers, DPC (Gomez and Sullivan) was contracted to conduct the study, which involved a review of existing information, hydrologic and hydraulic analyses, structural assessment, evaluation of impounded sediments, conceptual design of fish passage options, this feasibility report, and final public meeting. The Public Archaeology Laboratory (PAL) was subcontracted to conduct a cultural resources analysis.



Public involvement is paramount in the process of restoring diadromous fish to the Concord River. Public input has been or will be actively solicited at the following stages in the timeline of the broader restoration effort surrounding this feasibility study: planning phase, feasibility phase (this study), additional feasibility and consultation phase, design phase, and permitting.

Feasibility Study Overview

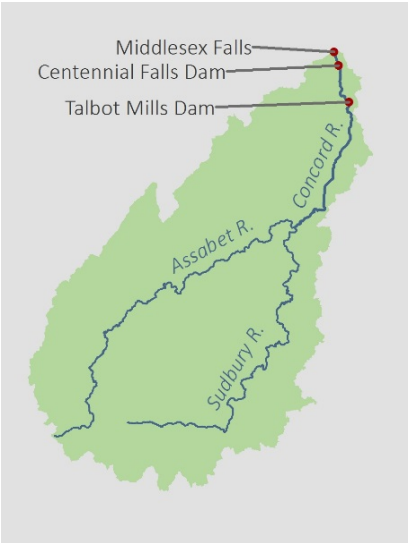
The first step in this project involved an extensive review of available existing information to compile data from previous studies and research, including information about the watershed, fish passage obstacles, infrastructure, and diadromous fishery resources. Various technical assessments—including a topographic survey and sediment, hydrologic, hydraulic, and cultural resources analyses—were then conducted to provide additional information for the alternatives analysis. Alternatives to restore diadromous fish passage in the Concord River were developed for each of the three sites of interest: Middlesex Falls, Centennial Falls Dam, and Talbot Mills Dam. The following alternatives that were determined to be most feasible for each site were analyzed:

- Middlesex Falls
  - No Action
  - Channel Improvements (1A)
- Centennial Falls Dam
  - No Action
  - Fishway Improvements (2A)
  - Volunteer Coordination (2B)
- Talbot Mills Dam
  - No Action
  - Technical Fishway (3A)
  - Partial Dam Removal (3B)

Obstacles to fish passage in the Concord River include Middlesex Falls (a natural bedrock falls and remnants of a breached dam), Centennial Falls Dam (a hydro dam with a fish ladder), and Talbot Mills Dam (a former mill dam that currently has no fish passage facilities).

Each alternative analysis included a discussion of its conceptual design, ability to meet target fish passage thresholds, potential benefits and impacts, recommendations for additional studies, and budgetary opinion of cost where applicable.

Site Background



The lowest potential obstacle to fish passage in the Concord River is Middlesex Falls at river mile 0.44 in Lowell, where the former Middlesex Dam was breached in the early 1980s. The site now consists of a large island flanked by a main channel defined by the remains of the concrete dam abutments and a minor channel defined by the remains of the former mill race/power canal. The natural bedrock ledge of the falls creates turbulence, making it hard for fish to pass upstream. Previous studies have suggested that during low flow conditions in spring, fish passage could be impeded, particularly for river herring and American shad.

The next obstacle is the Centennial Falls Dam at river mile 1.55 in Lowell, which contributes to hydraulic head for the Centennial Island Hydroelectric Project, a run-of-river facility owned and operated by Centennial Island Hydroelectric Company. The circa 1900, irregularly

shaped dam is approximately 8 feet high and 320 feet long. Fish passage structures added to the dam in 1990 include an upstream fish ladder and a downstream bypass sluice. The fishway has a history of deficiencies and passage efficiency is unknown. However, river herring have been observed using the fish ladder—a success due in part to recent active management of the fishway by the dam owner.

The third and primary obstacle to fish passage in the Concord River is the Talbot Mills Dam at river mile 4.76 in Billerica, a former mill dam that currently has no fish passage facilities. The dam is privately owned by CRT Development Realty, LLC. Its broad-crested stone masonry primary spillway is about 127 feet long and 10.2 feet high. It is classified as an Intermediate sized, Significant (Class II) Hazard potential structure. According to the most recent (2015) dam safety inspection, the dam was found to be in "fair" condition. Noted deficiencies include the lack of an operation and maintenance plan, lack of routine oversight of the dam (particularly during storm events), lack of working controls, lack of an operable low level outlet and emergency bypass in the event of flooding, seepage in the spillway abutments (particularly the left abutment), and trees located just downstream of the primary spillway and on the upstream face of the left embankment near the former intake gates to the Talbot Mills complex. Significant remedial measures were recommended to bring the dam into compliance with dam safety regulations, including repair or replacement of the left abutment, low level outlets, and sluiceway and stilling basin gates, totaling (at a minimum) over $100,000.

The Talbot Mills Dam does not meet dam safety regulations and increases upstream flooding.

Additionally, as part of this study, the dam was found to not meet dam safety regulations to be able to pass the 100-year spillway design flow without overtopping. As such, spillway capacity would need to be added, and recommended dam safety repairs would need to be made if the dam is maintained as is or modified in any way (e.g., to add a fishway). Although described in the dam safety report as a flood control dam, it is important to note that an overflow or "run-of-river" type of dam such as the Talbot Mills Dam provides no flood control. In fact, the hydraulic analysis conducted for this study found that the dam increases upstream water surface elevations—by at least 3.5 feet upstream of the dam and 0.8 feet at the upstream extent of the Concord River for the 100- and 500-year floods. The lack of any operable low level outlet or emergency bypass system at the Talbot Mills Dam further decreases its ability to provide any sort of flood control.

The Talbot Mills Dam is a historic property listed in the National Register of Historic Places. The site of the current dam has a long and controversial past. Prior to the damming of the Concord River in North Billerica, the area was used by generations of Native Americans as an encampment and fishing grounds. The first dam was erected at the site over 300 years ago in 1711. Over the course of the next nearly 150 years and incremental raising of the dam height, various legal disputes between multiple generations of farmers and dam owners resulted in the dam being removed and rebuilt several times. Both the current dam, built in 1828, and its predecessor, built in 1798, reportedly included a fishway, which was likely a simple opening in the spillway abutment through which fish could pass under suitable flow conditions with unknown effectiveness. The fishway was filled with concrete sometime after the 1960s. If a fish passage restoration alternative is selected for implementation at the Talbot Mills Dam (e.g., a technical fishway or partial dam removal), the lead federal agency for this project (NOAA) would consult with interested parties on ways to avoid, minimize, or mitigate any adverse effects to historic and archaeological resources that may result.

Feasibility Study Findings

Diadromous fish passage restoration in the Concord River is feasible.

This study has demonstrated that diadromous fish passage restoration in the Concord River is feasible. Alternatives at the two most downstream sites—Middlesex Falls and Centennial Falls Dam—are relatively straightforward and inexpensive and could be implemented fairly quickly if pursued. Channel improvements at Middlesex Falls (Alternative 1A) may help reduce flow turbulence to more acceptable ranges for upstream passage, or this project could be deferred to a later phase after additional monitoring to confirm whether or not fish can navigate the falls at a satisfactory rate. Minor fishway and operational modifications could be made at Centennial Falls Dam (Alternative 2A) to improve fish passage, and the opportunity for continued stewardship and public education at that site and throughout the watershed (Alternative 2B) would help ensure the lasting effectiveness.

Although more complex than options at the other sites, each of the alternatives at Talbot Mills Dam—a technical fishway or partial dam removal—has been demonstrated to be technically feasible. Installation of a fishway (Alternative 3A)—including a Denil ladder, eel ramp, and downstream bypass notch—would provide effective passage for target species. Passage of other aquatic species and overall connectivity of the river would be limited, but would represent an improvement over existing conditions. With the exception of cultural resources and aesthetics, little to no impacts to other resources are anticipated. The obligation to bring the dam into compliance with dam safety regulations as well as the continued responsibility for ongoing operation, maintenance, and liability associated with the dam would impact the cost effectiveness of this alternative. Still, a fishway at Talbot Mills Dam is a viable alternative for restoring diadromous fish in the Concord River that could advance to the next phase of this project for further study.

Conceptual rendering of a fish ladder at Talbot Mills dam

The proposed partial removal of the Talbot Mills Dam (Alternative 3B) would provide effective passage for target species as well as significant benefits for other resources. Water quality, aquatic habitat connectivity, and natural riverine sediment regime would be restored. Increased upstream flooding resulting from the dam would be reduced. Aging infrastructure would be decommissioned, eliminating ongoing operation, maintenance, and liability costs and concerns. Recreation and aesthetic resources may improve as well, although these benefits are subject to individual preferences of the members of the public using the resources. With the exception of cultural resources, few impacts to other resources are anticipated. As such, partial removal of the Talbot Mills Dam is a feasible alternative for restoring diadromous fish in the Concord River that could be further evaluated in future phases of this project.

Conceptual rendering of the partial removal of the Talbot Mills dam

Providing fish passage at the Talbot Mills Dam and addressing any potential obstacles at Middlesex Falls and Centennial Falls Dam would restore over 35 miles of diadromous fish habitat on the mainstem Concord, Assabet, and Sudbury Rivers, plus more than 100 miles of habitat on tributaries to these rivers and at least 260 acres of lacustrine habitat (not including areas that could be accessed with fish passage at additional upstream dams). The possibility of combining two or more alternatives together, implemented simultaneously or in several phases, provides the flexibility to develop a watershed-wide restoration plan that has both immediate and long-lasting benefits.

Providing fish passage at the Talbot Mills Dam would restore over 35 miles of diadromous fish habitat on the mainstem Concord, Assabet, and Sudbury Rivers, plus more than 100 miles of habitat on tributaries.

Next Steps

This feasibility study is not intended to identify a preferred alternative, but rather provides a critical foundation for ongoing and future restoration activities as well as a framework for continued communication between project partners and the public to determine how best to reconcile project goals with other interests. If preferred alternative(s) can be agreed upon, the project will advance to future phases of securing funding, additional feasibility work, consultation with interested parties, design, and construction to ultimately restore diadromous fish passage to the Concord, Sudbury, and Assabet Rivers.