



## Town of Bristol Citizen Science and Engineering to plan for the restoration of Pemaquid River Alewife

*"The Board of Selectmen of the Town of Bristol fully support the reconstruction of the fishway on the Pemaquid River, given the importance of healthy fisheries to the local economy and the support shown for the project by the community at large."*

Chad Hanna, Chairman  
Board of Selectmen (2015)



### **PARTNERS**

Fish habitat restoration projects typically benefit greatly from project teams representing a diversity of member types and levels of experience. Our growing list of project partners include: Town of Bristol/ Bristol Fish Committee, Pemaquid Watershed Association, local landowners and volunteers, ME Department of Marine Resources and US Fish and Wildlife Service

### **ISSUE AREA**

Maine's dams and culvert crossings often block access between important habitats for fish spawning, rearing and refuge from extreme temperatures. Alewives are especially vulnerable to migration "barriers" like dams and roads that block access to freshwater and marine habitats required for reproduction and growth to adulthood.

The Pemaquid Watershed's alewife run has long supported the sustenance and livelihoods of people from the local area and afar. The run has also periodically faced the threat of collapse, often due to dams without adequate fish passage. Presently, the Bristol Mills Dam fishway is the crucial link in providing access to most of the watershed's alewife spawning habitat.

### **PROJECT DESCRIPTION** (completed May 2015)

This project intends to reestablish unhindered alewife access throughout historic spawning grounds in the Pemaquid River Watershed. Our approach for the project relies on citizen science, participatory planning and stewardship, and well-proven engineering solutions. A Maine Coastal Program Coastal Communities grant funded the design phase of the project, which was aimed at developing engineering documents and partial regulatory permitting to address the primary impediment to alewife passage in the Watershed: the Bristol Mills Dam fishway.

## **THE CHALLENGE & APPROACH TAKEN**

The Bristol Mills Dam fishway, built in the 1980s, has for several decades been suspected of hindering fish passage, but data identifying the specific nature of deficiencies were unavailable until recently. Two years of volunteer alewife monitoring initiated by the Maine Department of Marine Resources (Maine DMR) and the Maine Coastal Program in 2013 demonstrated that the fishway is limiting the number of alewives passing producing. These data, subsequent fish tagging research by DMR, and the results of site visits by experienced fishway engineers provided the impetus to embark on a redesign of the fishway to improve performance. Specific problem areas identified at the fishway were:

- Poor attraction of fish to the entry
- Excessive elevation gain and turbulence at the entry
- Lack of a proper resting pool
- Lack of proper water control

Aside from the technical challenges of designing a fishway that performs well for the target species, fishway projects are faced with a diverse suite of challenges not limited to 1) need for adequate funding, landowner support, 2) local support for the best fishway design for the site, 3) integration of water level management and fishway maintenance into the planning process, 4) efficient permitting, 5) and demonstration of long-term local commitment to fishway stewardship and maintenance.

We sought to address most of these challenging by assembling a project team that weighed heavily on local community support and also the experience of seasoned restoration practitioners. With the advent of volunteer monitoring at the fishway in 2013, interest in the project soon grew, including re-establishment of the Bristol Fish Committee, which had disbanded some years earlier. The two years of monitoring data provided by volunteers provided a solid foundation for advancing the rough the design phase of the project. With an award from the Maine Coastal Program's Coastal Communities Grant Program, the engineering phase of the project was underway. Deciding on the conceptual, intermediate and final engineering design for the fishway was a highly deliberative process, informed by historical records and recollections, expert knowledge and opinion, and local engagement. The design advanced through four stages: conceptual, initial (90%), revised initial (90%) and final (95%). At each phase, the core project team, which included three of the most experienced fishway engineers in the northeastern, reviewed the latest set of engineering plans and then forwarded recommendations to the Town government for approval and advancement to the next stage of the process. The totally revised initial design came about as a result of the Project's overall goal for the fishway evolving from developing relatively "low cost" passage improvements to developing a fishway design capable of accommodating recovery of the alewife population size to full potential.



## COASTAL COMMUNITY GRANTS: Coastal habitat restoration

We originally intended to submit all permits for the construction phase of the fishway project during the design phase. After a pre-application regulatory meeting with several agencies, we decided against submitting fishway permitting because we anticipate an upcoming intensive dam inspection in summer 2015 that would likely require additional permits. We intend to combine both activities (the dam alterations and fishway construction) as the same construction project under the same permits.

### THE RESULTS

Several notable accomplishments of this project phase are worth mentioning. First, the Project resulted in engineered fishway design plans featuring the following improvements:

- Entry moved to where alewives naturally congregate
- Entrance of the fishway improved so fish can enter
- Slope of the fishway reduced
- Integration of a large resting pool
- Improved water control
- Addition of a monitoring platform
- Size increase from 3-feet wide to 4-feet wide

Secondly, volunteer monitoring at the fishway continued throughout the design process and will persist until at least several years after the new fishway is built.

The Bristol Fish Committee initiated practices and installed temporary structures that have improved passage until the long-term and sustainable solution of a new fishway can be implemented.

The project scope and team have also expanded to begin the process of planning for fish passage improvements in other parts of the Watershed.

Lastly, in a show deep commitment to the Project, the town of Bristol allocated \$20,000 to help kick-off a capital campaign for construction of the new fishway.

### NEXT STEPS AND OPPORTUNITIES

Next steps for the project primarily consist of the following activities:

- Complete the dam inspection and incorporate any necessary repairs/alterations into a single set of construction documents and permitting that also includes the fishway.
- Work with project partners to acquire funds for the construction phase of the fishway project.
- Identify other fish passage/connectivity barriers in the Watershed and develop a plan that add reassess these.



## **NEEDS**

Primary needs are for construction funding for the fishway and development of a plan/ funding to address other connectivity needs (primarily passage barriers caused by road culverts) in the watershed.

## **LESSONS LEARNED**

Perhaps self-evident, but one notable lesson learned during this project was most likely that identification of a realistic and responsible goal for fish passage is paramount for building a good foundation for subsequent activities and for overall success of the project in the long-term. Our initial decision to design "cost-effective" fishway improvements was motivated by knowledge that a major funding program for fishway construction in Maine was recently scrapped by NOAA and that NOAA had shifted its focus towards the Penobscot River Watershed. This change in policy left a major funding gap for the rest of the state, even for very high quality projects like ours, which were previously considered very attractive to NOAA funders. Wanting to provide prompt improvements to the Pemaquid alewife run to achieve at least a self-sustaining condition, we sought a fishway improvement solution that would achieve a realistic balance (under current funding conditions) between cost and performance and would be acceptable to funders, resource agencies with authority over alewife, and regulators. However, after some reflection, some Project Team members felt a major goal revision was warranted. The major consideration was that the Bristol Mills Dam fishway is the primary hindrance to a very large amount of upstream alewife spawning habitat (>2,400 acres). As a result, correcting passage problems at Bristol Mills could, in a single stroke, unlock access to one of the largest aggregations of alewife habitat in midcoast Maine. Designing a fishway that could accommodate growth of the Pemaquid alewife run to full potential (>600k returning adults) would cost on the order of \$150k-\$200k. That was more than we originally planned for, but no more than the cost of many other projects offering far smaller habitat gains. As a result, we reasoned that the goal of the engineering design should be to support full recovery of the population, not partial recovery because that is what seemed "affordable" in the short-term. The final cost estimate for construction is \$246,411 (2015).

## **APPLICABILITY FOR OTHER MUNICIPALITIES**

The overall trajectory, work plan and tasking of this project was modeled after over 100 other successful projects throughout the Gulf of Maine that were in part or whole brought to successful conclusion by the Gulf of Maine Council on the Marine Environment's Community Habitat Restoration Program. As the name of GOMC's now defunct program suggested, strong local support is a key factor in projects like ours as was gathering highly experienced project teams around local restoration issues.



**COASTAL COMMUNITY GRANTS:  
Coastal habitat restoration**

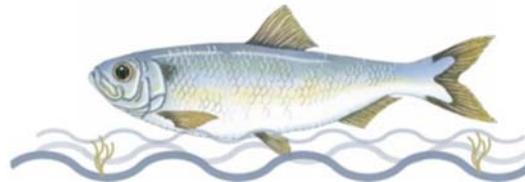
**RECOMMENDATIONS**

Funding amounts for the statewide construction of fishways is reduced from previous years among federal sources and not supported at all by any state funding programs. Many of Maine's fishways were constructed in the 1970s or 1980s and have reached the end of their design life, much like the ubiquitous problem of road crossings that are aging and block fish passage. Given the scale of this public infrastructure problem, new, sustained, and streamlined funding solutions for fishways and road crossings statewide would greatly help towns and complement the considerable investments of state and federal agencies on recovery of fisheries over the past decades.

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FY14 CCG - 27  
3.3.17.

Financial assistance provided by the National Oceanic and Atmospheric Administration, U.S. Department of Commerce Grant CZM NA13NOS4190045 to the Maine Coastal Program. Coastal Community Grants are awarded and administered by the Maine Department of Agriculture, Conservation and Forestry Municipal Planning Assistance Program.

