Regenerative Stream Channel Serves As A Nature-like Fish Passageway

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Abstract

The Bishopville Stream Corridor Enhancement Project involved the removal of a popular but aging mill dam to create a nature-like fish passageway in coastal Maryland. The project goal was to remove the dam while maintaining the existing pond and create fish passage through a series of rock weirs and shallow berms that served as a stream corridor to transition from non-tidal to tidal waters. Specifically, the project removed the 85 foot long steel coffer portion of the existing dam and replaced it with a boulder weir. A series of weirs 80-120 feet long and 35 feet wide and consisting of boulders and cobble to slow stream velocity created resting areas for fish to navigate further upstream. The berm and weirs were constructed of clean select sand and cobble fill material that was stabilized with herbaceous and woody wetland species including Atlantic white cedar and bald cypress. Construction sequence is described and is applicable in situations where pond habitat is to be maintained. Since the project was completed in fall 2014, anadromous fish including alewife, white perch and gizzard shad successfully moved upstream through the project during the 2015 and 2016 spring spawning runs.

Background

Watershed plans cited the Bishopville Dam as the major impediment to fish passage in the watershed. A dam had been at that location since, at least, shortly after the Civil War and was an integral part of the soul of the small community. There are over 500 such mill ponds in MD and a great many are much loved. Dam removal to provide fish passage was discussed but quickly decline because of the very strong desire of the residents to maintain their pond. Once the innovative concept of combining a stream channel with maintaining the pond was presented, the project was finally accepted by the community. Next, permitting agencies had to be convinced.

Implementation

The dam was a 4 ft high sheet pile dam that was in place since 1950 and impounds a 4 acre pond with a 34 sq mi watershed. Many meetings were held with local residents to explain the innovative construction project that would provide fish passage while maintaining the existing pond.

Concept

Conceptual design of created stream and weirs

Parabolic shape of weirs.

The concept was to first build a berm that would separate the pond from the passageway. The fish passageway would consist of a series of weirs that serve as grade controls and water spreaders to dissipate water velocity. The weirs would create the shallow steps and pools to allow fish to navigate up the four-foot elevation change. The weirs were formed in a parabolic shape to allow water to find its own path through the structures allowing for self-organization of the bottom substrate. The weirs were constructed of clean select sand and cobble fill material that was stabilized with herbaceous and woody wetland species including Atlantic white cedar and bald cypress.

Significance

This is part of the nationwide movement to remove and restore areas where dams are no longer in use. Their removal, although initially releasing built-up nutrients into the water column, allows the habitat to become more natural and fosters fish passage. There are alternatives, such as fish ladders and elevators, but these are not nearly as effective as removal and restoration of natural habitats.

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Outcomes

- Allows fish passage for alewife, white perch, and other herring species, as well as resident species that were previously swept over the dam.
- The opening of 7 miles of spawning area for anadromous fish species, as well as catadromous American eels.
- Restoration of 1.5 acres of tidal and non-tidal wetland stream habitat.
- 32,400 lbs. of nitrogen locked in the sand berm which prevents material from moving down stream.
- 1,100 Atlantic white cedar planted, as well as Virginia pine, bald cypress, and sweetbay magnolia.

Impacts on Community

- Improved health of local waterway
- Recreational area preserved
- Educate about the project and why it is important
- Foster environmental stewardship

Numbers of fish that were collected in the trap net at the upstream end of the project 2015 and 2016, the first 2 spawning seasons after completion of the project.

Dissolved oxygen (DO, left panel) in the pond (top) and just below the project (bottom) shows interesting patterns. Pond DO fluctuates widely early in the year, even supersaturation, but as the water goes through the series of weirs, the excess DO levels drop. But later in the year as DO levels drop in the pond, the weirs tend to increase DO in the water. Temperature (right panel) tends to decrease as the water tumbles through the weirs.