Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
New Hampshire

Stakeholders Cooperate to Restore Habitat in Lake Horace Marsh

Waterbody Improved

Lake Horace Marsh is one of only two town-designated prime wetlands in the Town of Weare, New Hampshire. This aesthetically beautiful marsh has long been a popular summertime recreation area. However, management of the downstream Lake Horace dam resulted in water-level fluctuations that adversely affected biological function and inhibited establishment of perennial wetland vegetation. Installing an ecological control structure (ECS) isolated the marsh from drawdown impacts and allowed water levels to more closely mimic natural conditions. Post-installation vegetation monitoring indicates that stabilized water levels have improved wetland condition and vegetation regime diversity.

Problem

Lake Horace is a dam-controlled lake on the North Branch of the Piscataquog River in Weare, New Hampshire. The southern end of the lake supports the 180-acre Lake Horace Marsh wetland complex (Figure 1). The marsh is presumed to be of high value for a range of wetland functions, particularly flood attenuation, sediment retention, wildlife habitat, fisheries and recreation. The 2006 *New Hampshire Wildlife Action Plan* maps Lake Horace as a part of a wetland complex that is "highest ranked in biological region" (the Hillsboro Inland Hills and Plains ecoregion).

The New Hampshire Department of Environmental Services (DES) manages the outlet dam on Lake Horace. The lake water level is lowered in October, and the lake is allowed to refill in May. This management regime resulted in a 3- to 5-foot drop in winter water levels in the marsh. Informal wildlife surveys during the 1980s and 1990s showed consistently fewer waterfowl, amphibians, furbearers, reptiles and insects than expected in the otherwise high-quality habitat. The timing of the fall drawdown was detrimental to animals that had prepared for freezing conditions when water levels were high. The spring fill-up flooded nests and created harsh conditions for fish redds and frys. Water level fluctuations did not allow typical wetland vegetation types to become established. A 2007 wetland functions and values assessment performed by biologists from the New Hampshire Fish & Game Department (F&GD) stated that the drawdown adversely impacted fish spawning and waterfowl nesting.

Figure 1. A post-restoration photograph of Lake Horace Marsh shows growth of multiple zones of healthy aquatic and emergent vegetation.

Project Highlights

The observation that fluctuating water levels were detrimental to the health of the marsh led the Piscataquog Land Conservancy (PLC) to advocate for altered dam management. Years of attempts to change the drawdown-refill practice had been unsuccessful because shoreline residents relied upon the drawdown to maintain and protect waterfront retaining walls and docks. There was no indication that this impasse was likely to be resolved. In 2003 the town announced plans to replace a century-old bridge on the road that forms the boundary between the lake and the marsh. This presented a unique opportunity for PLC to work with the town to implement an innovative solution to the ecologically disruptive fluctuations in marsh water levels.

With assistance from a 2004 U.S. Environmental Protection Agency (EPA) Clean Water Act (CWA) section 319 grant, PLC began a project to protect the marsh. PLC's proposed method was to install an ECS in the vicinity of the bridge. The ECS is essentially a low weir designed to retain water in the marsh during winter drawdown, while allowing normal connectivity and function (e.g., navigation, fish passage) during the rest of the year. The stone and impervious geotextile membrane structure was designed to key into the new bridge footings and span the river in a downstream-facing arc. The construction of the ECS occurred in conjunction with the fall 2008 bridge replacement work (Figure 2). The marsh now has a more natural water level fluctuation, because the ECS prevents the marsh from being drained when the lake level is lowered. The DES Dam Bureau designed and assumed ownership of the ECS, and it will also ensure that routine inspection and maintenance is completed. PLC contracted with an environmental consultant to conduct baseline monitoring, as well as three years of post-construction monitoring to assess the response of the marsh ecology.

Results

Since installation of the ECS, marsh water levels do not fall below the crest of the structure during annual lake drawdown. The unnatural spring and fall fluctuations that affected Lake Horace Marsh have been eliminated. In assessing project success, it is evident that the ECS created the more natural water-level fluctuations necessary for marsh restoration. However, biological marsh community response cannot be fully evaluated in the short term without great effort and expense. Therefore, vegetation community assessments are being used as a surrogate measure for biological community health. The key performance targets focus on whether the ECS effectively stabilized marsh levels to allow the establishment of diverse vegetation types suitable for forage and nursery zones, as well as secure overwintering habitat for reptiles and amphibians.

Changes detected at Lake Horace Marsh relative to the 2006 baseline studies include increased aquatic bed and deep marsh vegetation, and reduced open water (see Figure 1). The 2010 vegetation mapping showed that both the aquatic bed/open water and aquatic bed/emergent marsh cover types had increased, along with increases in several emergent species and decreases in open water in both the aquatic and emergent plots. These findings are consistent with the more stable winter water levels, resulting in a more suitable environment for overwintering perennial vegetation. Visually, the marsh now appears as a narrow channel of predominantly open water bordered by a mix of submerged aquatics and emergent vegetation. The development of diverse vegetative cover types is expected to continue as the substrates slowly accrete and perennial vegetation expands.

Figure 2. Installation of the ecological control structure (ECS) during winter 2008 lake drawdown.

Partners and Funding

Numerous project partners were involved in completing this project. EPA provided $64,359 in CWA section 319 funds. PLC, in close cooperation with DES staff, coordinated the project. The DES Dam Bureau provided designs and construction oversight. The Weare Conservation Commission provided $4,364 and the Russell Piscataquog River Watershed Foundation provided $8,500. The F&GD provided funding ($23,500) and technical assistance. Individual PLC members donated $300 to the project. Volunteers contributed an additional $6,179 of in-kind support to the nonfederal share for this project, bringing the match to 40 percent of project costs. The total project cost was $107,202.

U.S. Environmental Protection Agency
Office of Water
Washington, DC

EPA 841-F-15-001L
March 2015

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