



# NONPOINT SOURCE SUCCESS STORY

## New Hampshire

### McQuesten Brook Restoration Protects Native Brook Trout

#### Waterbody Improved

McQuesten Brook runs through highly urbanized areas. Despite the stressors associated with that setting, the brook hosts a robust population of native eastern brook trout. Low dissolved oxygen (DO) levels and barriers to fish passage threatened the survivability of the trout, and McQuesten Brook was added to the Clean Water Act (CWA) section 303(d) list of impaired waters for DO in 2010. In response, the New Hampshire Rivers Council (Council) coordinated implementation efforts recommended in the *McQuesten Brook Geomorphic Assessment and Watershed Restoration Plan*. Actions included bioengineered bank stabilization, floodplain restoration, stream crossing upgrades and stream daylighting that restored natural channel geometry, function, and DO levels. As a result, the New Hampshire Department of Environmental Services (NHDES) removed a segment of McQuesten Brook from the 2018 CWA section 303(d) list of impaired waters for DO.

#### Problem

In 2010, NHDES listed a segment of McQuesten Brook (assessment unit NHRIV700060803-16), a tributary to the Merrimack River, located in Bedford and Manchester, New Hampshire, for failure to support aquatic life integrity due to insufficient DO concentration. The brook did not meet the state standard of 5.0 milligrams per liter (mg/L). A sequence of open and closed channels and four fish passage barriers restricted the movement of brook trout and contributed to the DO impairment in this highly urbanized, 564-acre watershed (Figure 1).



Figure 1. Culverts like this one on Eastman Avenue blocked fish passage and contributed to low DO.

#### Story Highlights

NHDES awarded the Council a CWA Section 319 Watershed Assistance Grant to develop the *McQuesten Brook Geomorphic Assessment and Watershed Restoration Plan* in 2013, which ranked culvert improvements as the second most important structural recommendation in the watershed. These obstructions included: (1) an undersized culvert that carried the brook under a road and served only one household while constricting the brook and restricting aquatic organism passage; (2) another undersized culvert built with enough road fill to meet NHDES' definition of a dam; and (3) a collapsed stone culvert that completely blocked the channel and rerouted McQuesten Brook.

In mid-May 2016, work began. The Town of Bedford purchased and demolished the only house accessed by Wathen Road to the east of the brook, then removed a 35-foot segment of the road and the 36-inch undersized culvert. This innovative approach was less costly than upgrading the crossing with an appropriately sized bridge to provide proper aquatic organism passage and conveyance of flood flows. The Town's contractors regraded the floodplain to match upstream and downstream elevations. To attenuate floodwaters, they created roughness on the floodplain with salvaged branches and pieces of large wood held in place by felled trees. They seeded and planted the area to minimize erosion. The brook was diverted, and the culvert was removed in sections. Crews restored the bed with rounded cobble, and they stabilized the

channel and banks with bioengineered gravel bars and crib walls made of logs, stone, and root wads. They also constructed a log and stone crib with integrated root wads at the new terminus of Wathen Road. The design protects a parallel water main and a new detention and infiltration basin and its overflow outlet.

Upstream and one block north of Wathen Road, where the brook was constricted, the Town of Bedford replaced an undersized 36-inch culvert at Eastman Avenue with a 15-foot open-bottom bridge. This structure is sized appropriately for aquatic organism passage and conveyance of flood flows up to one and a half times bankfull width (Figure 2).

Immediately upstream of Eastman Avenue, contractors removed the remnants of a collapsed stream crossing. This work restored stream channel dimensions, function, and fish passage along a reach of the brook that previously supported little or no fish passage. Construction was completed in July 2016. Concurrently, several obsolete dams were removed upstream. This effort increased aquatic organism passage throughout the watershed and connected the restored culvert sites with upstream reaches, including McQuesten Pond, which (at that time) was also on the CWA section 303(d) list due to low DO. McQuesten Pond was slowly drained, and the area is now a defined wetland channel.

## Results

Addressing these three fish passage impediments in 2016 re-established a more natural flow regime in this segment of McQuesten Brook, resulting in improved DO levels and lower water temperatures, which created a healthier and more valuable habitat for eastern brook trout and other aquatic organisms. After restoration work, the DO threshold of 5.0 mg/L was met during a wide range of temperatures and conditions similar to those present while the brook was impaired (Figure 3). In 2018, NHDES removed this river assessment unit from the CWA section 303(d) list for its DO impairment.

Subsequent brook trout population surveys completed by New Hampshire Fish and Game Department biologists revealed that trout size and population density have increased and are similar to those found in pristine northern New Hampshire streams.



Figure 2. A new bridge crosses Eastman Avenue.

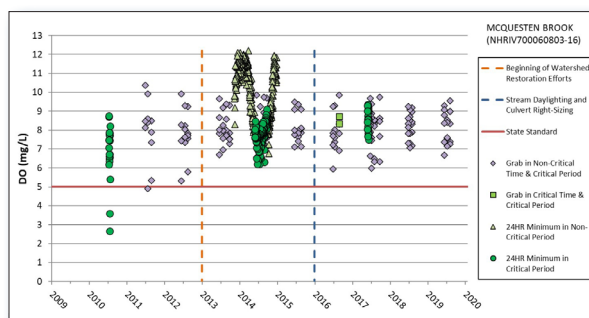


Figure 3. DO levels in McQuesten Brook (2009–2020).

## Partners and Funding

The Council's McQuesten Brook restoration plan and its initiative to partner with the Town of Bedford were the driving forces behind the daylighting project at Wathen Road. When the Town agreed to exceed the scope of their capital improvement plan at this site, the Council secured multiple grant resources and engaged a fluvial geomorphologist for specialized project design and construction oversight.

Funding provided in part by Watershed Assistance Grant Funds from NHDES, with \$50,000 in CWA section 319 funds from the U.S. Environmental Protection Agency awarded to the Council, who served as project manager. Other funds included \$345,000 in NHDES Wetland Bureau Aquatic Resource Mitigation Funds; \$482,504 in matching funds from the Town of Bedford's Capital Improvement Program, including engineering and construction costs; and another \$181,785 in matching funds from the Council, supported by dues, endowments, gifts, and more. Specialized contract work was performed by Field Geology Services and Inter-Fluve, Inc.



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