

Total Maximum Daily Loads
TMDLs
at Work
in Connecticut

Many Pollutants, One Target

Innovative TMDL Focuses on Impervious Cover to Address Stormwater Impacts in the Eagleville Brook Watershed

Like many urban watersheds, the Eagleville Brook watershed in eastern Connecticut is characterized by a mosaic of hard surfaces, such as parking lots and rooftops, that do not allow rain to infiltrate. Traveling over these impervious surfaces, large volumes of rapidly moving stormwater can carry a complex array of pollutants and cause other problems, such as streambank erosion and flooding. As shown in Figure 1, urban areas surround the headwaters of Eagleville Brook, including the University of Connecticut (UConn) and the Town of Mansfield. Eagleville Brook demonstrated water quality problems associated with stormwater runoff from urban impervious surfaces. The Connecticut Department of Environmental Protection (DEP) conducted surveys of fish and macroinvertebrate communities. Figure 2 shows how excessive sedimentation from stormwater runoff can degrade aquatic habitat. From these surveys, DEP concluded that Eagleville Brook did not meet the aquatic life designated use in Connecticut's water quality standards and required a TMDL. Studies by DEP across small Connecticut watersheds indicate that as little as 11 percent impervious surface has the potential to affect the speed, the timing, and the quality of runoff to a stream. Parts of the brook's watershed exceed 25 percent impervious surface.

To address the aquatic life impairment, DEP developed an innovative TMDL for Eagleville Brook. Rather than identifying reductions in specific pollutants, the Eagleville Brook TMDL establishes a target percentage of impervious cover (IC) for the watershed. Although IC is not the direct factor causing the impairment, it is a good indirect, or surrogate, measure because of the relationship between impervious surfaces and stormwater-related water quality problems. As stated in the final TMDL report, the goal of the TMDL is to reduce the effects of stormwater on aquatic life in Eagleville Brook. Therefore, future evaluation of the effectiveness of the TMDL will focus on the health of aquatic life in Eagleville Brook—not on measuring reductions in impervious cover in the watershed.

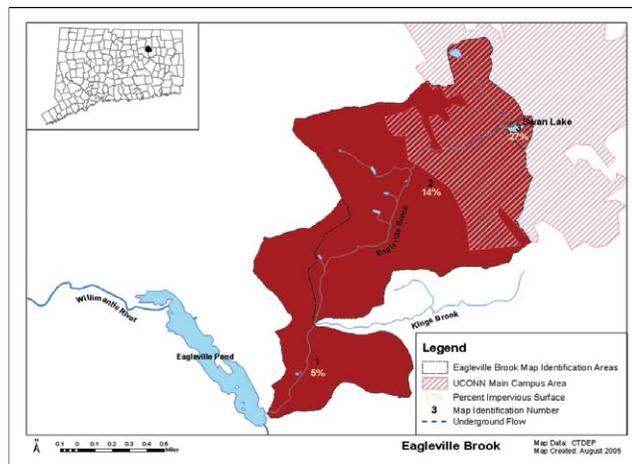


Figure 1. Location of the Eagleville Brook watershed.

TMDL at a Glance

Eagleville Brook Impervious Cover (IC) TMDL

(approved March 2007)

www.ct.gov/dep/lib/dep/water/tmdl/tmdl_final/eaglevillefinal.pdf

Factors causing impairment

Aquatic life designated uses impaired due to a complex array of pollutants transported by stormwater

Sources contributing to impairment

Urban storm water runoff from impervious surfaces. Impervious cover used as surrogate to address mix of pollutants and other stressors conveyed by storm water

Restoration options

Reduce and disconnect impervious cover where practical; minimize additional disturbance; install engineered best management practices to reduce effects of impervious cover on receiving waters

Stakeholder involvement

University of Connecticut, Town of Mansfield, Connecticut Department of Environmental Protection, Willimantic River Alliance, local businesses and watershed residents

Status of waterbody

Ongoing implementation

Benefits to stakeholders

Improved water quality and aquatic health, increased education, access to funding, and effective partnerships

What is a total maximum daily load (TMDL)?

It is a study or analysis that calculates the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. The TMDL establishes a pollutant budget and then allocates portions of the overall budget to the pollutant's sources. For more information on TMDLs, visit EPA's website at www.epa.gov/owow/tmdl.



Figure 2. Excessive sedimentation is a contributing cause of degraded habitat in Eagleville Brook.

How are TMDLs at work in the Eagleville Brook watershed?

The Eagleville Brook IC TMDL established a framework for highlighting water quality concerns and developing workable solutions. DEP applied the stressor identification process to examine the relationship between impervious cover and the adverse effect on aquatic life. This process enabled stakeholders to see connections between land use actions and water quality.

Who are the participating stakeholders and key partners?

Connecticut DEP is responsible for developing TMDLs in the state of Connecticut. To develop the IC TMDL for Eagleville Brook, DEP worked with key stakeholders, including UConn's Center for Land Use Education and Research (CLEAR).

TMDL implementation, unlike TMDL development, is in the hands of local stakeholders and partners, depending on the actions recommended by the TMDL. UConn's CLEAR and the Town of Mansfield are currently engaged in a project funded through a Clean Water Act (CWA) section 319 nonpoint source grant. Local watershed groups such as the Willimantic River Alliance, the Quinebaug-Shetucket Heritage Corridor, Inc., and the Thames River Basin Partnership have also taken an active interest in implementing the Eagleville Brook TMDL.

How did stakeholders participate in the TMDL process?

The overall TMDL process includes the following elements: CWA section 303(d) listing decisions, TMDL development, and TMDL implementation. Each element of the TMDL process provided stakeholders with an opportunity to express concerns and share information about the water quality problems in Eagleville Brook with DEP and other key partners. A description of each element of the TMDL process is provided below.

Section 303(d) listing decisions

If a waterbody does not meet water quality standards (i.e., numeric or narrative criteria) for one or more pollutants, it goes on a state's 303(d) list. Impaired waterbodies on this list require a TMDL for each pollutant contributing to the impairment. Stakeholders have the opportunity to provide input during the 303(d) listing process. While assessing Eagleville Brook, DEP observed low fish population densities and large amounts of habitat unoccupied by fish. Stretches of Eagleville Brook were almost devoid of fish. The surveys noted that sediment deposition from storm water runoff, as shown in Figure 2, was affecting in-stream fish habitat. An extensive DEP benthic invertebrate assessment following the fish surveys concluded that Eagleville Brook did meet the aquatic life designated use in Connecticut's water quality standards. DEP placed Eagleville Brook on Connecticut's 2004 list of impaired waterbodies requiring TMDL development.

TMDL development

Although DEP had sufficient information to determine that Eagleville Brook did not support the aquatic life designated uses, the data did not clearly point to a specific cause of impairment. As part of the TMDL development process, DEP conducted a Stressor Identification (SI) analysis to determine the most probable cause. The results of the SI analysis pointed to a complex array of pollutants transported by stormwater as the probable cause of the impairment in Eagleville Brook. Because no one pollutant was responsible for the impairment, DEP identified IC as a surrogate measure based on the relationship between impervious surfaces and stormwater quality and quantity. DEP developed a technical support document that provides the scientific basis for the use of IC as a surrogate measure for stormwater related impacts by demonstrating the correlation

between pollutant loads, stormwater flow, and runoff from impervious surfaces. The technical support document recommends a target of 12 percent IC for Connecticut streams with a watershed size comparable to that of the Eagleville Brook watershed.

Through the TMDL development process, DEP set a combined load allocation and wasteload allocation of 11 percent IC for Eagleville Brook. This target represents a recommended 12 percent IC threshold target and a margin of safety of 1 percent IC. The margin of safety is intended to account for uncertainty in the analysis.

DEP conducted an analysis of existing IC conditions in the Eagleville Brook watershed using UConn's Impervious Surface Assessment Tool (ISAT). Calculating the existing IC conditions in the watershed helped identify the percent IC reductions needed in specific locations to achieve the 11 percent IC target. For example, the TMDL identifies the need for a 59 percent IC reduction in one area on UConn's campus to achieve the 11 percent IC target.

DEP provided several opportunities for stakeholders to provide input on the Eagleville Brook IC TMDL, including public meetings and a formal public comment period. DEP reviewed comments provided by the public on the draft TMDL and prepared a response to comments document. According to DEP, public feedback on the draft TMDL was largely favorable, although there were some concerns that an IC TMDL approach might restrict future growth and development. DEP reassured the public that this approach would not focus on removing existing impervious surfaces or prevent future development. Instead, the goals of the TMDL are intended to promote improved stormwater management techniques and reduce the effects of stormwater runoff on the watershed.

TMDL implementation

Implementing the Eagleville Brook IC TMDL involves a four-step adaptive management strategy. The four steps are as follows:

- Reducing IC where practical
- Disconnecting IC from Eagleville Brook
- Minimizing additional disturbances
- Installing engineered best management practices (BMPs) to reduce the quantity and improve the quality of stormwater runoff.

A CWA section 319 project for Eagleville Brook is designed to take advantage of nationally recognized UConn expertise in stormwater management, landscape analysis, and land use planning, including ongoing DEP-UConn partnerships with the Jordan Cove research project and the *Nonpoint Education for Municipal Officials* (NEMO) education program. The goal is to develop a watershed-specific water quality management plan.

As part of this project, UConn, NEMO, and the Town of Mansfield are mapping potential locations for stormwater improvements and examining cost effectiveness for recommended BMPs at the mapped locations.

The TMDL development process has influenced the UConn staff involved with the design and implementation of stormwater BMPs, including the *Campus Sustainable Design Guidelines*. The TMDL has also set the stage for efforts to test BMPs within the Eagleville Brook watershed and measure site-scale results. For example, UConn is piloting a green roof in one location and identifying other possible locations suitable for this innovative stormwater management technique and others, such as rain gardens.

The Town of Mansfield has also implemented the Eagleville Brook IC TMDL through local land use planning and development reviews. For example, the town requested that the Environmental Review Team conduct a review and prepare a report for a proposed off-campus housing project and a small residential subdivision along Eagleville Brook.

What is the current status of Eagleville Brook as a result of the TMDL process?

With approval of the Eagleville Brook IC TMDL in March 2007, partners are just beginning to implement the TMDL. Over time, DEP will measure the aquatic diversity in Eagleville Brook to determine if implementation efforts are making progress toward restoring the brook's aquatic life designated uses. Although the ultimate measure of success is meeting the aquatic life designated uses, progress toward reducing impervious cover and mitigating impacts from stormwater runoff can also serve as an interim measure of TMDL implementation success.

How did local stakeholders benefit from the TMDL process?

Although it is too soon to measure the water quality benefits from implementing the TMDL, other benefits from the TMDL process include the following:

- **Increased stakeholder awareness and education.** Through the stressor identification analysis, stakeholders participating in the TMDL development process gained a better understanding of the connection between pollutant loads from impervious surfaces, the effects of stormwater volume and velocity from impervious surfaces, and changes to aquatic habitat and diversity.
- **Support for innovative stormwater management techniques.** The innovative approach to the Eagleville Brook TMDL translates to the consideration and piloting of innovative stormwater management techniques that fall under the umbrella of low impact design (LID). LID techniques under consideration in the Eagleville Brook watershed include green roofs and rain gardens. Through the mapping process, DEP and its partners will identify other potential locations for innovative stormwater management techniques and determine the associated cost-effectiveness of these approaches at priority locations.
- **Increased local stakeholder participation opportunities.** The Eagleville Brook IC TMDL process has fostered citizen involvement, such as participation in the streamwalk project sponsored by the Quinebaug-Shetucket Heritage Corridor Water Subcommittee.
- **Increased access to funding.** UConn and the Town of Mansfield are currently using Clean Water Act section 319 grant funding to create a watershed-based plan for the Eagleville Brook watershed that will assist with TMDL implementation. The total project cost is \$349,731, with \$200,000 in section 319 nonpoint source grant funding from DEP and \$149,731 in matching funds from UConn. The project will identify opportunities for near-term BMP implementation, as well as document a general methodology by which other regulated communities and entities can address impervious cover-based TMDLs. In addition, UConn is implementing a green roof project at a science building on campus. This project has a total cost of \$83,333,000, with \$50,000 in section 319 nonpoint source grant funds from DEP and \$33,333 in matching funds from UConn. DEP is providing an additional \$25,687 for this project to support more water quality monitoring activities



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For more information on the Connecticut TMDL Program, visit
www.ct.gov/dep/cwp/view.asp?a=2719&q=325604&depNav_GID=1654