



NONPOINT SOURCE SUCCESS STORY

Massachusetts

Installing Rain Gardens, Permeable Pavers and a Pocket Wetland Restores Recreational Uses to Sunset Lake

Waterbody Improved

Polluted stormwater runoff from a parking lot and access drive affected recreational uses at the town of Braintree's

Sunset Lake. High bacteria levels and dense nuisance aquatic plant growth resulted in several beach closings during each swimming season. The Massachusetts Department of Environmental Protection (MassDEP) placed Sunset Lake on the 1992 Clean Water Act (CWA) section 303(d) list of impaired waters for Eurasian watermilfoil. Project partners implemented a series of structural and nonstructural best management practices (BMPs) to address stormwater runoff to the lake. As a result, bacteria levels have decreased and water quality has significantly improved at Sunset Lake, allowing swimmers and boaters to return.

Problem

Sunset Lake, a 57-acre lake in the center of Braintree with a town-owned swimming beach, a park and a parking lot on its eastern shore, suffers from bacterial contamination issues, eutrophication and nuisance aquatic weed growth. The beach is generally closed several times during each swimming season due to bacterial contamination. The town has treated the lake with an herbicide several times to manage nuisance aquatic plants to allow for swimming and boating.

Sunset Lake was on the 2014 CWA section 303(d) list of impaired waters (in Category 4c); it drains to the Monaquot River. Land uses within Sunset Lake's 245-acre urbanized watershed are high-density residential, and include Braintree High School and athletic fields. In 1999 the Braintree Board of Health hired Comprehensive Environmental, Inc. (CEI), to conduct a bacteriological investigation of the lake and suggest solutions. Many of CEI's recommendations were implemented, such as lining leaking sewer pipes, changing the beach closure protocol, and installing an adequate aerator in the lake; however, some recommendations were not implemented due to lack of funding.

Project Highlights

In 2011 MassDEP received a U.S. Environmental Protection Agency (EPA) section 319 grant to improve the water quality of Sunset Lake by reducing stormwater runoff into the lake, particularly bacterial

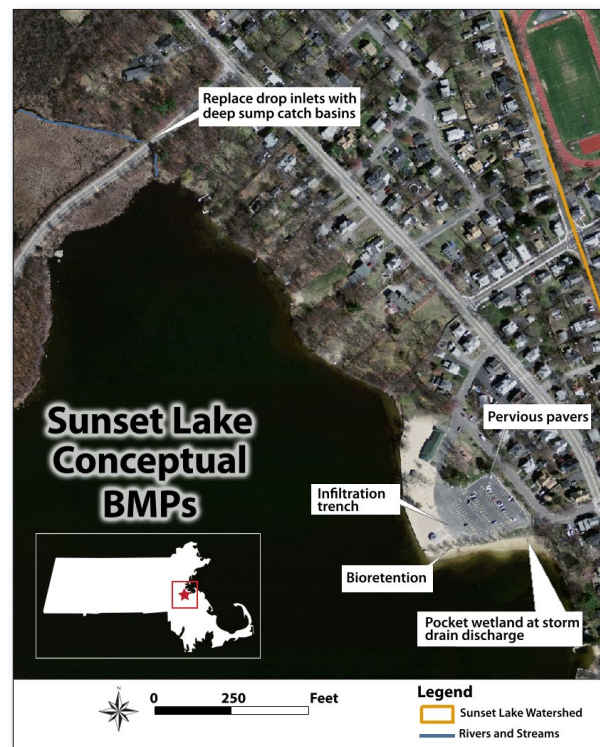


Figure 1. The town of Braintree added stormwater practices to protect Sunset Lake.

and nutrient pollution. The additional recommendations from the CEI report included BMPs for several focus areas (Figure 1.) Both structural and nonstructural BMPs were implemented as part of this project. The structural BMPs included one water quality swale, four rain gardens, three areas of permeable pavers,



Figure 2. Rain Garden 1 (approximately 600 ft²) collects and treats stormwater runoff from 11,270 ft² of Sunset Lake beachfront parking lot.

and two deep sump catch basins. Nonstructural BMPs included conducting outreach to residents around the lake (informing them about the project and the problems associated with feeding geese), installing a kiosk in the beach parking lot with informational signage, and promoting volunteer involvement in the project (e.g., planting rain gardens). All the structural BMPs were constructed in 2011 and 2012 and were operational by April 2012.

The infiltration trench/water quality swale is approximately 100 linear feet and was constructed at the western edge of the parking lot. The swale collects runoff from a drainage area of approximately 52,543 square feet (ft²). The swale is about 6 inches deep and infiltrates stormwater in small storms. In large storm events, the swale overflows to the catch basin that discharges to Rain Garden 1.

Four rain gardens covering approximately 1,360 ft² collect and treat flow from 15,500 ft² of the parking lot and 27,231 ft² of Safford Street (Figure 2). Three rows of permeable paver strips, each approximately 135 feet long by 5 feet wide, were installed in the parking lot. They overlay a crushed stone reservoir and allow for infiltration from approximately 24,045 ft² of the parking lot.

Two deep sump catch basins were installed in the high school access drive to replace existing drop inlets into the culvert connecting a large wetland to the lake. Water from the wetland flows to the lake. The drop

Table 1. Sunset Lake water sampling results (2009 – 2016)

Year	# of Weekly Tests	# of Single Sample Exceedances ¹
2009	21	9
2010	12	0
2011	13	1
2012	12	0
2013	12	0
2014	11	0
2015	14	1
2016	5	0

¹ In fresh waters, for *E. coli*, no sample shall exceed 235 colony-forming units (cfu) per 100 milliliters (mL), and the geometric mean of the most recent five samples within the same bathing season shall not exceed 126 cfu per 100 mL.

inlets allowed sediment, debris, and other items to drop directly into the culvert and flow into the lake. The deep sump catch basins will allow for sediment and debris removal and collect runoff from an area of approximately 16,988 ft² that includes portions of the access drive and a portion of Franklin Street.

Results

Visible indicators of the success of the BMPs have been observed. The scoured areas on the beach from the direct discharge of stormwater are gone. Ponding in the beach parking lot has been eliminated. A reduced frequency of beach closures indicate that bacteria are being removed by the BMPs. The Braintree Health Department conducts its weekly beach testing for *Escherichia coli* at Sunset Lake throughout each summer. Despite occasional heavy rains, there has been only one exceedance (in 2015) since the project was completed in 2012 (Table 1).

Partners and Funding

This project involved the cooperation of the town of Braintree, the Braintree Board of Health, CEI, MassDEP, EPA and local volunteers. The total project cost was \$157,330. EPA provided \$89,100 to MassDEP through a CWA section 319 grant. The town of Braintree gave \$68,230 for the project.



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

EPA 841-F-16-001MM
December 2016

For additional information contact:

Malcolm Harper
Massachusetts Department of Environmental Protection
508-767-2795 • Malcolm.harper@state.ma.us