Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Vermont

Logging Management Restores Joiner Brook Segment

Waterbody Improved

Erosion and sediment runoff from poorly managed logging operations degraded the biological communities in a tributary to Vermont's Joiner Brook. As a result, Vermont placed the stream on its Clean Water Act (CWA) section 303(d) list for aquatic life use impairments because of excessive sediment. Implementing Vermont's acceptable management practices for logging operations and the subsequent cessation of logging in the watershed brought the stream into compliance with Vermont's water quality standards. Vermont removed the stream from its CWA section 303(d) list in 2010.

Problem

The unnamed tributary to Joiner Brook is a 1.3-mile-long stream in north-central Vermont that drains a forested watershed south of the Bolton Valley Ski Resort in the Town of Bolton. Joiner Brook (Figure 1) feeds into the Winooski River, a large river that ultimately empties into Lake Champlain. The tributary watershed is steeply sloped, with the headwaters at an elevation of 2,200 feet and the junction with Joiner Brook occurring at 840 feet. The Vermont Department of Environmental Conservation (VTDEC) has classified the stream as a Class B water—a designation defined as "suitable for bathing and recreation, irrigation and agricultural uses; aquatic biota sustained by high quality habitat; good aesthetic value; acceptable for public water supply with filtration and disinfection."

VTDEC monitored macroinvertebrates in the stream using several different techniques, including the EPT index (short for the macroinvertebrate order names Ephemeroptera, Plecoptera and Trichoptera). The index is a measure of the number and types of pollution-sensitive, aquatic insects inhabiting a waterbody. Streams with a high EPT value contain a greater richness (diversity) of pollution-sensitive aquatic insects, indicating higher water quality. In addition, VTDEC measured macroinvertebrate densities—a general indicator of aquatic life viability and productivity—and a variety of other aquatic health indicators. VTDEC also measures the extent of stream embeddedness, or the amount of fine sediment filling in cracks between stones along the stream bottom. Embeddedness is a key indicator of habitat conditions.

Biological monitoring found that the stream did not fully meet Vermont's Class B water quality standards for aquatic life support in 1997. The stream had low EPT values and low macroinvertebrate densities. In addition, stream embeddedness was very high. As a result, Vermont placed the stream on its CWA section 303(d) list of impaired waters in 1998. VTDEC attributed the impairment to sediment entering the stream from logging roads (during and after construction) and mobilization of soil following tree removal. The sediment smothered benthic (bottom dwelling insect) habitat in the streams.

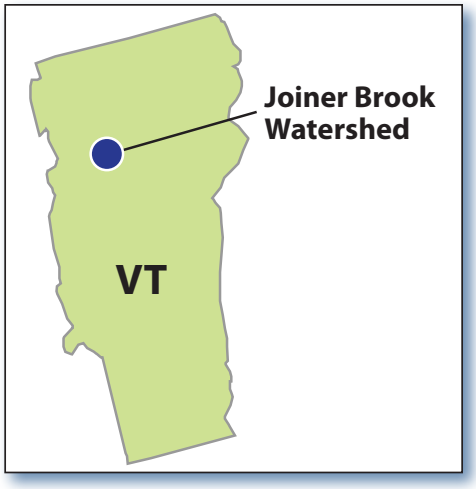

Figure 1. Joiner Brook is in Vermont's Winsooki River watershed.

Project Highlights

Major logging operations occurred in the watershed in 1997. Sediment eroded from logging roads and other disturbed areas was transported in stormwater runoff to the streams. In addition, some parts of the watershed were clear-cut, resulting in substantial erosion of soil from the steep terrain. Toward the end of the logging operation, the logging company implemented sediment control practices consistent

with Vermont's Acceptable Management Practices for logging operations. These practices included stabilizing ditches along logging roads, installing waterbars to dissipate flows along the roads, and adding silt fences and hay bales to reduce sediment transport to the streams.

Results

Implementing logging erosion management practices helped to control sediment transported from a temporary logging operation. Cessation of the logging operation in 1998 allowed the remaining damaged areas of the watershed to revegetate naturally. Biomonitoring data collected in 2006 and 2008 show that biological integrity has improved as a result (Table 1). Data show that the Joiner Brook tributary experienced substantial increases in macroinvertebrate density and EPT richness between the 1997 and 2006/2008 sample dates. Embeddedness has also declined dramatically. As a result, VTDEC assigned both monitored sections of the Joiner Brook tributary a rating of "good-fair" in 2006 and 2008. While the density fell just below Vermont's Class B guideline, the guidelines for all other indices were met, and the state's "weight of evidence" assessment led to the overall "good-fair" rating. This rating complies with Vermont's water quality standards.

Table 1. Joiner Brook Tributary Biomonitoring and Embeddedness Results (1997–2008)

Sampling site	Date	Assessment Rating	EPT Index	Macroinvertebrate Density (Individuals/ Square Meter)	Embeddedness
Joiner Brook (mile 0.1)	10/20/1997	Fair	15	208	Poor (> 75%)
	10/25/2008	Good-Fair	23	729	Very Good (5–25%)
Joiner Brook (mile 0.4)	10/20/1997	Poor	14	160	Poor (> 75%)
	10/5/2000	Fair	16	257	Good (25–50%)
	9/11/2006	Good-Fair	17.5	286	Very Good (5–25%)
Class B Guideline			≥ 16.0	≥ 300	N/A

Note: Values in red indicate non-compliance.

The data indicate that the remediation practices and subsequent re-growth of the forest canopy reduced sediment delivery to the streams, improved stream habitat and allowed the stream to meet Vermont water quality by 2006. As a result, the state removed the Joiner Brook tributary from its CWA section 303(d) list in 2010. The stream is scheduled to be monitored again in 2013.

Partners and Funding

A few key partners worked to minimize the erosion caused by logging in the Joiner Brook watershed. VTDEC staff conducted site bioassessments and aquatic studies. Vermont Department of Forests, Parks and Recreation provided oversight and technical assistance to the state's logging contractor to ensure proper implementation of Vermont's accepted management practices for logging operations. Approximately $3,000 in CWA section 319 funds supported stream monitoring work by VTDEC

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For additional information contact:

Eric Perkins
EPA Region 1
617-918-1602 • perkins.eric@epa.gov
Steve Fiske
Vermont Department of Environmental Conservation
802-242-1378 • steve.fiske@state.vt.us