



## Section 319

# NONPOINT SOURCE PROGRAM SUCCESS STORY

# Virginia

## Batie Creek Restoration Helps to Protect Unique Karst Habitats

### Waterbody Improved

Batie Creek was listed on Virginia's 303(d) list of impaired waters in 1998. The creek was listed because of low dissolved oxygen levels, caused by inflows of anoxic leachate due to a lumber company's improper disposal of sawdust. The low dissolved oxygen levels negatively affected a population of endangered cave isopods (a type of crustacean) in Batie Creek's headwaters. With help from an array of partners, led by the section 319-funded Karst Program of the Virginia Department of Conservation and Recreation's Division of Natural Heritage, the company removed and reused most of the decomposing sawdust. Dissolved oxygen levels have rebounded, prompting the removal of Batie Creek from the impaired waters list in 2006.

### Problem

Batie Creek flows through a karst region of Lee County in southwest Virginia. Its base flow originates with two springs, Batie East and Batie West. The springs are fed by water flowing through caves formed in Lee County's karst geology. (Areas with karst geology are characterized by sinkholes, underground streams, and caverns.) The caves of Lee County host a diverse and abundant fauna of cave-adapted invertebrates. Among the caves is Thompson Cedar Cave, where in the 1960s cave biologists John Holsinger and Dave Culver discovered the first Lee County Cave isopod (*Lirceus usdagalun*).

In the late 1980s and early 1990s, the sawdust disposal activities of a lumber company generated anoxic leachate rich in lignins and tannins. The leachates contaminated the entire ¾-mile length of Batie Creek, from the headwater springs to the creek's confluence with the Powell River. The decomposition of the sawdust generated anoxic leachate that drained into Thompson Cedar Cave, eliminating nearly all aquatic life, including the rare isopod. In 1992 the U.S. Fish and Wildlife Service (USFWS) listed the Lee County Cave isopod as endangered under the provisions of the Endangered Species Act. The dissolved oxygen levels at Batie West Spring from the late 1980s through the early 1990s ranged from 5.5 to 1.0 mg/L, generally declining over that period. During that period, all but one reading was below the 5.0 mg/L standard for surface streams. In 1998 the Virginia Department of Environmental Quality (DEQ) placed Batie Creek on the 303(d) list as impaired because the stream's dissolved oxygen

levels were less than half of the 5.0 mg/L necessary to support aquatic life.

### Project Highlights

In the late 1980s, soon after the discovery of sawdust at Thompson Cedar Cave, the Virginia Cave Board established a voluntary agreement with the lumber company to have the sawdust removed from the cave entrance. Working through the governor-appointed Virginia Cave Board, of which Holsinger was chair, an agreement was reached with the lumber company, which removed the sawdust from the cave entrance and agreed to address the issue. During the 1990s, however, the sawmill's production increased, generating vast sawdust stockpiles that led to further contamination of the Batie Creek system.

In 1994 the Virginia Department of Conservation and Recreation's Division of Soil and Water Conservation provided EPA section 319 funding to DCR's Division of Natural Heritage to establish the Karst Program. That program established the Batie Creek Task Force and gathered data. DCR Karst Program staff performed dye trace studies that verified a connection between the cave stream and Batie West Spring. In 1998 independent reports by Virginia Water Resources Center and Virginia DEQ established the dissolved oxygen impairment of Batie Creek and identified breakdown of the sawdust as the culprit.

Virginia DEQ issued a consent decree to the lumber company, allowing it to operate under the

condition that the sawdust would be removed within 5 years. The company quickly found an economically viable way to dispose of newly generated and recent sawdust, but the older material remained a problem. In 2000 DCR Karst Program staff developed a strategy involving multiple partners to address the historic sawdust stockpile issue. The Cave Conservancy of the Virginias funded Virginia Tech researchers, who proved that decomposing sawdust could be used to amend soil at mined land reclamation projects. The DCR Karst Program then took those results to the U.S. Fish and Wildlife Service and the Tennessee Valley Authority, which teamed up to fund the transport of sawdust to project sites for use as a soil amendment in reclaiming mined land.

## Results

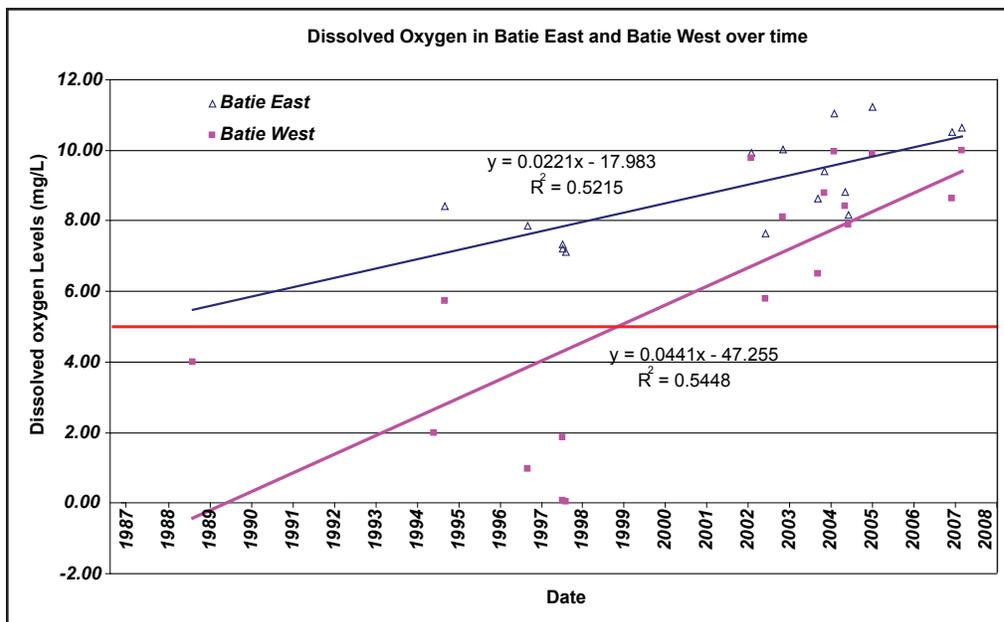
By the summer of 2002, dissolved oxygen levels had rebounded to 5.8 mg/L, allowing aquatic life, including the Lee County Cave isopod, to return to Thompson Cedar Cave. (The DCR Karst Program staff believes that some isopods had survived in an uncontaminated upstream cave.) In 2006 Virginia DEQ removed Batie Creek from the list of impaired streams. As of January 2007, an insignificant amount of actively decomposing sawdust remained on the lumber company's property.

Dissolved oxygen values at Batie West Spring have remained healthy since 2001 (Figure 1).

## Partners and Funding

From 1994 through FY2006 Virginia DCR's Division of Soil and Water Conservation provided more than \$1.3 million in the form of annual EPA section 319 grants to Virginia DCR's Natural Heritage Program to fund the Karst Program, which has worked to improve water quality throughout the state's karst areas. Approximately \$250,000 in section 319 funding for the Karst Program has gone toward providing the technical and staff support needed for the Karst Program to spearhead interagency efforts to remediate the Batie Creek system. The Virginia Water Resources Center and Virginia DEQ provided monitoring and other technical support. Other partners include the following: the Cave Conservancy of the Virginias provided a \$10,000 grant for the characterization of decomposing sawdust for use as a soil amendment, Virginia Tech offered technical expertise, USFWS provided \$100,000 to support the transport of sawdust for incorporation as a beneficial soil amendment for coal mine reclamation, and the Tennessee Valley Authority provided funding and facilitated the reuse of old sawdust.

**Figure 1. Regression of dissolved oxygen 1998-2007.**



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### For additional information contact:

**Wil Orndorff**, Karst Protection Coordinator  
Virginia Natural Heritage Program  
540-831-4056  
wil.orndorff@dcr.virginia.gov