



# NONPOINT SOURCE SUCCESS STORY

## Indiana

### Watershed Effort Restores Aquatic Community in Flowers Creek

#### Waterbody Improved

Nonpoint source pollution from agricultural sources caused increased nutrient levels in Flowers Creek. As a result, the Indiana Department of Environmental Management (IDEM) added this waterbody to its 2006 Clean Water Act (CWA) section 303(d) impaired waters list for nutrients, dissolved oxygen, and biological impairment. Implementing a variety of best management practices (BMPs) in the watershed improved nutrient and dissolved oxygen levels in Flowers Creek. As a result, Indiana is proposing to remove Flowers Creek from its 2018 CWA section 303(d) list of impaired waters.

#### Problem

Flowers Creek is a 12.72-mile-long tributary of the Eel River (HUC 05120104) in eastern Miami County in north-central Indiana (Figure 1). The Eel River, which is well-known for its smallmouth bass fishery, is designated as an outstanding river for 63 river miles. The Flowers Creek watershed is rural and highly agricultural (92 percent row crops and grazing lands). It contains four confined animal feeding operations with a total of 600 dairy cows and 26,800 hogs. The watershed is underlain with subsurface drainage tiles that deliver percolated water to the streams after precipitation events (Figure 2). Biological communities in the streams are expected to be that typical of warm water stream habitats.

Applicable water quality criteria include: (1) daily average concentrations of dissolved oxygen must be at least 5.0 milligrams per liter (mg/L), and may not fall below 4.0 mg/L at any time; (2) nitrogen concentrations may not exceed 10 mg/L; (3) total phosphorus levels may not exceed 0.3 mg/L; (4) pH may not exceed 9.0 or be consistently at/close to the standard (i.e., in the range of 8.7- 9.0); and (5) algae may not be deemed “excessive” based on field observations by IDEM scientists. To be classified as impaired for nutrients, a segment must fail to meet two or more of the above criteria on the same date. In addition, biological indices (index of biotic integrity [IBI] and macroinvertebrate IBI) scores must be at least 36 to meet aquatic life use support requirements.

Monitoring conducted by IDEM in 2003 on Flowers Creek showed elevated levels of total phosphorus and ammonia in conjunction with low dissolved oxygen and impaired biotic communities. On the basis of these

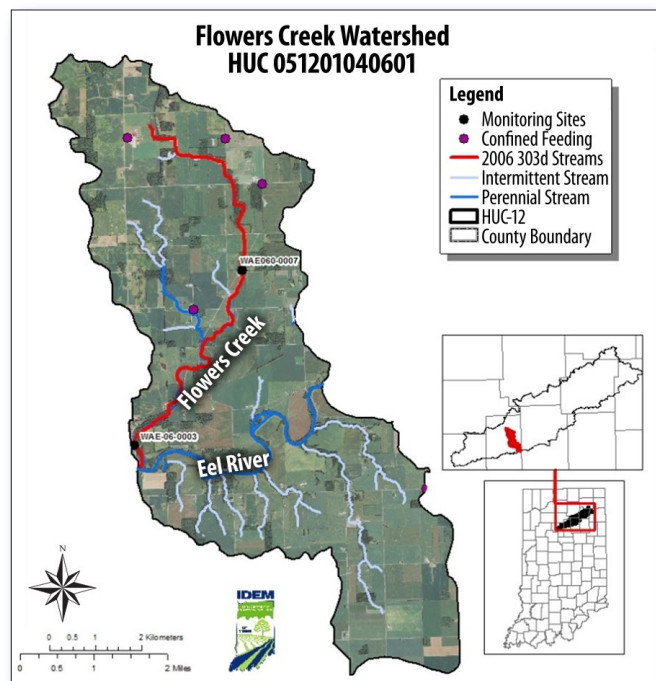


Figure 1. Flowers Creek is in rural northern Indiana.

data, Flowers Creek assessment units [AUs] INB0461\_T1001 and INB0461\_T1002 were listed as impaired for nutrients, dissolved oxygen and biological impairments in 2006. (Note: in 2012 these two AUs were combined [AU INB0461\_T1005] for assessment purposes.)

#### Project Highlights

Manchester University’s Department of Environmental Studies obtained a CWA section 319 grant in late 2008 to support the Middle Eel River Watershed Initiative, which included developing a watershed management

Photo by Craig Colvon, 2009



Figure 2. Subsurface drainage tile in Wilson Rhodes Ditch, part of Flowers Creek watershed.

plan for the Middle Eel River and its tributaries, promoting and implementing a cost-share program for BMPs, and conducting water quality monitoring and public outreach. The university hired a watershed coordinator and formed a steering committee to lead development of the watershed management plan. Implementation efforts began after the watershed management plan was completed in early 2011.

CWA section 319 funding was supplemented with financial support from the Lake and River Enhancement program within the Indiana Department of Natural Resources' Division of Fish and Wildlife, Clean Water Indiana, and the local soil and water conservation district (SWCD). The Indiana State Department of Agriculture (ISDA) also obtained a CWA section 319 grant to hire three technicians to help install BMPs in several watersheds, including the Middle Eel River. U.S. Department of Agriculture (USDA) Farm Bill dollars were used as well. Manchester University obtained a second CWA section 319 grant to continue implementation throughout the Middle Eel River watershed in early 2013.

Federal, state and local funding was used to install a variety of BMPs, including 214.5 acres of conservation tillage; 22,793.4 acres of cover crops; 96.9 acres of pest management; nutrient management on 4,503 acres; 22.03 acres of grassed waterways; 0.3 acre of heavy use area protection; 32.45 acres of filter strips; 10.7 acres of riparian buffers; 3,540 linear feet of livestock exclusion; one animal mortality facility; one roof/cover; 105.2 acres of forage/biomass planting; one grade stabilization structure; 11.0 acres of hardwood tree planting; and 12.20 acres of pollinator habitat.

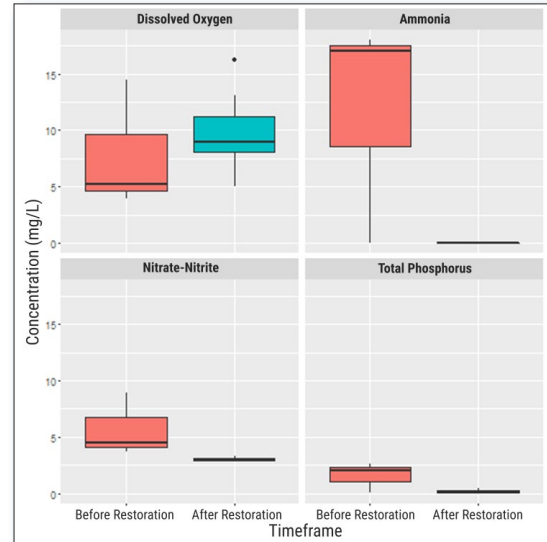


Figure 3. Water quality improved after watershed restoration was conducted: dissolved oxygen levels increased and nutrient concentrations decreased.

## Results

IDEM resampled Flowers Creek in 2015 at two sites: at both the original site midway up the stream reach and at an additional site near the mouth of Flowers Creek. (Biological communities were sampled only at the mouth of the watershed.) Post-project sampling showed that the biological communities had recovered (fish went from IBI = 24 to IBI = 44; macroinvertebrates maintained a passing score of mIBI = 44). Additionally, the streams were no longer impaired for nutrients or low dissolved oxygen (Figure 3). On the basis of these data Indiana is proposing to remove Flowers Creek (AU INB0461\_T1005) from its impaired waters list in 2018.

## Partners and Funding

Federal, state and local partners supported restoration efforts. The USDA provided \$968,585 through the Conservation Reserve Program, Environmental Quality Incentives Program and the Wildlife Habitat Incentives Program. CWA section 319 funding was provided by IDEM (\$668,932.50) and ISDA (\$430,250). Manchester University provided \$733,333 in local match funding. Miami County SWCD provided \$5,436.65 in cost share. Indiana Department of Natural Resources' Lake and River Enhancement program provided \$22,102.50. Lastly, ISDA and Miami County SWCD provided \$106,500 in state Clean Water Indiana funding.



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