



NONPOINT SOURCE SUCCESS STORY

Indiana

Watershed Restoration Work Improved a Section of Indian Creek

Waterbodies Improved

Nonpoint source pollution from agricultural and residential sources caused increased bacteria and decreased dissolved oxygen (DO) levels in the Devils Backbone section of Indian Creek. As a result, the Indiana Department of Environmental Management (IDEM) added this waterbody to its 2002 Clean Water Act (CWA) section 303(d) impaired waters list for pathogens and low DO. Implementing a variety of best management practices (BMPs) in the greater Indian Creek watershed from 1996 to 2010 improved bacteria and DO levels in Devils Backbone. As a result, Indiana removed four segments of the Devils Backbone section of Indian Creek from its 2014 CWA section 303(d) impaired waters list.

Problem

The Devils Backbone section of Indian Creek is a 17.02-mile reach in Harrison County, Indiana (adjusted to 21 miles in 2012, see results section), just upstream of Indian Creek's confluence with the Ohio River (Figure 1). The stream is in the Indian Creek 12-digit watershed (HUC 051401040502). Although the impaired segment's 12-digit watershed is largely forested (represented by hash marks in the lower left of Figure 1), upstream of this watershed the creek is highly influenced by agriculture (particularly livestock agriculture, but some row crops as well) and the cities of Corydon and Galena.

Indiana's water quality standards for pathogens state that 30-day geometric means for *Escherichia coli* must be less than or equal to 125 most probable number (MPN) per 100 milliliters (mL), with maximum concentrations less than 235 MPN/100 mL. Standards for DO require daily averages of at least 5 milligrams per liter (mg/L), and minimum concentrations of 4 mg/L. Additionally, if one or more samples are less than 4 mg/L, no more than 10 percent of those samples may be less than 5 mg/L.

Water quality data collected by IDEM in 2000 indicated that these standards were not being met. The 30-day geometric mean of weekly *E. coli* samples collected from 7/12/2000 to 8/9/2000 was 163 MPN/100mL, with three of the five samples above the single sample maximum of 235 MPN/100mL. For DO monitored six times between 5/16/2000 and 8/9/2000, four out of the six samples fell below the water quality standard of 5 mg/L, and three of the samples fell below 4 mg/L. Due to these *E. coli* and DO levels, IDEM added the 17-mile Devils Backbone section of Indian Creek (INN04A3_00) to the CWA section 303(d) list of impaired waters in 2002 for failing to attain aquatic

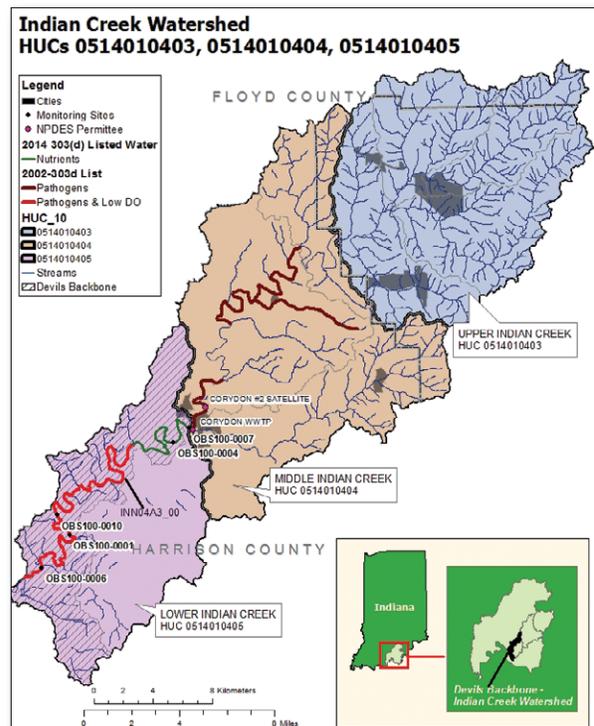


Figure 1. Devils Backbone is in the Lower Indian Creek Watershed.

life use (because of low DO) and recreational use (because of excess pathogens).

Project Highlights

From 1996 to 2006 The Nature Conservancy (TNC) reforested 4.4 miles of the Indian Creek riparian corridor under their statewide conservation strategy. TNC also conserved 61 acres of land as an addition to Harrison-Crawford State Forest, which protected 0.6 miles of riparian corridor. TNC also

worked with the Harrison County Regional Sewer District (HCRSD), local water utilities and Harrison County Health Department to mail a septic system maintenance reminder to Harrison County residents, including those in the Indian Creek watershed.

The Harrison County Commissioners tasked the HCRSD with developing a watershed management plan (WMP) for Indian Creek. This WMP, developed from 2006 to 2008, helped to inform the location and type of subsequently implemented BMPs.

Project partners in the Indian Creek watershed used U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) financial and technical assistance (through the Environmental Quality Incentives Program [EQIP]) to implement numerous conservation practices between 2003 and 2010. A few of the practices installed with EQIP funding included 591.9 acres of cover crops, 2.5 acres of critical area planting, 145,100 feet of fencing, 1111.6 acres in no-till farming, 2,177 acres of prescribed grazing, 1,363.9 acres covered under a nutrient management plan, and 3,155.1 acres of pasture/hay planting. Additional practices installed from 2003 to 2010 using USDA Farm Service Agency (FSA) Conservation Reserve Program (CRP) funds included 160.2 acres of permanent introduced grass and legumes, 116.6 acres of tree plantings (stream habitat improvement and management or riparian buffer), 46.6 acres of filter strips and 101.91 acres of riparian buffers.

Additionally, Harrison County allocated \$950,000 between 2002 and 2010 toward agricultural BMPs in the county, including 121 livestock watering facilities and 6,780 acres of cover crops. Harrison County also received funding from the Clean Water Indiana state fund and installed 67 acres of pasture/hay planting in the Indian Creek watershed.

Results

IDEM monitored *E. coli* weekly from May 17, 2010 through June 14, 2010. Results indicated that water quality standards had been met, with a geometric mean of 29.24 MPN/100 mL, and no samples exceeding the single sample maximum of 235 MPN/100 mL (Table 1). IDEM measured DO in the watershed

five times from May–July 2010. At no time did the DO fall below the minimum criterion of 5 mg/L.

On the basis of these data, IDEM removed four segments totaling over 21 miles (INN0452_04, INN0452_05, INN0452_06 and INN0452_07) of the Devils Backbone section of Indian Creek from the 2014 CWA section 303(d) impaired water list for DO and pathogen impairment. The removal of these impairments for four segments rather than the one originally listed segment was due to the resegmenting of the waterbody in 2012. (Note: The total length of these 2014 segments is longer than the originally listed 17 miles because the 2012 resegmentation was performed using higher resolution data from the National Hydrography Dataset.)

Partners and Funding

The restoration of Devils Backbone was supported by numerous state and federal partners. IDEM provided \$99,930 in CWA section 205(j) grant funding to the HCRSD to create the WMP. The NRCS provided \$687,567 in financial and technical assistance for conservation practice implementation with EQIP funding. The FSA provided \$55,094 in CRP funding. TNC provided \$210,000 in funding for stream restoration and outreach. Lastly, the Harrison County Soil and Water Conservation District provided \$950,000 through the county-funded cost-share program for agricultural BMPs.

Table 1. Pathogens and dissolved oxygen levels in the Devils Backbone segment of Indian Creek, 2000 and 2010

Date	Site Number	<i>E. coli</i> ¹ (MPN/100 mL)	Date	Site Number	DO ¹ (mg/L)
Pre-project <i>E. coli</i> data			Pre-project dissolved oxygen data		
7/12/2000	OBS100-0006	243	5/16/2000	OBS100-0001	9.87
7/19/2000	OBS100-0006	708	7/12/2000	OBS100-0006	7.83
7/26/2000	OBS100-0006	40	7/19/2000	OBS100-0006	3.98
8/2/2000	OBS100-0006	20	7/26/2000	OBS100-0006	4
8/9/2000	OBS100-0006	833	8/2/2000	OBS100-0006	2.52
	Geomean:	162.88	8/9/2000	OBS100-0006	3.06
Post-project <i>E. coli</i> data			Post-project dissolved oxygen data		
5/17/2010	OBS100-0010	35.5	5/17/2010	OBS100-0010	9.16
5/24/2010	OBS100-0010	142.1	6/1/2010	OBS100-0010	8.72
6/1/2010	OBS100-0010	20.9	6/7/2010	OBS100-0010	7.63
6/7/2010	OBS100-0010	12	6/14/2010	OBS100-0010	7.16
6/14/2010	OBS100-0010	16.9	7/28/2010	OBS100-0010	7.46
	Geomean:	29.24			

¹ Values in red indicate exceedances of state water quality criteria.



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