Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Michigan

Stream Stabilization Projects Put Carrier Creek on the Path to Recovery

Waterbody Improved

Carrier Creek, a tributary to the Grand River, flows through a rapidly developing area near Lansing, Michigan. Historic channelization and more recent urban runoff resulted in eroding stream banks, high sedimentation rates, and degraded aquatic habitat for fish and macroinvertebrate communities. Extensive stream restoration and storm water retention activities have resulted in increased fish taxa at two monitoring locations.

Problem

Carrier Creek, in Eaton County, Michigan, is a tributary to the Grand River. Michigan has included a 4-mile segment of the creek—from its confluence with the Grand River upstream to where it flows under Interstate 496—on its 303(d) list of impaired waters for more than 10 years. Michigan water quality standards (WQS) require that all surface waters of the state are "designated for and shall be protected for, among other things, aquatic life and wildlife." Biological assessments on Carrier Creek had shown that the macroinvertebrate community was rated *poor*, which first led Michigan's Department of Environmental Quality (MIDEQ) to place the segment on the list of impaired waters in 1996.

MIDEQ determined that the quality of the biota in this segment of the creek was reduced by urban runoff, poor in-stream habitat, and excessive sediment deposition (Figures 1 and 2). MIDEQ completed a Total Maximum Daily Load (TMDL) for Carrier Creek biota in 2002. As noted in the TMDL, achievement of the WQS for designated uses for Carrier Creek will be demonstrated by assessing the macroinvertebrate community and the in-stream habitat as it relates to sediment.

Project Highlights

In 2000 a team of contractors, local agencies, and volunteers stabilized and restored 5 miles (3,771 linear feet) of channel using funding from MIDEQ. These projects increased channel stability, improved in-stream habitat, and reconnected the channel to its floodplain. The upstream end of the channel was narrowed, and the stream pattern was reestablished with structures that promote meandering. Throughout the rest of the restored reach, various structures were installed to stabilize the channel, including cross-vanes, J-hooks, lunkers, log revetments and riprap (Figures 3, 4, and 5). In some locations, the project team removed dredge spoils that were separating the stream from its natural floodplain.

In 2002 project partners created a 32-acre wetland in the headwaters of the watershed to intercept storm water runoff and decrease stream flashiness, or the tendency for the stream to rise and fall quickly after storms. In 2004 the Perrin Chapter of Trout Unlimited installed 50 large, wooden lunker boxes along the creek to provide shelter and resting points for fish.

In addition, the Eaton County Drain Commissioner is enhancing storm water detention and flow control

Figure 1. Before: Note the shallow, linear stream channel and the lack of in-stream habitat features.

Figure 2. Before: Note the erosion of historic dredge spoils and poor in-stream habitat.

Figure 3. After: Restored stream meanders.

throughout the upper portion of the watershed to stabilize the channel, reduce velocity of the flow, reduce erosion downstream, and reduce the amount of flooding. This work is ongoing.

Figure 4. After: A crossvane.

Figure 5. After: A J-Hook.

Results

The data presented in Table 1 represent an interim assessment of the project's progress. MIDEQ collected data on fish, macroinvertebrates, and aquatic habitat quality at two locations within the project area, both before (2000) and after (2006) the restoration activities occurred. MIDEQ collected additional fish data in 2007. The data show that the number of fish taxa has increased at both locations, more than doubling at one site and quadrupling at the other. Macroinvertebrate populations have not responded as quickly; neither the total number of taxa nor the number of pollution-sensitive taxa (mayflies, stoneflies, and caddisflies) had changed substantially as of 2006. As of 2006, aquatic habitat was unchanged at one site, and had improved at the other. However, a single slippershell mussel (*Alasmidonta viridis*) was found during an informal inspection of the restored reach in 2007. The slippershell is listed as a Species of Special Concern by the Michigan Natural Features Inventory.

The restoration activities conducted to date have stabilized the stream channel and its hydrology, reduced stream bank erosion, and improved aquatic habitat. Fish and macroinvertebrate communities are beginning to respond, and future monitoring should show further improvements in the biota and eventually result in the delisting of Carrier Creek.

Partners and Funding

In 2000 and 2002, MIDEQ provided a total of $1,263,555 in Clean Michigan Initiative funds (section 319 grant matching funds) to the Eaton County Drain Commissioner for the stream restoration and wetland creation projects. The Drain Commissioner provided a total of $653,943 in local matching funds. Additional partners include the Friends of Carrier Creek, city of Lansing, Windsor and Delta Charter townships, Fitzgerald Henne & Assoc., Inc., Spicer Group Inc., and Trout Unlimited.

Table 1. Fish, macroinvertebrate, and aquatic habitat data for two Carrier Creek project area locations: before and after stream restoration

Metric	2000 (Pre)		2006 (Post)		2007 (Post)[1]	
	Site 3	Site 5	Site 3	Site 5	Site 3	Site 5
Fish						
Number of Taxa	5	3	12	9	12	12
Macroinvertebrates						
Number of Taxa	12	9	9	15	—	—
Number of EPT[2] Taxa	2	1	1	1	—	—
Rating	Acceptable	Poor	Acceptable	Acceptable	—	—
Habitat						
Ranking	Good	Poor	Good	Excellent	—	—

[1]Macroinvertebrate and habitat surveys for 2007 are in the process of being completed.

[2]EPT= mayflies, caddisflies, and stoneflies—three orders of pollution-sensitive aquatic insects that are common in the benthic macroinvertebrate community.

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