

Total Maximum Daily Loads  
**TMDLs**  
at Work  
in Michigan

# Getting the Sediment Out of Carrier Creek to Improve Habitat and Restore Aquatic Life

A history of changing landscapes in the Grand River watershed, first to support agricultural activity and then urban land uses, created a series of local water quality problems due to sediment from stormwater runoff and eroding streambanks. Excessive sediment eventually took a toll on Carrier Creek, a tributary to the Grand River in Eaton County, Michigan. Data collected by the Michigan Department of Environmental Quality (MDEQ), the Eaton County Drain Commissioner, and other key partners demonstrated that Carrier Creek did not have the habitat necessary to sustain healthy fish and macroinvertebrate communities and, therefore, was not supporting its aquatic life designated use. Changes in the amount of impervious surfaces within the communities surrounding Carrier Creek have led to increases in urban runoff, which affects both the quality and the quantity of storm water conveyed by Carrier Creek. Figure 1 illustrates the appearance of Carrier Creek due to erosion and straightening that affect instream habitat.

Starting in 2000, local stakeholders worked together to implement nonpoint source best management practices (BMPs) using Clean Michigan Initiative grant funding from MDEQ. The TMDL for biota in Carrier Creek, completed in 2002, provided a framework for understanding the problems and making the connection between the sources, water quality standards, and implementation activities. Implementation activities, such as stream channel restoration and wetland creation, have reduced stream bank erosion, improved aquatic habitat, and improved the health of aquatic communities at some monitoring locations in Carrier Creek. Continued monitoring efforts will help stakeholders identify progress toward achieving the numeric biota and habitat endpoints to support the aquatic life designated use.

## How are TMDLs at work in the Carrier Creek watershed?

The sediment TMDL to address aquatic life impairments in Carrier Creek provided a vehicle to compile the existing data and information about trends in the health of Carrier Creek's aquatic life, particularly the macroinvertebrate community, and provide the framework necessary to support implementation efforts. Stakeholders



Note erosion of historic dredge spoils and poor instream habitat



Note shallow, linear stream channel and lack of instream habitat features

Figure 1. Pre-BMP Pictures of Carrier Creek.

### TMDL at a Glance

#### Carrier Creek TMDL

(approved July 2002)

[www.deq.state.mi.us/documents/deq-swq-gleas-tmdlcarrier.pdf](http://www.deq.state.mi.us/documents/deq-swq-gleas-tmdlcarrier.pdf)

#### Factors causing impairment

Aquatic life use impaired by habitat loss due to excessive sediment and changes in natural hydrology

#### Sources contributing to impairment

Soil erosion and stream bank erosion due to construction activities, road projects, drainage projects and urban runoff

#### Restoration options

Stream channel restoration and stabilization, stormwater management and retention projects, improve in-stream habitat, wetland construction, detention basin construction and re-vegetation

#### Stakeholder involvement

Eaton County Drain Commissioner, Friends of Carrier Creek, City of Lansing, Delta Charter Township, Michigan Department of Transportation, Trout Unlimited, and local consultants

#### Status of waterbody

All phases of restoration project completed as of fall 2008. Some trends in monitoring data indicating improvement in fish taxa and habitat conditions.

#### Benefits to stakeholders

Water quality improvements, added recreational and aesthetic value, healthier aquatic communities, reduced flooding, funding opportunities, effective partnerships

## What is a total maximum daily load (TMDL)?

It is a study or analysis that calculates the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. The TMDL establishes a pollutant budget and then allocates portions of the overall budget to the pollutant's sources. For more information on TMDLs, visit EPA's website at [www.epa.gov/owow/tmdl](http://www.epa.gov/owow/tmdl).

recognized that implementation activities to restore Carrier Creek could start before the completion of the TMDL, based on existing information on the factors causing impairment and the likely sources. Through the TMDL analysis, MDEQ provided stakeholders with documented numeric targets for restoring biological communities and habitat conditions related to changes in sediment load. The TMDL report supported the approach of implementing best management practices that will reduce sediment with the goal of improving biological integrity. In addition, the TMDL emphasized the need for reassessments of the biological communities of Carrier Creek to determine progress toward supporting the aquatic life designated use.

## What is the current status of Carrier Creek as a result of the TMDL process?

The initial phase of the implementation project began in 2001 and consisted of stream stabilization in an upstream reach by narrowing and deepening an over wide channel using a series of stone meander structures. In addition, the project team used numerous in-stream structures (e.g. crossvanes, j-hooks, and lunkers) to stabilize eroding banks and removed berms to provide greater access of stream flow to the floodplain. Figure 2 shows the improvements to Carrier Creek resulting from the restored stream meanders, and the use of crossvanes and j-hooks. The remaining work under Phase I involved the reconstruction of 1,200 feet of stream channel to stop massive erosion. Phase II involved the construction of a storm water wetland at the upstream end of the impaired reach to assist in flow mitigation and habitat restoration.

Monitoring data collected in Carrier Creek before and after implementing the restoration project show a few signs of in-stream improvements. According to the U.S. Environmental Protection Agency's CWA section 319 Nonpoint Source Success Story for Carrier Creek, the number of fish taxa increased from 2000 (pre-restoration) to 2007

## ■ Stakeholders Say...

*"The Carrier Creek project successfully balanced the needs of so many competing interests. It protected the health of the Grand River, provided drainage for industrial, commercial, and residential development, and preserved the aesthetics of Carrier Creek. Ultimately, the project saved and greatly improved the water quality of the creek and improved the health of the wildlife. It will meet the needs of local communities in the long-term—for the next 75 years, not just the next 10 years."*

—Lyle Frost, President, Friends of Carrier Creek

(post-restoration). Habitat assessment data from 2006 also show an improvement from the 2000 pre-restoration conditions at one monitoring site. The project team recently completed implementation of Phase II of the project; subsequent monitoring data from stations in Carrier Creek will indicate if the newly completed implementation activities produced additional progress toward TMDL target values.

## How did local stakeholders benefit from the TMDL process?

The efforts implemented under the Carrier Creek Storm Water Management and Restoration Project has generated initial improvements in biota and habitat conditions. Once monitoring data show that biota and habitat meet the target values established through the TMDL, project partners will know that Carrier Creek can again support its aquatic life designated use. The project has generated interim benefits for stakeholders, including the following:

- **Improved hydrology and habitat.** The projects were effective in increasing channel stability, improving in-stream habitat, reconnecting the channel to its floodplain, and decreasing stream flashiness during periods of elevated storm runoff.
- **Increased awareness and involvement.** Restoration projects included the implementation of local educational programs to gain public support and voluntary assistance. The project team distributed brochures, fact sheets, and newsletters, conducted field trips for local high school students, and provided cross-training opportunities for other Michigan drain commissioners.
- **Continued monitoring.** The TMDL process has provided local stakeholders with the framework and rationale for continued monitoring in Carrier Creek to assess whether implementation projects are making progress toward achieving water quality standards.
- **Effective local partnerships.** Cooperative efforts among MDEQ, the Eaton County Drain Commissioner, Friends of Carrier Creek, and other local partners and volunteers were underway before the finalization of the Carrier Creek biota TMDL. However, these local partnerships will serve as the driving force to achieving the TMDL target values and attaining water quality standards in Carrier Creek.

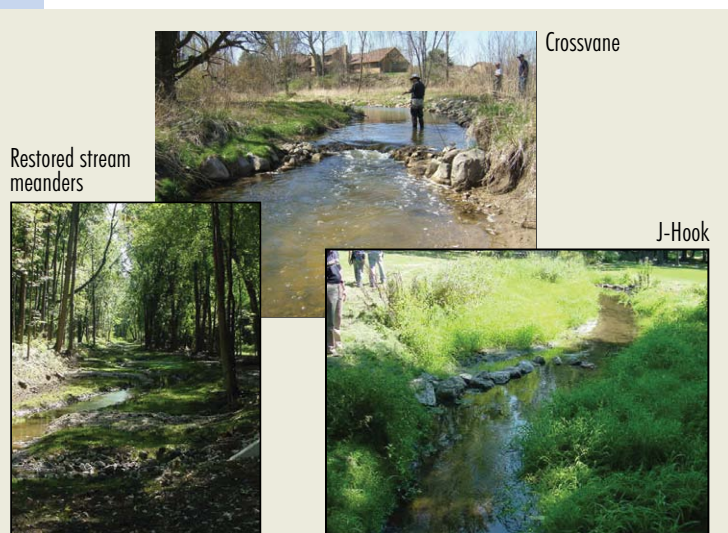


Figure 2. Post-BMP Pictures of Carrier Creek.

For more information on the Carrier Creek biota TMDL, contact Joe Rathbun, Michigan Department of Environmental Quality Water Bureau, [rathbunj@michigan.gov](mailto:rathbunj@michigan.gov), (517) 373-8868

For more information on the Michigan TMDL Program, visit [www.michigan.gov/deq/0,1607,7-135-3313\\_3686\\_3728-12464--,00.html](http://www.michigan.gov/deq/0,1607,7-135-3313_3686_3728-12464--,00.html)



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