

Title: Sedimentation controls improve instream habitat and macroinvertebrate populations in Fumee Creek

Waterbody Improved: Fumee Creek (AUID 040301080705-01), a small coldwater tributary to the Menominee River in Dickinson County, Michigan.

GRTS Number: Grant #97547404, Project #26.

Problem: Fumee Creek was impacted by severe upland and streambank erosion caused by runoff from adjacent commercial truck parking lots and from U.S. Route 2, which resulted in excessive sediment loads, stream bed embeddedness, and a lack of instream cover. These sediment loads and degraded instream habitat, in turn, reduced the number of sensitive macroinvertebrate taxa in the creek. Fumee Creek is not on Michigan's 303(d) list of impaired waterbodies.

Project Highlights: This project resulted in the installation of the following storm water runoff best management practices (BMPs):

- Runoff from the trucking facility was addressed with a grade stabilization structure, hillside stabilization, and a 600 linear foot storm water diversion channel (Figure 1).
- Runoff from the Fumee Falls roadside park along Route #2 was addressed with 200 linear feet of slope stabilization and 50 linear feet of stream channel restoration.
- Runoff from an all-terrain vehicle trail was addressed with 270 feet of slope stabilization.

Data on benthic macroinvertebrates, instream habitat and channel morphology measurements were collected at an upstream control reach and a site downstream of the erosion area, before (2002) and after (2012) BMP construction.

Results: Pre- and post-construction monitoring found measureable improvements in the macroinvertebrate community and instream habitat (Table 1):

- The total number of macroinvertebrate taxa at the treatment site increased by 54%.
- The number of "sensitive" macroinvertebrate taxa increased by 42%.
- Instream habitat metrics related to sedimentation (available cover, substrate embeddedness, and sediment deposition) improved substantially (Figure 2). Available cover includes cobble riffles, woody structure, and undercut banks, which act as refugia, or feeding and spawning sites. Substrate embeddedness is the extent to which rocks and woody structure are covered with fine-grained sediments, which

reduces habitat for aquatic organisms. Sediment deposition is the amount of sediment that accumulates in pools or elsewhere on the streambed. High sediment deposition indicates channel instability.

- Channel width decreased by 35 percent between 2002 and 2012. Channel narrowing is expected with a decrease in sediment loads, and will reduce sediment deposition and substrate embeddedness.
- The median particle size in the project reach increased from 0.42 mm (sand) in 2002 to 4.8 mm (fine gravel) in 2012, despite the increase of sand-sized particles in the upstream reference reach. Most macroinvertebrates prefer stable gravel or cobble-sized substrate rather than shifting finer-grained sediment.

Partners and Funding: This work was funded by a Clean Michigan Initiative-Nonpoint Source grant to the Dickinson Conservation District. The overall grant was for \$450,000 (plus \$537,310 in match), and \$41,344 (plus \$109,350 in match) paid for this project. These monies were used as match for the 2004 Section 319 grant. The partners for this specific project were Gunville Trucking, Inc., the Michigan Department of Transportation, and the local Rotary Club. Monitoring was performed by the Michigan Department of Environmental Quality and its contractors. Monitoring staff were partially funded with Section 319 base funds.

This project was associated with two other Section 319 grants, to develop a watershed management plan in 2000, and to develop an information and education program in 2004.

Photographs:

Figure 1. Pre and post photographs of the hillside at the trucking facility.



Figure 2. Pre and post photographs of the project reach, showing fine sands before the BMPs and coarser substrate afterwards.



Data table/graph/chart:

Table 1. Macroinvertebrate and instream habitat data

| Metric | Control site | | Treatment site | |
|------------------------------------|--------------------------|-------------------------|-------------------|-------------------------|
| | 2002 | 2012 | 2002 | 2012 |
| Macroinvertebrate Community | | | | |
| No. taxa | 27 | 31 | 24 | 37 |
| No. sensitive taxa* | 12 | 13 | 12 | 17 |
| Overall score | +5 | +6 | +5 | +7 |
| Rating | Excellent | Excellent | Excellent | Excellent |
| Instream Habitat | | | | |
| Sediment D ₅₀ | 29 mm (coarse gravel) | 6.8 mm (fine gravel) | 0.42 mm (sand) | 4.8 mm (fine gravel) |
| Available cover | 20** | 14 | 10 | 18 |
| Embeddedness | 18 | 14 | 9 | 17 |
| Sediment deposition | 14 | 17 | 6 | 14 |
| Overall score | 165 | 136 | 140 | 175 |
| Rating | Excellent | Good | Good | Excellent |

*Mayflies, caddisflies, and stoneflies

**Maximum score for individual metrics = 20

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