



Section 319

NONPOINT SOURCE PROGRAM SUCCESS STORY

Michigan

Stabilizing Stamp Sand Deposits and Streambanks Improve Water Quality and In-stream Habitat

Waterbody Improved

Historic copper mining activities deposited mounds of fine-grained rock waste—also known as stamp sands—into the stream channels and floodplains of Kearsarge Creek and Scales Creek. Runoff from these stamp sands resulted in impaired aquatic macroinvertebrate communities and elevated water column copper concentrations, which led Michigan to list these waterbodies on its 2002 and 2004 303(d) list. Capping and stabilizing two large stamp sand deposits has decreased copper concentrations and improved the macroinvertebrate community enough that these impaired miles will be nominated for removal from the 2008 303(d) list.

Problem

Kearsarge Creek and Scales Creek are headwater tributaries to Houghton County's Trap Rock River in Michigan's Upper Peninsula. All three waterbodies are on Michigan's 303(d) list for excessive copper concentrations and poor biota. The 3.5-mile impaired segment of Kearsarge/Scales Creek includes a portion of Kearsarge Creek upstream of where it flows into Scales Creek, as well as the lower portion of Scales Creek to its confluence with the Trap Rock River.

Copper mining operations dating from the 1860s deposited tons of fine-grained mine tailings in the floodplains of these streams, and decades of water and wind erosion have transported large quantities of these stamp sands into the stream channel and floodplain. These mineral-rich, fine-grained particles degrade aquatic life in the streams by (1) burying in-stream habitat features and (2) leaching copper into the water column. Bioassays performed in the early 1990s demonstrated that water from these headwater streams exceeded state water quality standards for copper. Biological surveys conducted at the same time found that excessive sedimentation caused degraded in-stream habitat and impoverished fish and benthic macroinvertebrate communities.

Project Highlights

Project partners isolated two areas of stamp sand deposits from the streams by stabilizing the stream banks and capping and revegetating the upland areas. The Houghton/Keweenaw Conservation District stabilized one 2.5-acre deposit in the Kearsarge

Figure 1. Kearsarge Creek before and after restoration.



Before: Stamp sand deposits cover streambanks and riparian area.

After: Removal of upstream stamp sand source allows revegetation of streambanks and riparian area.

Figure 2. Scales Creek before and after restoration.



Before: Stamp sand deposits cover streambanks and riparian area.

After: Habitat improves once stamp sand source is removed and streambanks and riparian area are stabilized.

Creek watershed in 1998 (Figure 1). U.S. EPA stabilized another 19-acre deposit along Scales Creek in 2005 using Superfund Program funds (Figure 2).

Results

The Kearsarge Creek project stabilized a 2.5-acre stamp sand deposit and triggered natural revegetation downstream. This improved the in-stream habitat conditions and benthic macroinvertebrate communities. In-stream copper concentrations fell by a factor of 10, total macroinvertebrate taxa tripled, sensitive macroinvertebrate taxa (mayflies, caddisflies, and stoneflies, also known as EPT) returned, and the in-stream habitat assessment noted steadily less sediment deposition between 1991, 2001, and 2006 (Table 1). Michigan Department of Environmental Quality (MIDEQ) uses a macroinvertebrate community scoring procedure to identify impaired waterbodies. Possible scores range from -9 to +9; a score of less than -4 is considered unacceptable. Macroinvertebrate scores improved from a score of -7 in 1991 to +2 and +1 in 2001 and 2006, respectively.

The Scales Creek project stabilized 19 acres of stamp sand deposits and restored 1,205 linear feet of Scales Creek streambank. MIDEQ noted

measurable improvements within one year of this project's completion; between 1991 and 2006 in-stream copper concentrations decreased slightly, total macroinvertebrate taxa increased by 40 percent, sensitive macroinvertebrate taxa doubled, and in-stream habitat features such as substrate embeddedness and sediment deposition improved substantially (Table 2). Macroinvertebrate scores, as determined by MIDEQ's scoring procedure, improved from 0 in 1991 to +4 in 2006. MIDEQ expects scores to continue to improve as biota colonizes the improved habitat. Given the positive results from both projects, MIDEQ expects to remove Kearsarge/Scales Creek from the state's 303(d) list by 2008. MIDEQ will survey the creeks again in 2011.

Partners and Funding

In 1998 MIDEQ provided \$44,359 in section 319 funds to the Houghton/Keweenaw Conservation District for the Kearsarge Creek restoration. EPA's Superfund Program restored the Scales Creek site in 2005 at a cost of \$373,000 (including a 10 percent match from Michigan). Section 319 also funded the pre- and post-restoration water and biological surveys in both streams.

Table 1. Monitoring data from Kearsarge Creek, before and after stamp sand stabilization

Year	Copper (µg/L)	Macroinvertebrate taxa	EPT taxa*	Score (-9 to +9)	Habitat category	Embeddedness	Depth regime	Sediment deposition
1991	125	3	0	-7	Fair	6	6	8
1998	<i>Stamp sands stabilized</i>							
2001	34	12	6	+2	Good	10	13	8
2005	12	12	3	+1	Good	11	14	17

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

Table 2. Monitoring data from Scales Creek, before and after stamp sand stabilization

Year	Copper (µg/L)	Macroinvertebrate taxa	EPT taxa	Score	Habitat category	Embeddedness	Depth regime	Sediment deposition
1991	31	15	5	0	Poor	5	6	2
1998	<i>Stamp sands stabilized</i>							
2001	27	16	7	0	Good	8	12	8
2005	23	21	10	+4	Good	15	12	13



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