Title: Kearsarge Creek and Scales Creek Restoration

Michigan 303(d) Number: 221001P (AUID number = 040201030303-08)

GRTS Number: 995014970 - Project 32

Opening Paragraph: Historic copper mining activities deposited tons of fine-grained mine tailings (stamp sands) in Kearsarge Creek, Scales Creek and the Trap Rock River, resulting in an impaired aquatic macroinvertebrate community and elevated water column copper concentrations to the point that these streams are on Michigan's 303(d) list. Capping and stabilizing two large stamp sand deposits on Scales Creek and Kearsarge Creek has substantially decreased copper concentrations and improved the macroinvertebrate community.

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 indigenous aquatic life and wildlife impairments, caused by excessive aqueous copper concentrations. The 3.5-mile impaired segment of Kearsarge Creek/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 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 more than 50 percent, 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 deceased from a high of 31 µg/L in 1991 to 23 µg/L in 2006, 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. 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.

Photos:

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.**

Data:

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	Embedd-edness**	Depth Regime**	Sediment Deposition
1991	125	3	0	-7	Fair	6	6	8
1998	*Stamp sands stabilized*							
2000	34	12	6	+2	Good	10	13	8
2006	47	12	3	+1	Good	11	14	17
2007	44							
2008	51							
2009	56							
2009	54							

*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 (-9 to +9)	Habitat Category	Embedd-edness**	Depth Regime**	Sediment Deposition
1991	31	15	5	0	Poor	5	6	2
1998	*Stamp sands stabilized*							
2000	27	16	7	0	Good	8	12	8
2006	23	21	10	+4	Good	15	12	13

Contact Information: Joe Rathbun, MDEQ-Water Bureau; 517-373-8868; rathbunj@michigan.gov.