Title: Bruno Creek Culvert Replacement

Michigan AUID Number: This stream reach was never on the Michigan 303(d) list.

GRTS Number: This project was funded by the property owner and was not used as match for another project, so it is not in the GRTS system.

Opening Paragraph: Bruno Creek is a tributary to the West Branch of the Otter River in Houghton County, in Michigan's Upper Peninsula. Excessive soil erosion at a logging road crossing and stream blockage from a collapsing culvert altered the hydrology of the stream and aggraded the stream bottom.

Problem: Excessive soil erosion at a logging road crossing and stream blockage from a collapsing culvert altered the hydrology of the stream and aggraded the stream bottom, smothering riffle and pool habitat and degrading the benthic macroinvertebrate community.

Project Highlights: Around 1990, Michigan Department of Natural Resources (MDNR) staff discovered massive erosion from a private logging road crossing into Bruno Creek. MDNR staff contacted the land owner, Conner Forest Industries, who voluntarily stabilized the road crossing and constructed and maintained an instream sand trap. Between 1992 and 2005, MDNR staff and MDEQ staff ensured that these stabilization BMPs were maintained despite property ownership changes. In 2005 it was apparent that the culvert was altering the hydrology and sedimentation patterns of the stream, and that year it was replaced by a bridge.

Results: Pre-BMP data were collected by MDNR in 1991, and post-BMP data were collected by MDEQ in 2001 (after the road crossing was fixed, but before the bridge was replaced). Overall macroinvertebrate diversity was identical both years (23 taxa; Table 1), but the composition of the macroinvertebrate community changed significantly:

- Total EPT taxa (three sensitive families; mayflies, caddisflies and stoneflies) increased from 4 to 9 taxa.
- Percentage of mayfly taxa increased from 9 to 14 percent.
- Percentage of caddisfly taxa increased from 4 to 20 percent.
- Percentage of tolerant isopod, snail and leech taxa decreased from 6 to 1 percent.
- Percentage of tolerant surface breathing taxa decreased from 10 to 0 percent.

Overall this shift in macroinvertebrate community reflected the change in aquatic habitat as indicated by the aquatic habitat survey data (Table 2), from a wide,

shallow, sandy stream channel with unstable banks to a narrower, deeper, rockier channel with stable banks.

Partners and Funding: Conner Forest Industries voluntarily funded fixed the road crossing, and installed and maintained an instream sand trap during the 1990s. A subsequent owner of the property, Forestland Group, voluntarily replaced the culvert with a channel-spanning bridge in 2005, at a cost of approximately $20,000.

Photographs:

1. Eroding soil entering stream from road; delta shown is along the left side of picture 4, below. A similar delta of soil eroding from the other side of the road is on the right side of picture 4.

Photographs, continued.

	
2. Stream crossing when culvert was in place; note that culvert (arrow) is smaller than channel width.	**3. Stream crossing after bridge was installed; note that bridge spans full channel width.**
	
4. Upstream of culvert; note soil delta on both banks, and the wide, shallow, sandy channel.	**5. Upstream of bridge; note vegetated bank on left, and the narrow, deeper, rockier channel.**

Data:

**Table 1. Macroinvertebrate Data,
Before and After Road Crossing was Fixed.**

Metric	1991	2001 (after road crossing was fixed, but before bridge was replaced)
Total taxa	23	23
Total EPT* taxa	4	9
Percent mayflies	9	14
Percent caddisflies	4	20
Percent isopods, snails and leeches	6	1
Percent surface air breathers	10	0

*EPT = sensitive taxa; mayflies, stoneflies and caddisflies

**Table 2. Aquatic Habitat Data,
Before and After the Road Crossing was Fixed.**

Metric*	1991	2001 (after road crossing was fixed, but before bridge was replaced)
Bottom substrate	2	11
Substrate embeddedness	3	9
Velocity:Depth	8	15
Bottom deposition	3	8
Habitat heterogeneity	4	9
Bank stability	4	7
Bank vegetative stability	5	10
Overall score	**46 (Poor)**	**90 (Good)**

*Higher score = better habitat

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