Title: Livestock exclusion fencing improves Cedar Creek habitat and macroinvertebrates

Water body improved: Cedar Creek (AUID number 040500060406-02) is in the Cedar Creek sub-watershed within the Rogue River watershed located in Kent County, Michigan. Cedar Creek is listed on the Clean Water Act Section 303(d) list of impaired waters for a Fish Consumption Designated Use impairment due to polychlorinated biphenyls. While Cedar Creek is listed as fully supporting the Other Indigenous Aquatic Life and Wildlife Designated Use, there are areas where macroinvertebrate scores are acceptable, but trending toward poor.

GRTS numbers: 98502312 and 98502317 (pre- and post-monitoring support, respectively)

Problem: Unlimited cattle and horse access created a wide muddy stream channel with trampled banks. Instream habitat and macroinvertebrate populations were degraded (Figure 1).

Project highlights: Best management practices (BMPs) installed in 2015 were 1,300 feet of livestock exclusion fencing, restricted cattle crossing, and trees along with native vegetation planted on stream banks.

Results: BMP installation narrowed the stream channel and stabilized the banks where fencing was installed and vegetation planted (Figure 2). Based on the Michigan Department of Environmental Quality's (MDEQ's) biological and habitat monitoring protocol, livestock exclusion had beneficial impacts on instream habitat (Table 1) and the macroinvertebrate community (Table 2). Specifically, improvements were mostly measured on the upstream side of Algoma Avenue, directly adjacent to the livestock access site.

- Overall habitat score increased about 17 percent upstream of Algoma Avenue.
    - Mostly related to a decrease in sediment deposition and an improvement in vegetation.
- Overall macroinvertebrate score increased by four points upstream of Algoma Avenue.
    - Mostly related to an increase in mayflies and caddisflies.
- Downstream of Algoma Avenue macroinvertebrates and habitat scores were about the same, indicating that the livestock access had localized impacts on stream quality.

Partners and Funding: Trout Unlimited received funding from the United States Fish and Wildlife Service (USFWS) as part of the Rogue River Home Rivers Initiative project. The funding was provided through the USFWS under the Great Lakes Restoration Initiative and the National Fish Habitat Partnership – Great Lakes Basin Fish Habitat Partnership. Trout Unlimited and South Peat Environmental, LLC worked with the landowner to install the livestock exclusion fencing while the MDEQ conducted the pre- and post-monitoring. The total project cost was approximately $16,000.

Photographs:

Figure 1. Aerial of Cedar Creek in April 2009 with extensive livestock access, before exclusion fencing was installed. Stream is flowing west to east. Red dots represent sampling locations.

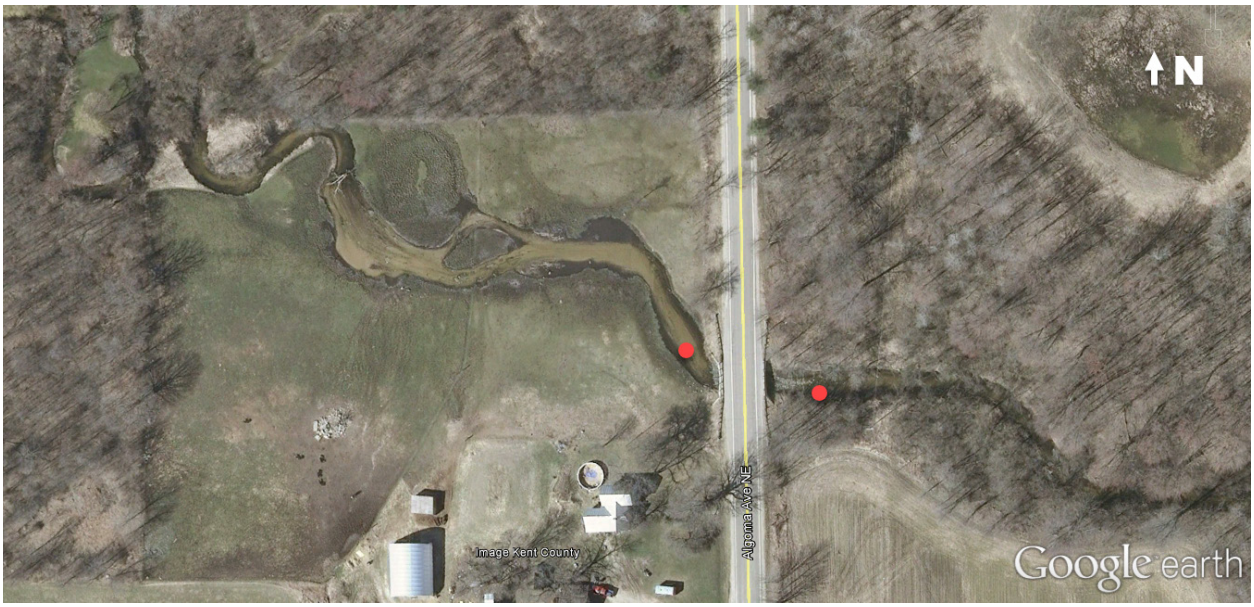
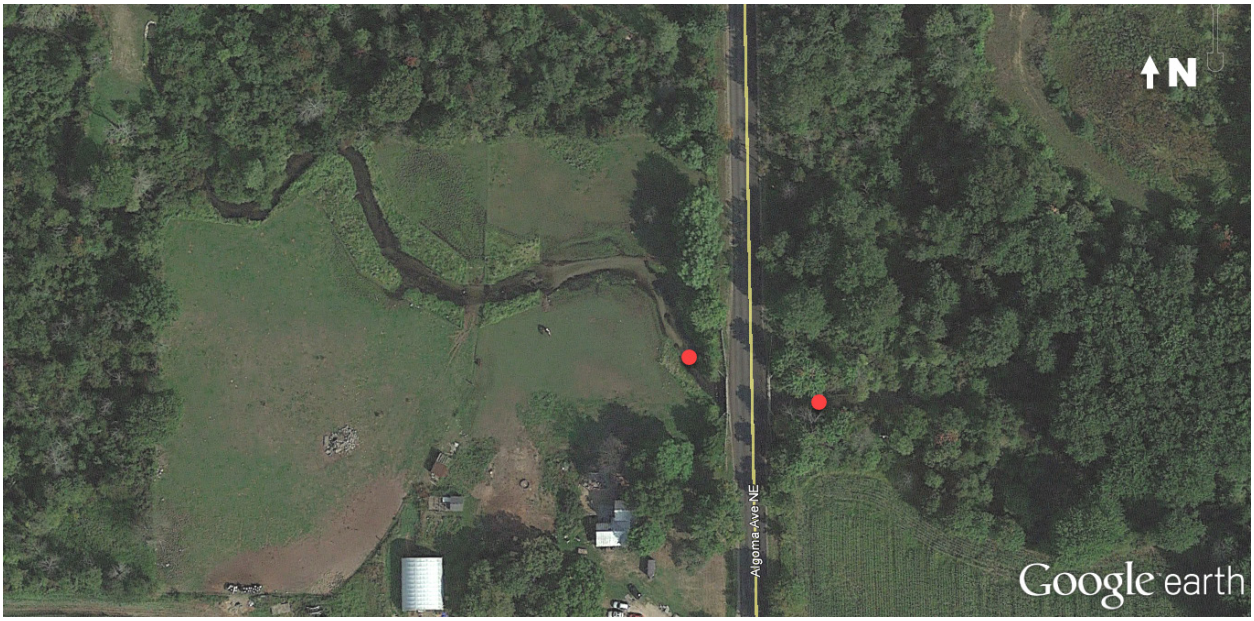


Figure 2. Post BMP aerial of Cedar Creek in September 2017 after exclusion fencing was installed. Stream is flowing west to east. Red dots represent sampling locations.



Data:

Table 1. Pre and post BMP stream habitat data (BMPs were installed in 2015).

Table 1. Pre and post-BMP stream macroinvertebrate data (BMPs were installed in 2015).

Habitat metric	U/S Algoma Ave. pre-BMP (2012)	D/S Algoma Ave. pre-BMP (2012)	U/S Algoma Ave. post-BMP (2018)	D/S Algoma Ave. post-BMP (2018)
Epifaunal substrate/available cover	10	13	10	14
Pool substrate	13	13	16	15
Pool variability	6	14	8	15
Sediment deposition	10	10	15	15
Channel sinuosity	15	15	11	10
Bank stability (LB, RB)*	7, 7	8, 8	8, 8	9, 7
Vegetative protection (LB, RB)*	2, 2	8, 8	8, 7	8
Riparian vegetative zone width (LB, RB)*	0, 0	10, 4	3, 3	8, 6
Overall score	105	144	127	145
Overall rank	Good	Good	Good	Good

*Left bank (LB) and right bank (RB) determined by looking downstream.

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Table 2. Pre and post BMP stream macroinvertebrate data (BMPs were installed in 2015).

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Macroinvertebrate metric	U/S Algoma Ave. pre-BMP (2012)	D/S Algoma Ave. pre-BMP (2012)	U/S Algoma Ave. post-BMP (2018)	D/S Algoma Ave. post-BMP (2018)
Total taxa	26	28	29	29
Sensitive taxa (mayflies, stoneflies, caddisflies)	5	10	7	7
Overall score	-2	1	2	2
Overall rank	Acceptable	Acceptable	Acceptable	Acceptable

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