Middle Fork Horse Creek Site Visit

Mountain Foothills Ranch LLC
Mass Wasting Event Site Visit 2018

Author

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1 Introduction

Middle Fork Horse Creek is a small stream that originates on the western flank of the Crazy Mountains and flows for 7 miles until its confluence with North Fork Horse Creek. The combined flow from these streams form the main stem of Horse Creek (Figure 1). The landowner contacted Carol Endicott, a fisheries biologist with Montana Fish, Wildlife & Parks, who provides technical assistance to landowners seeking to improve habitat for Yellowstone Cutthroat Trout (*Oncorhynchus clarkii bouvieri*) on their lands. He was concerned about substantial erosion that occurred during exceptionally high waters in spring of 2018, and the potential for this erosion to harm the stream and fish.

Middle Fork Horse Creek supports a nonhybridized population of Yellowstone Cutthroat Trout (Leary 2013) and lacks nonnative species, giving this stream considerable conservation value. In 2011, a portion of Middle Fork Horse Creek was the subject of a restoration project aimed at improving habitat for Yellowstone Cutthroat Trout and reducing sediment loading from a stream adjacent vertical terrace. Decades of incompatible livestock grazing, and creation of a shallow on-stream pond had degraded habitat quality within the treated reach. With funding from the Future Fisheries Improvement Program and the previous landowner, actions included creating a stream channel in the footprint of the pond and construction of a floodplain bench at the toe of the eroding terrace. Transplants of mature willows on the floodplain bench and extensive willow sprigging expedited reestablishment of a shrub community, and permanent rest from grazing facilitated natural reproduction of willows.

Snowpack in the Crazy Mountains was well above average this winter, and spring runoff resulted in flooding throughout the watershed. Gage data from the U. S. Geological Survey's gage station near the mouth of the Shields River (06195600) show the Shields River exceeded flood stage twice in the month before the site visit. Spring rains further augmented stream flows. Flooding in tributaries and the main stem of the Shields River was substantial, and the Shields River inundated its floodplain and washed out roads on the east side of the watershed. Bank erosion was likely considerable along reaches where riparian health and function were reduced.

The severity of the erosion described by the landowner warranted a site visit to evaluate the threat posed to the stream's Yellowstone Cutthroat Trout. In addition, evaluation of how the restored section withstood the flooding was of interest given the investment of Future Fisheries Improvement Program funds. Post-disturbance monitoring provides valuable information in evaluating whether a restoration methodology is effective.

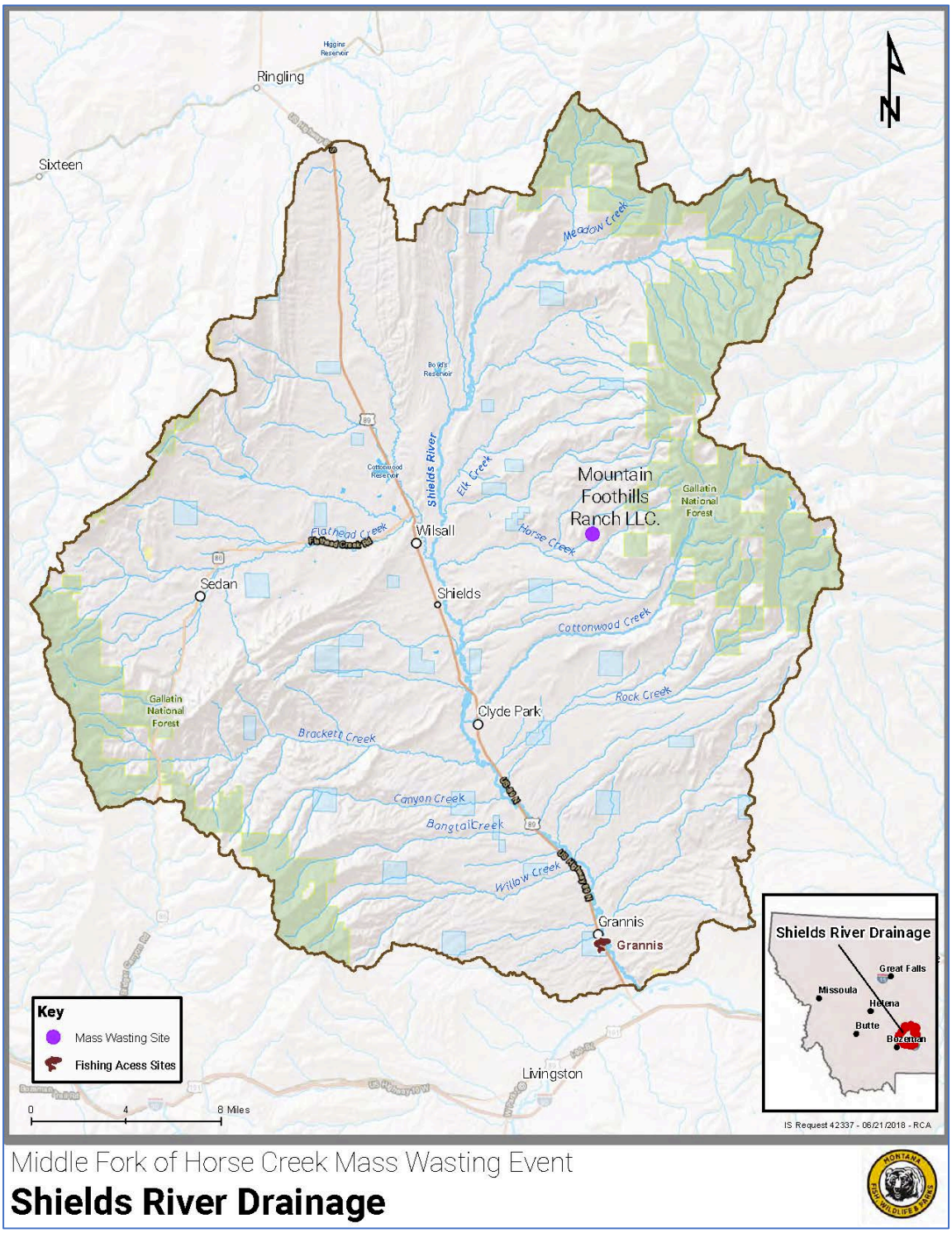

Figure 1. Map of the Shields River watershed highlighting Middle Fork Horse Creek and site visit location.

2 Site Visit

On June 13, 2018, Carol Endicott visited Middle Fork Horse Creek. The restored reach of Middle Fork Horse Creek withstood flooding with no damage (Figure 1). The channel remained deep and narrow, and the constructed floodplain was intact, with willows continuing to recruit. The formerly vertical, bare terrace (Figure 2) had continued to settle into an angle of repose. Earlier site visits found an invasive weed (probably *Galium*) covered much of the settled slope; however, grasses and forbs had largely displaced this early invader. The constructed floodplain bench allowed the stream to spread across the floodplain on both sides of the stream, making this reach resilient to flooding.

Figure 1. View of the constructed channel and floodplain bench, June 13, 2018.

Figure 2. Middle Fork Horse Creek terrace pre-restoration 2009.

The area of erosion was upstream of the restored reach, and the landowner's description of massive erosion was accurate. Flooding and wet soils resulted in a mass wasting event that eroded about 75 feet the top of the terrace towards Middle Fork Horse Creek (Figure 3). A large amount of terrace soils traveled across the stream (Figure 4). The soils had high clay content and resembled concrete. Despite the cohesiveness of the clay-dominated soils, Middle Fork Horse Creek had cut a channel through this material by mid-June (Figure 5). The date of the mass wasting event is unknown; however, gage data from the U. S. Geological Survey gage near the mouth of the Shields River shows the Shields River exceeded flood stage twice in the month before the site visit.

Figure 3. View of slump from top of terrace, looking downstream.

Figure 4. View of slump showing terrace soils spilled across the stream channel.

Figure 5. Channel cut through materials slumped into stream during mass wasting event.

An aerial photo from 2017 provides additional perspective on the extent of erosion at this mass wasting site (Figure 6). The photo shows the top of the terrace in August 2017. The mass wasting event resulted in lateral movement of the rim of the terrace that cut up to 20 feet into the terrace. The fence line is visible in the aerial photo, and the landowner had to rebuild the fence away from the rim, as much of it was overhanging the slump.

Figure 6. Aerial photo of the area of mass wasting showing the location of the top of the terrace before the event (August 9, 2017).

3 Conclusions and Recommendations

An above average snowpack and a wet spring resulted in flooding throughout the Shields River watershed. Wet soils and high stream flows caused mass wasting along a 75-ft long stretch of terrace adjacent to Middle Fork Horse Creek. Mass wasting is a natural geomorphic process where soil, sand, or rock moves downslope. Mass wasting can be slow when driven by gravity, or it can be a rapid event, when aided by water or other disturbance. The rapid mass wasting along Middle Fork Horse Creek was the result of natural processes during a wet spring with high stream flows.

As this area is not under grazing pressure or other human disturbance, the terrace will eventually restabilize, although it will be a natural source of sediment loading until the slope settles into an angle where vegetation can establish. Middle Fork Horse Creek will rework the channel through this reach and eventually reestablish a channel with access to its floodplain. Allowing this area to recover naturally is the recommended approach.

The restored reach downstream of the area of mass wasting was unaffected by high flows or sediment loading from erosion upstream. The narrow, deep channel effectively transported the augmented sediment load, and the constructed floodplain bench prevented scour along the formerly eroding terrace. Middle Fork Horse Creek has experienced 2 floods since restoration of this reach, with the first flood occurring the following spring. Its continued resilience to flooding demonstrates this restoration approach to be effective at taking pressure off highly erodible areas and allowing the stream to access a floodplain, which dissipates flow energies and allows transported sediments to filter through streamside vegetation.

4 Literature Cited

Leary, R. 2013. Genetic letter from Robb Leary to Dave Moser documenting results of samples of Yellowstone cutthroat trout, October 7, 2013. University of Montana, Missoula: University of Montana Conservation Genetics Laboratory.