



**Little Prickly Pear Creek
Post-Flood Event Restoration
At Sieben Ranch**

Status Report for Northwestern Energy
FERC Project 2188

Project #2019-21

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December 2019

In spring 2018, Little Prickly Pear Creek flooded resulting in damage to a stream reach that had been previously restored by Montana Fish, Wildlife and Parks (MFWP) with funding from Northwestern Energy (NWE) and other entities. At the December 2018 Missouri River Technical Advisory Committee (MoTAC) meeting, MFWP was awarded \$41,375 from NWE to conduct channel maintenance and restore the Little Prickly Pear Creek channel to the pre-2018 flood event state.

In 2011, peak stream flow in Little Prickly Pear Creek reached 2,460 cfs which was the highest flow since 1975. Little Prickly Pear Creek overfilled its banks and caused considerable erosion to the BNSF railroad grade resulting in the stream flowing down the railroad grade. A restoration project was completed in 2014 to remove the channel from the railroad grade and restore proper stream function. The ultimate goal was to safeguard valuable trout habitat. The stream channel maintained itself until large-scale flooding occurred throughout the region in spring 2018, including in Little Prickly Pear Creek. While the USGS Little Prickly Pear Creek gauge had been temporarily discontinued, it was estimated based on a nearby gauge to be approximately 1,000 cfs, which would have been the highest flow since 2011. The flooding caused significant damage to the constructed stream channel including leaving an active headcut and a large amount of sediment deposition in the downstream end of the project area near the frontage road and an active headcut further upstream.

Based on an assessment by Northwestern Energy's restoration consultant, the unravelling of the constructed stream channel on the Sieben Ranch during the 2018 spring run-off appeared to be a chain of events that possibly started downstream of the constructed channel. A survey of the impacted stream reach showed the existing stream channel bottom downstream of the constructed reach was almost a foot lower than when construction ended in 2014. This elevation change indicated a headcut may have started downstream and advanced through the project area. The third (most downstream) former rock cross-vane apparently failed on the right bank of the channel, which added over a foot of gradient differential to any advancing headcut. This differential caused a cascade effect upstream, taking out the second rock cross-vane, which caused a large amount of eroded sediment to plug the stream channel down valley creating the alluvial fan at the bottom of the constructed reach.

The restoration approved by the MoTAC and permitted by the appropriate agencies was completed in late April and early May 2019. The restoration and maintenance consisted of removal of the stream channel plug and stabilizing and redefining the existing channel. Rock grade control structures were also constructed in two areas of active headcuts to prevent further channel down cutting. Rock grade control structures were constructed with 2 ft minus rock and built to the stream grade to prevent a similar occurrence from happening in the future.

The project was designed to complete a minimal amount of work in the highly degraded areas to restore the stream to the previously constructed channel with additional grade control structures to restore the stream function and prevent the headcuts from continuing up the channel. This

work was also necessary to limit the potential for large-scale damage that would likely occur if the channel encroached into the adjacent frontage road.

Figure 1 depicts the location of the project. Photos 1 through 12 depict the project area before, during, and after completion of the work.

Submitted by: Jason Mullen December 2019

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Figure 1. Map of Little Prickly Pear Creek project area. Yellow circles depict the approximate locations of where work was completed.



Photo 1. Little Prickly Pear Creek after 2014 channel construction and pre-2018 flood event. May 2014.



Photo 2. Little Prickly Pear Creek during 2018 flood event. May 17, 2018.



Photo 3. Little Prickly Pear Creek after 2018 flood event. June 14, 2018.



Photo 4. Little Prickly Pear Creek after 2018 flood event. July 16, 2018.



Photo 5. Little Prickly Pear Creek after 2018 flood event. July 16, 2018.



Photo 6. Little Prickly Pear Creek after 2018 flood event, during restoration. May 1, 2019.



Photo 7. Little Prickly Pear Creek after 2018 flood event, during restoration. May 1, 2019.



Photo 8. Little Prickly Pear Creek after 2018 flood event, during restoration. May 1, 2019.



Photo 9. Little Prickly Pear Creek after 2018 flood event, after restoration. May 21, 2019.



Photo 10. Little Prickly Pear Creek after 2018 flood event, after restoration. May 21, 2019.



Photo 11. Little Prickly Pear Creek after 2018 flood event, after restoration. May 21, 2019.



Photo 12. Little Prickly Pear Creek after 2018 flood event, after restoration. July 16, 2019.