

Musselshell River CMZ Mapping



Musselshell River History

- The Musselshell River Watershed contains approximately 9,500 square miles.
- Drains from the Crazy, Castle and Little Belt Mountains, the main stem of the Musselshell River flows from the confluence of the North and South Forks near Martinsdale, Montana for nearly 340 miles to Fort Peck Reservoir. Provides irrigation water for nearly 85,000 acres and 250 farms and ranches and 388 water rights holders, including six municipalities.
- Traditionally, the area's water users plan for much less water than "normal" because of the much more frequent occurrence of drought. The Musselshell is a prime example of changing weather extremes, with spring melts and runoff taking place earlier in the year, unpredictable major weather events, and weather systems that change direction and intensity by the hour.

Musselshell River Flood History, the last decade

- While drought and water shortages have historically characterized the Musselshell Basin, the two largest floods ever recorded at Roundup occurred within four years of each other; in the spring of 2011 and the late winter of 2014. Since 2011, flood events have come to define the Musselshell River as unpredictable and powerful.
- In 2011, a combination of snowmelt and rain resulted in 150-year flooding along all reaches of the Musselshell. At its height, floodwaters reached two feet higher than the previous record flood in 1967. The 2011 flood caused a “reset” of the Musselshell River. There were 59 avulsions that resulted in the river channel being shortened by 37 miles. In places, the river migrated several hundreds of feet during the flood, causing massive erosion, and sediment deposition downstream. A total of 31 breaches occurred in the historic Milwaukee Railroad grade and has served as a flood berm for nearly 100 years.

2014 Flood near Mosby



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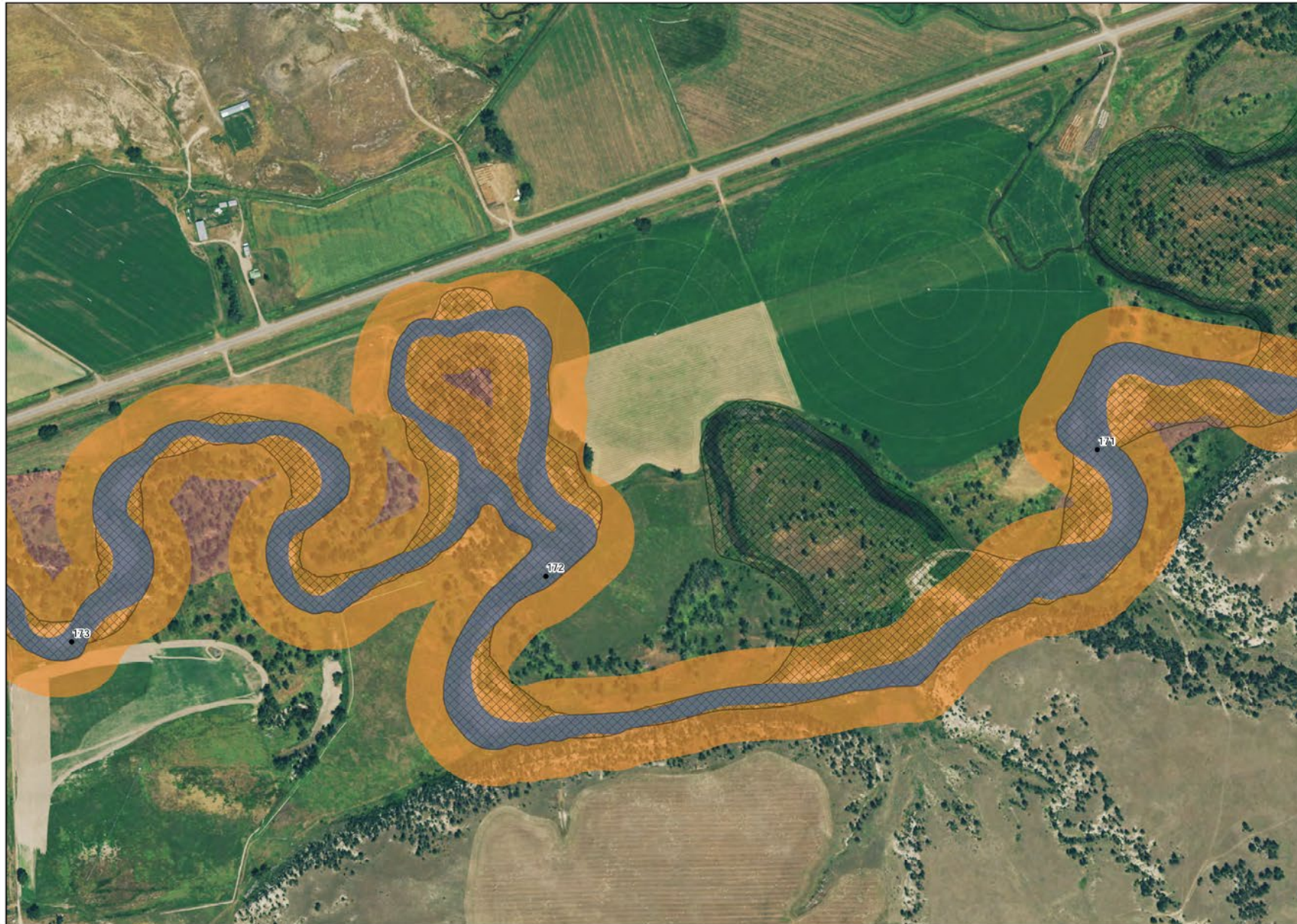
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CMZ Mapping



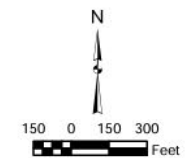
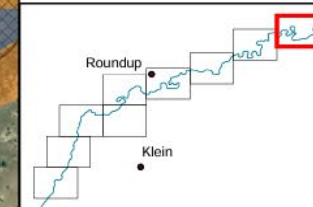
Musselshell River Channel Migration Zone (CMZ) Mapping

Roundup Area


March 2022

Legend

- 2019 River Miles
- 2019 Channel
- ▨ Historic Migration Zone
- Erosion Hazard Area
- Avulsion Hazard Zone



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River and Reservoir Engineering CDRAW-EDM1	
Produced by CMC	 US Army Corps of Engineers Omaha District
Production Date: 10 Mar 2022	
Revised by:	
Revision Date:	
File Location:	

Source: 2019 NAD Imagery

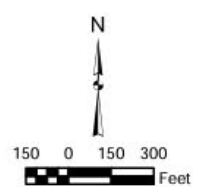
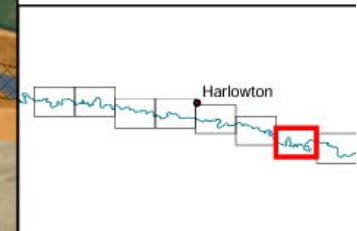
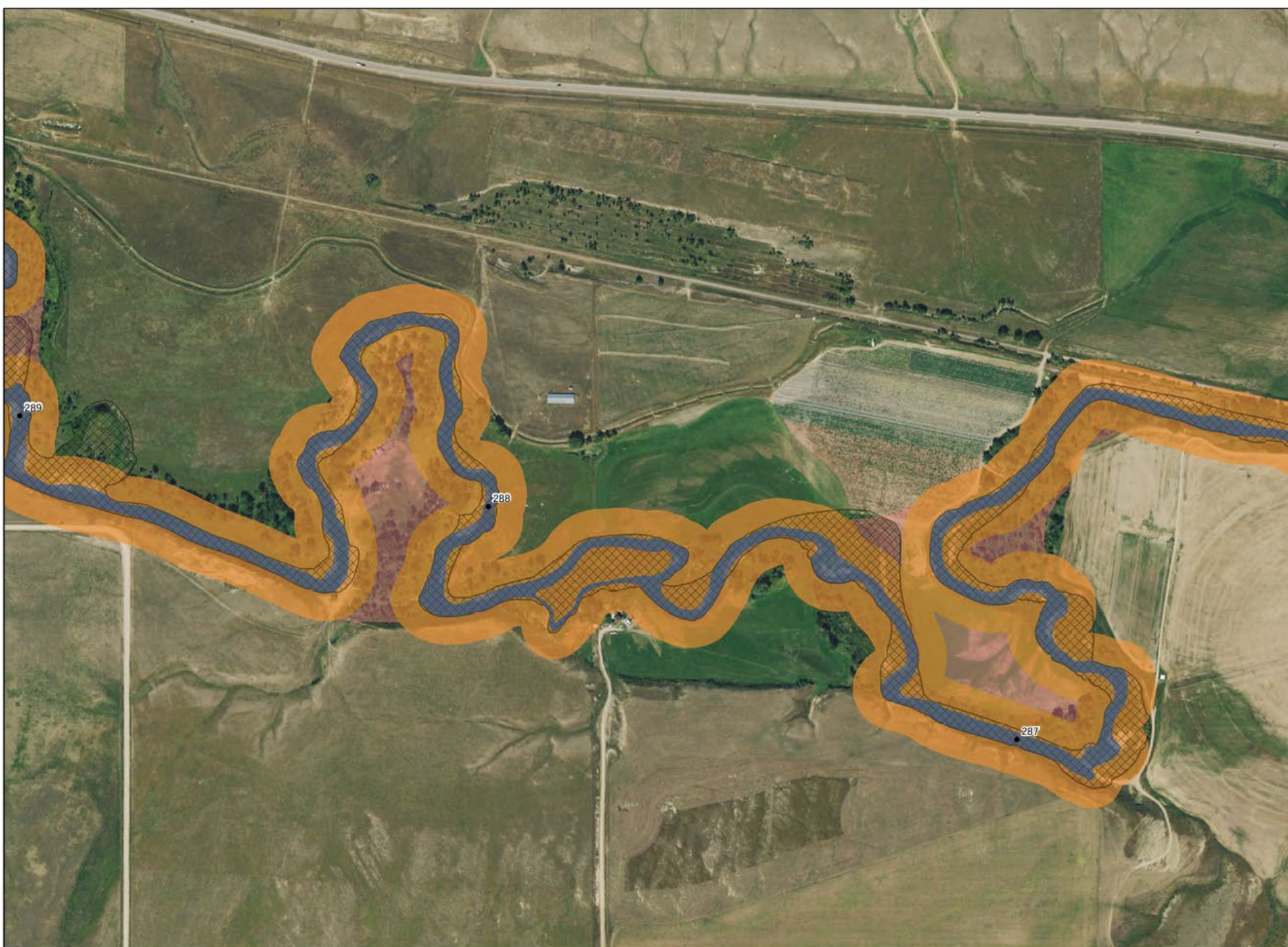
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Harlowton Area

March 2022

Legend

- 2019 River Miles
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Map USE

- CMZ mapping is used by local, state, and federal agencies, as well as private landowners to:
 - better manage the Musselshell River;
 - prioritize treatments that will conserve water resources;
 - identify areas of evident channel stability that can provide effective renewable resource development sites that will have minimal impact on stream function;
 - identify areas where channel dynamics support vital ecological function where voluntary measures can be pursued to preserve river function and associated public and natural resource benefits.

Agricultural Use of Maps

- water user associations and conservation districts/NRCS for the purpose of helping landowners site ag infrastructure like pumpsites, water lines, pivots, etc. (several pumpsites and pivots that were replaced after 2011 had to be replaced again in 2014-2020 because of continued flooding.
- Conservation districts -310 permitting.
- County governments for siting roads and bridges - the Cushman Bridge being a good example of having better predictive information about what the river will do to aid in making the decision about what to do with the bridge.
- Floodplain encroachment project, ranked all Encroachments within the watershed (majority being Railroad embankments) to determine feasibility, Floodplain connectivity and watershed function. We Used CMZ maps to help aid in prioritized Encroachment projects to pursue in the watershed.



Kilby Butte Bank Restoration Project

- Kilby Butte bank project and potential fish bypass of the diversion
- Understanding of rivers regarding the risks they pose to infrastructure, so that those risks can be managed and hopefully avoided. Furthermore, we believe the mapping supports the premise that managing rivers as dynamic, deformable systems contributes to ecological and geomorphic resilience while supporting sustainable, cost-effective development. –Karin Boyd



Figure 23. View upstream of Eliason Diversion Dam on June 16, 2011 showing historic channel remnants both within active corridor and beyond highway (Kestrel).

- As the Coalition has just received these maps, future goals and outreach include:
- Continued bank restoration projects as it relates to erosional severity and the rivers' ability to access its floodplain to dissipate energy.
- Water users' associations- helping farmers and ranchers where irrigation infrastructure is located within a critical migration zone
- Flood Preparedness in the future/landowner decision making
- Best Management Practices at a holistic Watershed scale and Conservation Easement planning
- projects constructed in stream environments such as bank stabilization, homes and outbuildings, access roads, pivots, and diversion structures are built without a full consideration of site conditions related to river process and associated risk.

Conclusions

