



Musselshell Watershed Coalition

2020 Volunteer Salinity Monitoring Program

Project Goals:

The goal of this monitoring project is to simultaneously collect credible, useful salinity data while also providing a method for education and outreach about water resources. Sedimentation/erosion and weeds have been raised as topics of concern and will be monitored alongside salinity. Salinity is addressed by using specific conductance meters, while sedimentation/erosion and weeds are addressed through photo point monitoring. This program serves to engage local water users and/or water managers in data collection to increase awareness about water quality, to produce locally collected data that can be used in public education efforts to foster stewardship and increase communication about water resources within the Musselshell River basin, and to collect photo documentation of bank condition changes through time, which could help MWC identify areas in need of shoreline or ecological restoration due to sedimentation/erosion and weeds.

Project Overview:

The Musselshell River is part of a unique combination of mountain and prairie stream watershed systems located in Central Montana. Originating in the Crazy, Castle, and Little Belt Mountains, the Musselshell flows over 300 miles from its source near Martinsdale, MT to its confluence with the Missouri at Fort Peck Reservoir. Late spring rainfall and snowmelt from the valley's bordering mountain ranges are responsible for the majority of the Musselshell's in-stream flows throughout the year. The 9,500 square mile drainage of

the Musselshell encompasses a varied landscape including ponderosa pine woodlands, sagebrush dominated plateaus, short grass prairie, and a thin ribbon of riparian corridor characterized by cottonwood galleries and thickets of willow.

The valley's economy is centered on agriculture with dry-land farming and ranching operations representing the majority of agricultural production. Mineral extraction has also long been present in the valley, namely coal mining in the Bull Mountains south of Roundup, MT. Since the

late 19th century, many significant alterations have been made to the Musselshell River floodplain. Most significantly, the now defunct "Milwaukee Road" railway running adjacent to the Musselshell for a large extent of its reach shortened the river's original channel length and prohibited it from accessing its floodplain. Historically, the Musselshell was commonly dewatered during late summer months due to irrigation withdrawals.

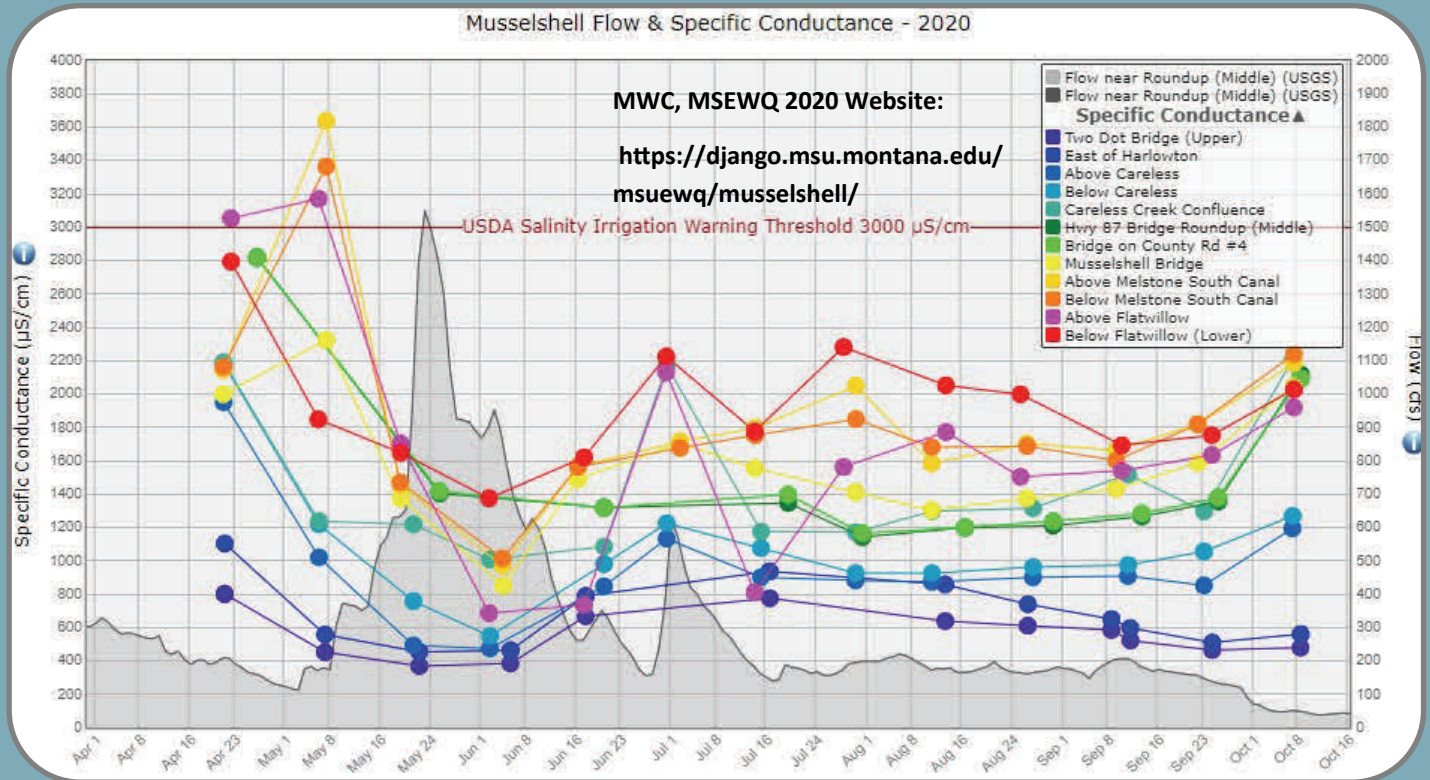
Project Design:

Sampling was conducted on the Musselshell River and one of its tributaries from the confluence of its north and south forks to its confluence with Flatwillow Creek upstream from Fort Peck Reservoir. The tributary, Careless Creek, will be monitored at its confluence with the Musselshell. Most sample sites are laid out above and below major points of diversion and confluences, others are laid out above and below human developments. Twelve sites were monitored in total. The Musselshell River differs significantly from its upper to lower reaches, transitioning from a mountain to a prairie stream system, with the sites laid out to capture those differences. Proximity of sites to USGS gaging stations was also taken into account, such as the Mosby and Musselshell bridge stations.



Musselshell Watershed Coalition 2020 Salinity Data Summary

Specific Conductance (SC) is the amount of electricity that water will conduct and is directly related to how much salt is dissolved in the water. The USDA has designated 3000 $\mu\text{S}/\text{cm}$ as the irrigation warning threshold. Water with a SC above this concentration may cause drought stress in crops and/or unpalatability of stock water.



USDA NRCS June 2020 Western Snowpack and Water Supply Conditions for Montana:

“Precipitation was well above average in the Smith-Judith-Musselshell River basin during May. Most of the precipitation occurred during the colder first half of the month. Water year precipitation has been slightly above average, and snow remains at upper elevations only. The basin-wide snowpack peaked at near-normal conditions in mid-April. Currently, with 14 inches of snow (5.8 inches snow water), Onion Park SNOTEL has over double its normal June 1st snowpack. Spur Park SNOTEL currently has about 40 inches of snow. Due to near-record high temperatures, significant snowmelt occurred at the end of April and end of May, which pushed streamflows soaring to near-record high stages. “



The lowest specific conductance reading was taken at Two Dot Bridge in late May with a value of 371 $\mu\text{S}/\text{cm}$.



The highest conductance for the year was above Meltstone South Canal at 3,638 $\mu\text{S}/\text{cm}$ taken in early May.

2020 was a somewhat average water year in the region. After a great spring, precipitation levels dropped significantly in the summer months. The Musselshell flows past Roundup remained about average after the highs in May. Snow pack was slightly below average this year. After 2019, which was showed relatively low salinity levels in the river, 2020 had abnormally high levels especially in the early spring months. There were four measurements that exceeded the 3,000 $\mu\text{S}/\text{cm}$ standard. After the early peaks, all the sites generally stabilized in the summer and salinity ranged from ~ 800 -2300 $\mu\text{S}/\text{cm}$. Despite being a somewhat normal year for precipitation and streamflows, salinity was a potential problem. If Central Montana were to enter a period of drought-like conditions, the problem of high salinity for irrigation and stock water would almost certainly be exacerbated. Continued monitoring in the Musselshell Watershed is critical for making management decisions.

In addition to the yearly monitoring of salinity in the Musselshell, MWC's Big Sky Watershed Corps member sampled livestock ponds for salinity throughout Petroleum County. Many producers have been concerned with persistently high salinity levels in ponds as a result of the 2011 floods.