



Musselshell Watershed Coalition

2016 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.

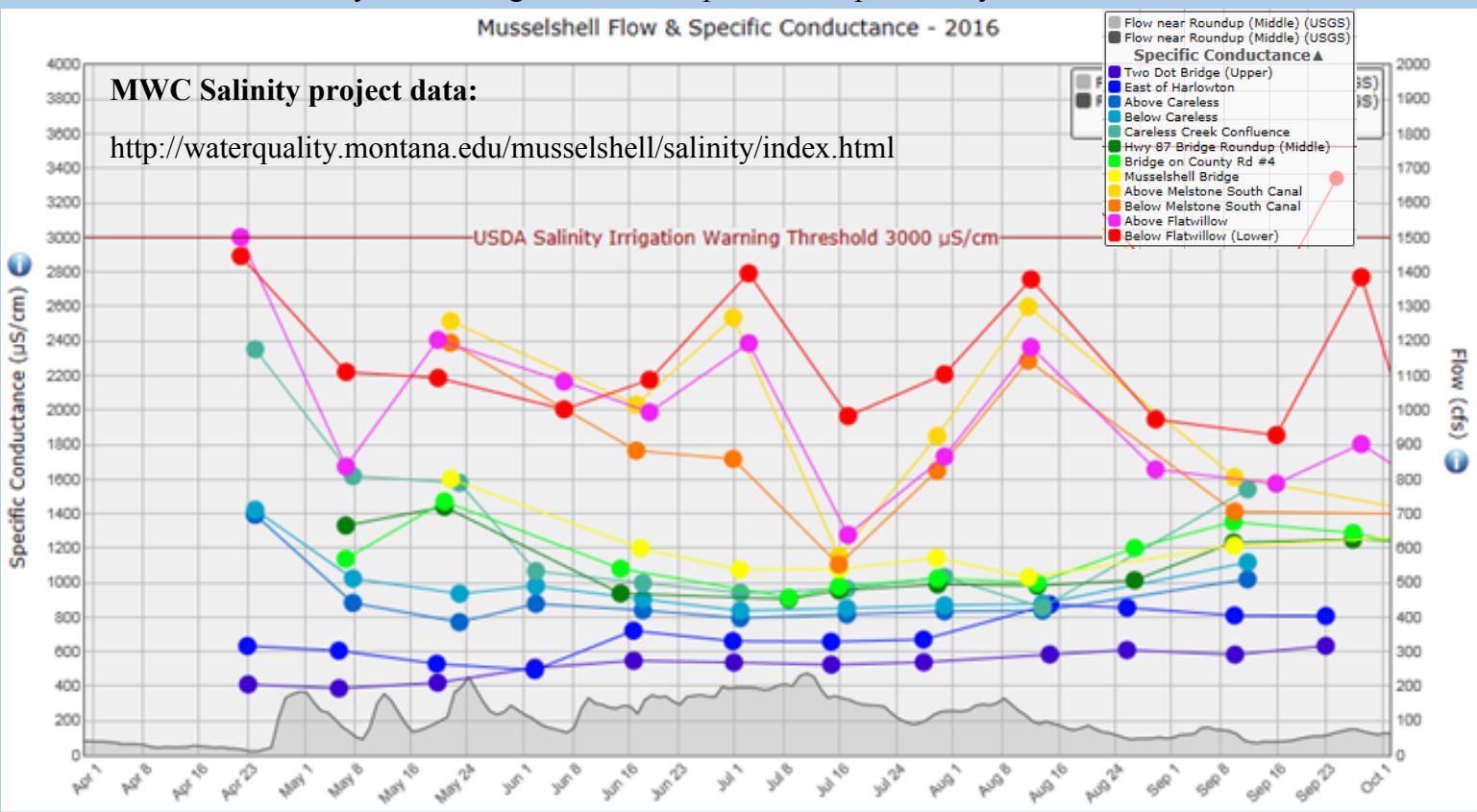
Project Design:

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 2016 Salinity Data Summary

Specific Conductance (SC) is the amount of electricity that water will conduct and is directly related to how much salt is suspended 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 April 2016 Western Snowpack and Water Supply Conditions for Montana:

"Snowpack peaked near or slightly below normal in most areas during the first week of April, one to three weeks earlier than average. Periods of high pressure ushered in abundant sunshine with well above average, and even some record high, temperatures, causing a rapid transition to snowmelt in most river basins."

Just as in 2015, the lowest SC measurement of 2016 (387 $\mu\text{S}/\text{cm}$) was recorded by Leon Hammond at the Two Dot Bridge sampling site on May 5th. This occurred shortly after the initial spring runoff event, when the fresh melt water from the mountains diluted the river's salinity.

Did you know...
Deionized (DI) water has all the salt removed and does not conduct electricity (SC = zero).
Snow and rain are nature's DI water!

The highest SC measurement of 2016 (3002 $\mu\text{S}/\text{cm}$) was recorded by Tammie Starkjohann at the Above Flatwillow site on April 21st. This occurred before the initial spring runoff event and associated salinity dilution. This was the only 2016 reading in excess of 3000 $\mu\text{S}/\text{cm}$.

SC readings in the upper and middle reaches of the Musselshell River from Two Dot bridge to the bridge at Musselshell remained generally low throughout the sampling season, especially after the initial spring runoff/salinity dilution event. The lower reach sampling sites, from Above Melstone South Canal to Below Flatwillow, all saw higher readings and much more reading fluctuation throughout the season as compared to the upper and middle reaches. This pattern is similar to findings from past sampling seasons.

One notable event visible in the data of the four lowest sites occurred between early July, when there was a peak in the readings, through mid-July, when readings decreased by nearly 1000 $\mu\text{S}/\text{cm}$. By mid-August, all of the readings had returned to the early July values once again. There are a variety of factors that may have caused this dilution event. It is possible that this dilution was caused by a surge of low salinity stored reservoir water that was released but then went unutilized by irrigators due to precipitation. This low salinity reservoir water possibly flowed down the river to these lower sampling sites causing this anomalous salinity dilution, though it is difficult to say for certain at this point without more accurate local precipitation data, data from irrigators, and/or notes from water managers.

Thanks to our 2016 Salinity Volunteers and MSUEWQ Staff!

From late April through early October, our five local citizen volunteers collectively spent 150 hours collecting 350 data points and photos along the stretch of the Musselshell River from Two Dot to Mosby and entering them in the online database. None of the MWC's salinity monitoring program would have been possible without their willingness and dedication over the past six months.

Additionally we would like to thank Adam Sigler and Erin Wall with MSU Extension Water Quality for their training, support, and guidance leading up to, during, and after the sampling season.



Leon Hammond is the water commissioner for Zone 4, project manager for Upper Musselshell Water Users Association, and ditch rider for Deadman's Basin Water Users Association. When he is not running water, he is the shooting sports instructor for the Wheatland County Rifleman's 4-H Club in Harlowton. He is also an Army Veteran and an active member of the American Legion Post #15.

Sample Sites: Musselshell at Two Dot Bridge and Musselshell East of Harlowton



Pam Mickelson is a kindergarten through 4th grade teacher at Ryegate Public School and a landowner along the Musselshell River. She became involved with water quality monitoring after Matt Schmidt, MWC's Big Sky Watershed Corps member, spent a day at Ryegate School doing guest lectures.

Sample Sites: Musselshell Above Careless Confluence, Musselshell Below Careless Confluence, and Careless Creek at Musselshell Confluence



Donna Pedrazzi is the District Administrator at Lower Musselshell Conservation District in Roundup. She and her husband own and operate a ranch along the Musselshell River. She became involved in water quality monitoring through her activities with the Coalition and regularly participates in MWC activities as a representative of the Lower Musselshell Conservation District.

Sample Sites: Musselshell at Hwy 87 Bridge near Roundup and Musselshell at County Road 4 Bridge



Lynn Rettig lives in Musselshell and is the water manager for the Delphia-Melstone Water Users Association. He also serves on the board of the Montana Water Resources Association. He became involved in water quality monitoring through his activities with the Coalition.

Sample Sites: Musselshell at Bridge at Musselshell, Musselshell Above Melstone South Canal Return, and Musselshell Below Melstone South Canal Return



Tammie Starkjohann is a member of the Rowton family, a Petroleum County Centennial family. The Rowton Brothers ranch operates largely on the Musselshell River and Tammie and her husband work on the ranch, as well as other off-ranch jobs. Her family is involved in the Coalition and she became involved with water quality monitoring through this connection.

Sample Sites: Musselshell Above Flatwillow Creek and Musselshell Below Flatwillow Creek