2019 Upper Clark Fork Stream Survey
Clark Fork Coalition
May, 2019

Introduction

On May 16, 2019 Clark Fork Coalition staff floated approximately 7.1 miles of the upper Clark Fork River through phases 2-6 of the *Clark Fork River Reach A* Superfund cleanup as a follow up to a similar assessment float that was conducted in May of 2018. The purpose of both the 2018 and 2019 floats was to investigate the impact of unusually high flows on unremediated portions of the upper Clark Fork between the completed phases of cleanup located immediately above (phases 1 & 2) and below (phases 5 & 6) the target reach. With a near record snowpack in the UCF and sustained high flows during 2018, our initial float in May of 2018 identified several areas of incipient channel change and avulsion that appeared to have the potential to produce significant mobilization of contaminated sediments downstream to remediated reaches of the Clark Fork. We revisited this sections of the river in 2019 to document changes to channel structure between 2018 and 2019.

Hydrologic Context

From 2017-2019 the upper Clark Fork River experienced several anomalously high flow events that have contributed to increased channel movement (erosion and deposition). Long time fishers and floaters in the area have reported the most drastic changes to the channel occurred in the unremediated reaches upstream of Deer Lodge (phases 3,4 & 7-13).

The USGS Clark Fork River stream gage at Galen (period of record 1989-2018) typically records peak flows in late May or early June with a long term average peak of just over 400 cubic feet per second (cfs). During the past 3 years, flows have greatly exceeded that long term average and flows over 800 cfs have been recorded at Galen.

Anecdotal reports from local recreationists suggest that many of the large avulsions documented in the report below were initially activated during a significant rain event that occurred from June 12-13, 2017. The rain event dropped over 2 inches of rain in Deer Lodge with an estimated 5+ inches falling in portions of the Flint Creek Mountains nearby. These heavy rains caused streamflows to rise rapidly in the area and the Clark Fork River at Galen reported a bump in flows of over 500 cfs in just a 48-hour period.

Although the June event may be responsible for some of the recent bank destabilization on the upper river, long and sustained high flows during 2018 likely compounded those issues. The Galen gage reported flows in excess of 700 cfs for over a month during May/June 2018 (Figure 1).

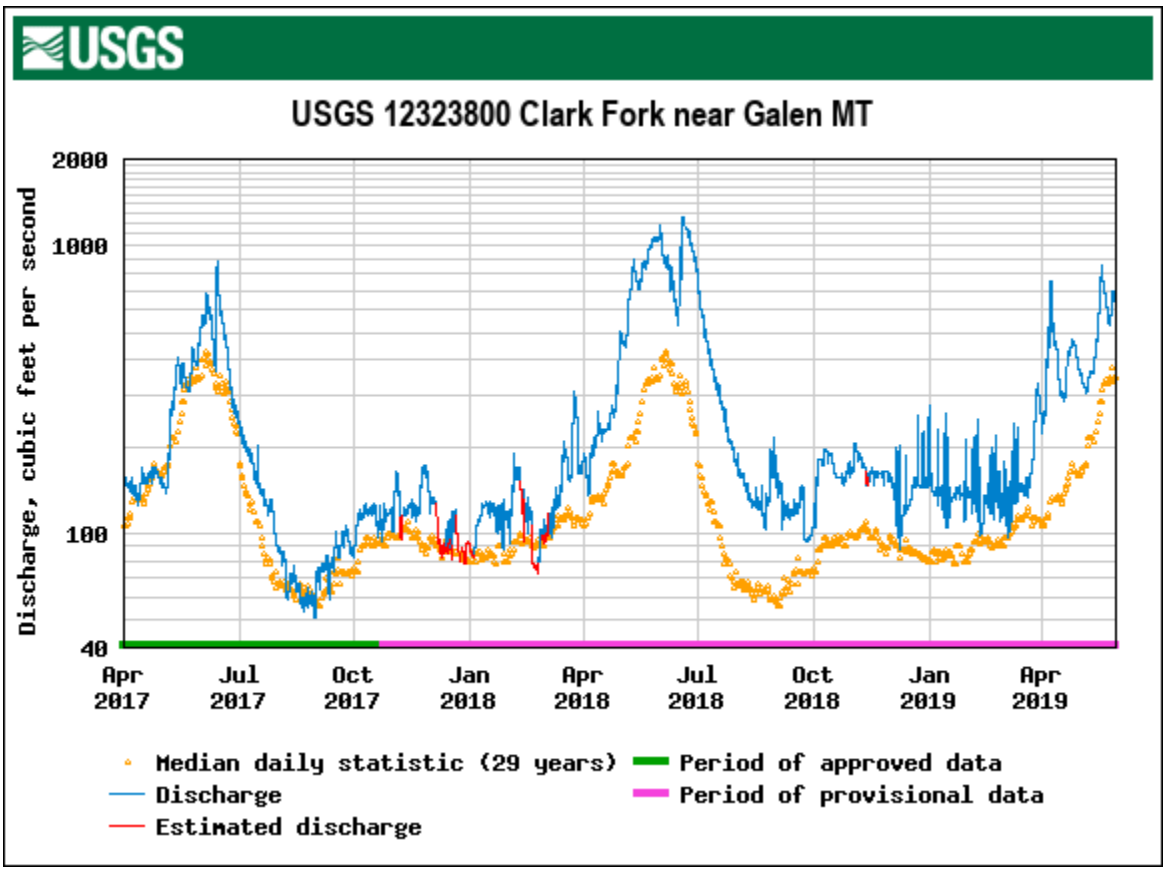


Figure 1- Hydrograph showing streamflow conditions on the upper Clark Fork from April 2017 to present. The yellow points represent average conditions and the blue line shows actual recorded streamflows. Note the period of significantly above average flows that started in the spring of 2018 and have continued through spring 2019.

Methodology

The 2019 float launched at approximately 9:30 am on May 16th and ended around 3:30 pm. Access was granted from the two adjacent property owners (the DCCR and Lamperts). Nathan Cook from MT FWP and Professor Brian Chaffin from the University of MT joined CFC staff member Alex Leone in the assessment.

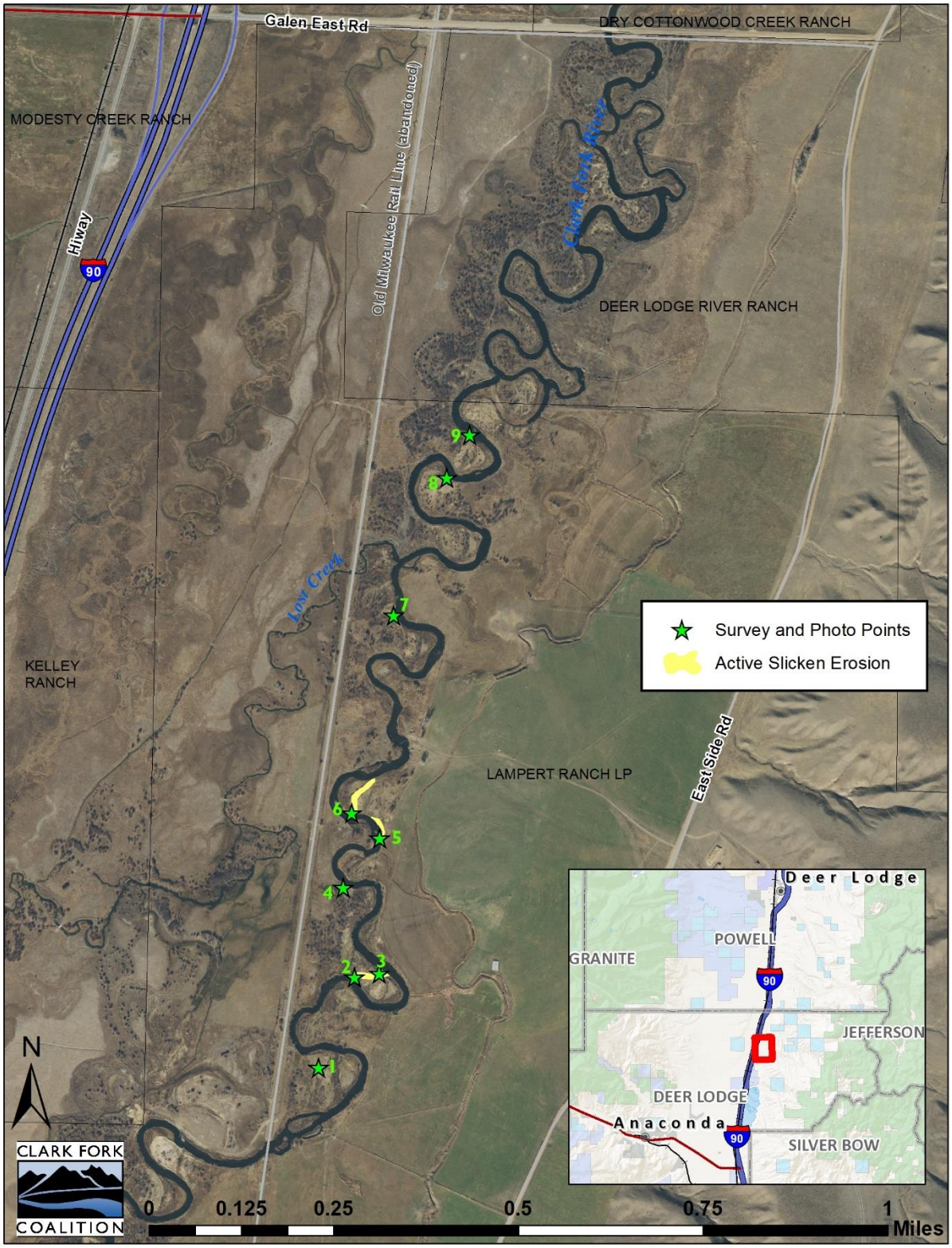
While floating through phases 3 and 4, CFC staff and partners used GPS data points established in 2018 to revisit and photo-document active erosion and avulsion of contaminated sediments at several points along the reach. We also consulted USGS stream gaging data from Galen to compare flows on the 2018 and 2019 assessment float dates. Stream discharge at the USGS Galen gaging station was approximately the same during the 2018 and 2019 assessment floats (Table 1).

	May 7th, 2018 Streamflow (cfs)	**May 16th, 2019 Streamflow (cfs)**
Beginning of float	552	572
End of float	572	599

Table 1- Comparison of streamflow at the USGS gage at Galen between the CFC's floats in 2019 & 2019. Note that flows were about 20 cfs higher during the 2019 float (which represents an increase in stage height of approximately 1 inch).

Results

The following 24 photos provide a comparison of conditions in 2018 with those in 2019 at approximately equal rates of discharge in the Clark Fork. Photo point locations and areas of active erosion/avulsion are presented in Map 1. Photos are annotated with brief, qualitative descriptions of the impacts we observed and the changes that occurred between the 2018 and 2019 floats. To assist with the comparisons, yellow circles have been added in some of the photos to identify common points of reference.



Map 1- Map of the reach of the Clark Fork floated during the CFC's surveys in 2018 and 2019. The survey and photo points will be referenced in the series of photos below.

Photo 1- Taken at Point 1. This photo was taken from the middle of a slicken that is stable with a berm still intact.

Photo 2- Taken at Point 1. This slicken continues to remain stable and is disconnected from the surface water flow of the mainstem. The berm at this location remains intact and isn't at risk of failure.

Photo 3- Taken at Point 2. This photo shows a slicken with an incipient avulsion that was activated during the June 2017 rain event. This photo is taken on the upstream portion of the avulsion looking downstream towards Point 3.

Photo 4- Taken at Point 2. This photo is taken on the upstream portion of the avulsion looking downstream towards Point 3. As evidenced in the photo, there has been considerable amounts of additional channel scour through this slicken.

Photo 5- Taken at Point 3. This photo shows a slicken with an incipient avulsion that was activated during the June 2017 rain event. This photo is taken on the downstream portion of the avulsion looking upstream towards Point 2.

Photo 6- Taken at Point 3. This photo is taken on the downstream portion of the avulsion looking upstream towards Point 2. As evidenced in this photo, the avulsion at this location has likely turned into a permanent side channel and is now connected to the mainstem.

Photo 7- Taken at Point 3. This photo shows the outlet of the avulsion. The berm at this location has been breached and continues to erode.

Photo 8- Taken at Point 3. This photo shows the outlet of the avulsion. As clearly evidenced in the photo, the outlet has further eroded since 2018. As evidenced by the stake on the ground near the CFC staff, this photo was taken on the opposite end of the berm from the previous year.

Photo 9- Taken at Point 3. This photo also shows the outlet of the avulsion. It is taken from the banks of the Clark Fork River. The berm is clearly visible next to the CFC staff member. Note the shrub and stake within the yellow circle

Photo 10- Taken at Point 3. This photo also shows the outlet of the avulsion. As evidence by the depth of the outlet, there has been additional erosion to the berm and downcutting at this location. The outlet at this location into the mainstem of the Clark Fork also contains a clearly visible delta of slicken materials.

Photo 11- Taken at Point 4 looking downstream. Active bank calving was noted while stopped at this location.

Photo 12- Taken at Point 4 looking downstream. As evidenced in the photo, additional bank calving occurred at this location from 2018 to 2019.

Photo 13- Taken at Point 5. This photo was taken looking downstream towards the outlet of the recently activated channel. The CFC staff member is standing on the downstream end of the breached berm.

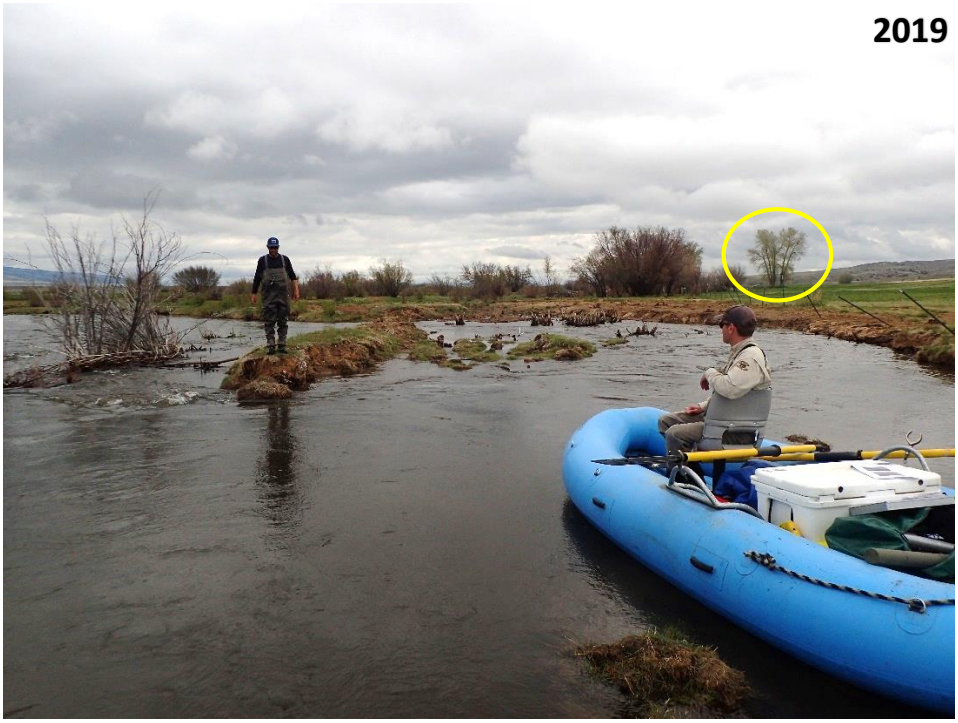


Photo 14- Taken at Point 5. This berm at this location has completely failed and the main channel has absorbed most of the slicken. Note the tree in the background directly above the boat. This photo was taken at the same location as the above photo but the channel has changed significantly.

Photo 15- Taken at Point 6. This photo is taken looking downstream from the active high water side channel through a slicken. The side channel was active with approximately 3 cfs of flow.

Photo 16- Taken at Point 6. This photo is taken looking downstream from the active high water side channel through a slicken. The channel has expanded significantly at this location as the berm on the upstream side continues to erode.

Photo 17- Taken at Point 6. This photo was taken looking downstream on the mainstem of the Clark Fork near the entrance of the high water side channel.

Photo 18- Taken at Point 6. This photo was taken looking downstream on the mainstem of the Clark Fork near the entrance of the high water side channel. Note the cantilevered bush in water to the left of the CFC staff member (that is the same bush from the 2018 photo).

Photo 19- Taken at Point 7. This photo shows a berm that is actively eroding into the river.

Photo 20- Taken at Point 7. This location has remained relatively stable with only minor bank calving occurring over the last year.

Photo 21- Taken at Point 8. This photo shows a berm that is at risk of erosion. The shallow surface water was colored teal due to the underlying slicken materials.

Photo 22- Taken at Point 8. The berm at this location remained stable and there was little additional erosion over the last year.

Photo 23-Taken at Point 9. This photo shows a high slicken bank that is at risk of erosion in higher flows.

Photo 24-Taken at Point 9. Note the small bush on the edge of the bank in the center of the photo (same bush that is on the left of the photo in the top pane). There has been some minor bank calving at this location over the past year.