

Metadata Report

Project Name

Poudre River at Sheep Draw SfM Greeley, CO June 2020

Summary

In spring 2020, the world was hit by a pandemic that spread globally by March, causing universities and most of the world to move to remote means. Summer field camps, long hailed as a rite of passage in the geosciences, were cancelled throughout the US. The community moved quickly, with NAGT developing remote learning tools and arranging for sharing and collaboration between instructors and institutions. As such, UNAVCO (GETSI) and University of Northern Colorado embarked on a data collection campaign for a summer field course entitled “Geoscience Field Issues Using High-Resolution Topography to Understand Earth Surface Processes” – originally slated for in-person teaching. The team collected GNSS data, drone imagery for use in structure from motion, and terrestrial laser scanning from a site near Greeley, Colorado on the Poudre River. In an assignment, students conduct a Structure from Motion (SfM) survey of the Sheep Draw field site. The end product is a point cloud used in additional assignments to conduct analyses. This is the instructor-derived SfM point cloud.

Personnel

- Sharon Bywater-Reyes, University of Northern Colorado
- Ara Metz, University of Northern Colorado
- Keith Williams, UNAVCO
- Beth Pratt-Sitaula, UNAVCO

Site Information

- Site description

Educators visited the Cache la Poudre River at Sheep Draw Open Space (City of Greeley Natural Areas) in northern Colorado. According to the Coalition for the Poudre River Watershed, “The Cache la Poudre River Watershed drains approximately 1,056 square miles above the canyon mouth west of Fort Collins, Colorado. The watershed supports the Front Range cities of Fort Collins, Greeley, Timnath and Windsor. In an average year, the watershed produces approximately 274,000 acre feet of water. More than 80 percent of the production occurs

during the peak snowmelt months of April through July.”

<https://www.poudrewatershed.org/cache-la-poudre-watershed>

In 2013, the Front Range and plains of Colorado experienced extensive flooding. The region experienced the average annual rainfall in one week. There was extensive damage to infrastructure and in some cases the erosion of 1000-years’ worth of weathered material (Anderson et al., 2015). Near Greeley, significant portions of the Poudre trail were impacted as the river topped its floodplain and eroded its banks. In a series of exercises from “Geoscience Field Issues Using High-Resolution Topography to Understand Earth Surface Processes” https://serc.carleton.edu/NAGTWorkshops/online_field/courses/240348.html students create an SfM model of either Area of Interest 1 or Area of Interest 2. Here, the entire area flown is included. The photos used for the SfM student exercise can be found here: Bywater-Reyes,

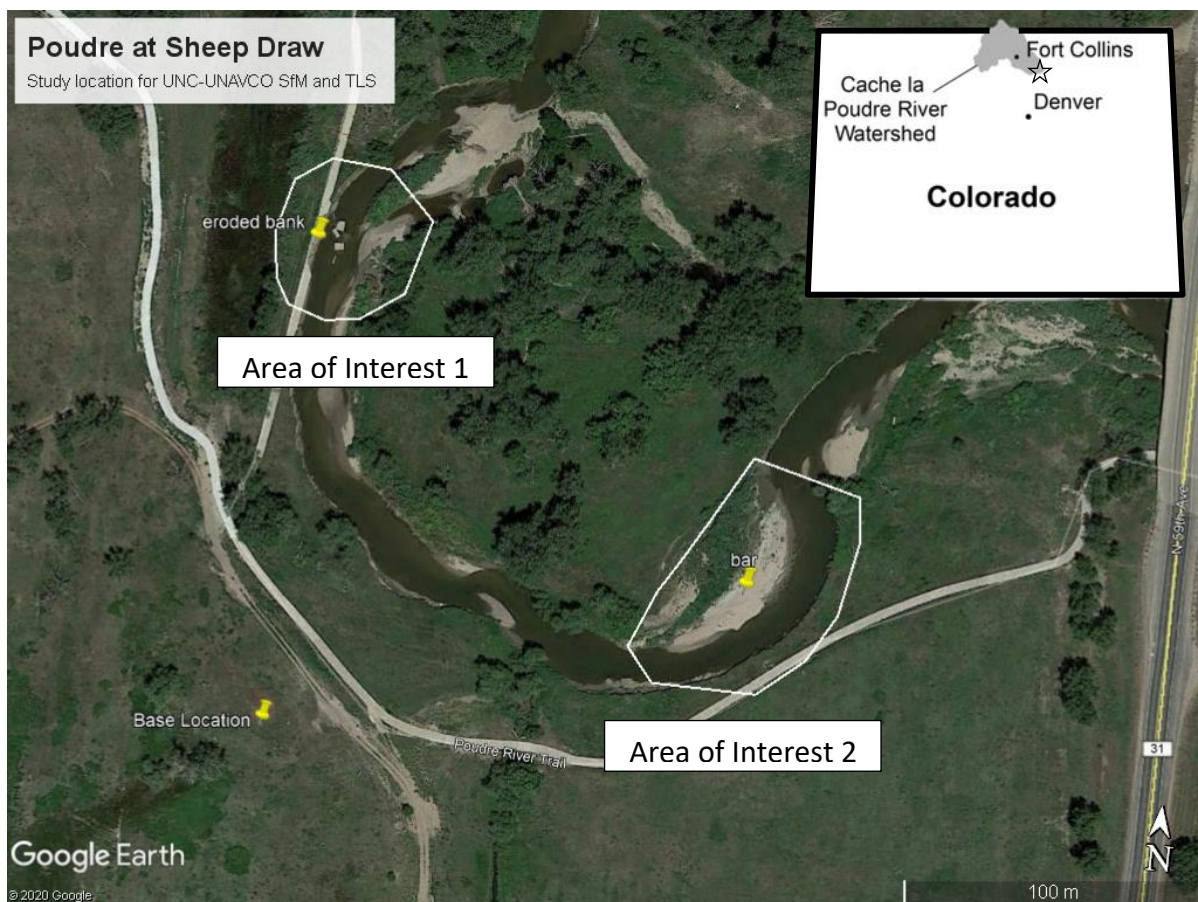


Figure 2. Inset: Map of the Cache la Poudre River Watershed, located in northern Colorado. The study site at Sheep Draw has two areas of interest, Area of Interest 1 on an eroded bank and Area of Interest 2, a cutbank and point bar.

Sharon, "Structure from Motion at Sheep Draw" (2020). *UNC Faculty Open Course Materials*. 7. <https://digscholarship.unco.edu/courses/7>

- Site Location

Center: Lat 40.445398, Long -104.776100

Survey Results

- Equipment used

- For this project, images were collected using a DJI Mavic 2 Pro drone. Two flight paths were conducted at altitudes of 40-m (Figure 3) and 50-m (Figure 4) and different orientations. The flight was completed with an app that allows for automatic flight with specified overlap of photos. (70% side and 80% forward).
- RTK GPS Ground Control collected with Septentrio base and rover RTK GPS setup
- Structure from Motion workflow done with Agisoft Metashape

- GPS solutions

- Septentrio base and rover RTK GPS used as ground control

- Errors

- Base solution error 0.002 m X, 0.003 m Y, 0.003 m Z (ellipsoid) and 0.049 m Z (ortho height)

- Ground Control

Northing	Easting	Elevation	Description
4477259.169	518913.4259	1431.442208	GC1
4477310.15	518921.7538	1431.622797	GC2
4477269.431	518930.3081	1429.678525	GC3
4477234.415	518957.4354	1431.427751	GC4
4477179.083	519050.1303	1430.745212	GC5
4477182.717	519071.6034	1429.871474	GC8
4477232.126	519087.9902	1429.478129	GC9
4477155.003	519067.656	1431.081	GC7
4477168.886	518983.262	1431.244	GC10
4477195.186	519109.535	1430.856	GC6

Products

- Date of dataset collection: 6/19/2020
- Coordinate system of datasets: NAD83 UTM Zone 13 North
- Spatial resolution: Minimum spacing 0.05 meters
- Horizontal Accuracy: 0.05 m
- Vertical Accuracy: 0.04 m
- Data formats: point cloud, unclassified



Preview: eroded trail on bank of Cache la Poudre River

- Data processing methods: Agisoft Metashape

Misc Notes



TLS for same area exists through UNAVCO; contact sharon.bywaterreyes@unco.edu for more information on SfM and TLS products and associated curriculum