1. PRF#: 57428-ND8
2. Project Title: Alluvial Suspended Sediment Routing as a Filter of Source Area Tectonic and Climatic Signals: 3-D Stratigraphic Analysis and Modeling
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During the second year of this project, we analyzed field data obtained during the first year, further developed theoretical models of sediment routing, analyzed existing map data using GIS, and obtained an additional field data set to document the chronology of floodplain deposits along our field site at the Powder River in Montana.

One of our results from the first year was an M.S. thesis by Tara Metzger, who used methods of dendrochronology on samples from excavated trees to quantify histories of floodplain growth along Powder River. During the last year, we finalized and submitted for publication a journal article describing these results. The revised manuscript was accepted by the journal Earth Surface Processes and Landforms in September, 2019.

Another of our project goals was to develop new theoretical tools for routing sediment signals through alluvial corridors subject to episodic sediment storage. This year, I wrote a long manuscript describing these new mathematical models and applying them to two published data sets, one from the Little Missouri River in North Dakota and the other from the Belle Fourche River in South Dakota. This manuscript was submitted to the journal Geomorphology during the summer of 2019. Positive reviews were received in September, 2019, and a revised manuscript will be submitted in the next few months. An abstract summarizing these results has been submitted to the American Geophysical Union 2019 Fall Meeting.

During the summer, a new PhD student, Max Huffman (supported by a fellowship from the University of Delaware) analyzed some of the map data created during 2018 by former postdoctoral researcher Sheila Trampush. The goal of these analyses was to determine the age distribution of sediments eroded by the Powder River from 1998 to 2013; this provides an estimate of how long sediments are stored in floodplains of this river before being re-eroded and transported further downstream. Age data of eroded sediment were provided by a suite of dates provided to us by a previous PhD dissertation of Dr. Derek Schook (who used dendrochronology as a dating tool), as well as age dates obtained using optically stimulated luminescence provided by our colleague from the U.S. Geological Survey, John A. Moody. Max completed this analysis in August, 2019. An abstract describing these results has been submitted to the American Geophysical Union 2019 Fall Meeting.

We also just finished a 2-week field campaign to the Powder River in Montana. We located over 100 trees on the Powder River's floodplain that had been previously dated using dendrochronology by Derek Schook, and determined the thickness of floodplain deposits at each location over the life of the tree by hand augering. We were aided in this effort by John A. Moody and Deborah Martin of the U.S. Geological Survey. These data will supplement and extend our previous results documenting the temporal growth of floodplain deposits along the river. We will analyze these data in the coming months, and develop a theoretical model of floodplain growth to use in our sediment routing models.