2020 NM WRRI Student Grant Final Report

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1. Introduction

Three bedload-transporting flow events have been recorded at the Pinos site. Myself and New Mexico Tech undergraduate students (who are partially funded by this grant) were able to successfully measure a wide range of parameters associated with these flows. The data collected contribute a new season of data to the unique dataset from the sediment monitoring station.

2. Results

Individual Event Summaries

July 23:
Time: 2**0:10 – 23:59**
Duration: **4 hours**
Personnel: **Kyle Stark, Daniel Cadol, Sharllyn Pimentel, Kelsey Romero**
Maximum water depth: **19 cm**
Maximum reach-averaged bedload flux: **4.8 kg/sm**
Number of automated SSC samples: **10** Number of manual SSC samples: **5**

Field crew arrived prior to flow event and setup up equipment (18:45). Flow arrived at 20:10 local time. Field crew focused on collecting manual depth, velocity, and ADV (3-D velocity) samples.

July 24:
Time: **21:13 – 02:52 (July 25)**
Duration: **6 hours**
Personnel: **Kyle Stark**
Maximum water depth: **33 cm**
Maximum reach-averaged bedload flux: **NA**
Number of automated SSC samples: **10** Number of manual SSC samples: **0**

Field crew arrived at 22:32, after the flow bore. Flow was too dangerous to wade; only remote sampling was conducted. Surface velocity was collected as well as LSPIV video. **Samplers were (mostly) full from previous event. Only Left and Right samplers have limited bedload flux.**

September 1:
Time: **15:00 – 17:00**
Duration: **2 hours**
Personnel: **Kyle Stark & Sharllyn Pimentel**

Maximum water depth: **13 cm**
Maximum reach-averaged bedload flux: **3.2 kg/sm**
Number of automated SSC samples: **0** Number of manual SSC samples: **2**

Crews arrived at 15:00, prior to flooding. A small bore arrived and a limited number of samples were collected. Drone imagery was collected of hydrograph recession.

Table 1: Data collected during each event.

FLOOD DATE	WATER DEPTH	BEDLOAD FLUX	MIC. PULSES	SEISMIC	HYDRO-PHONE	TURBIDITY	SUSPND. SED.	VELOCITY
2020/07/23	X,M	X	X	X	X*	X	X,M	X,M,3D
2020/07/24	X	X*	X	X		X	X	X, M
2020/09/01	X,M	X	X	X		X	M	X,M

* only one of two units recorded

X = collected automatically
M = collected manually

Water depth was fairly consistent across the channel during all floods (Figures 1 – 3). Direct measurements of bedload flux were collected using Reid-type slot samplers. In general, bedload flux increased with water depth. When comparing data collected from this monsoon season (2020) to data collected in 2018 (the most recent year with bedload transporting events), we observe similar trends (Figure 4).

Samples of suspended sediment were collected using ISCO 3700 pump samplers and DH-48 manual sampler. These samplers automatically collected samples throughout the flood from two vertical locations at the stilling well located on the right bank of the river. During the 2020 monsoon season, 24 discrete samples of suspended sediment were collected. These samples were dried and weighed to determine the suspended sediment concentration (Figure 5). Samples collected from the 2020 season match data collected from previous years. A thorough analysis of these data is being conducted by undergraduate students. Their contribution to the project are expected to be included in a future peer-reviewed publication.

Figures:

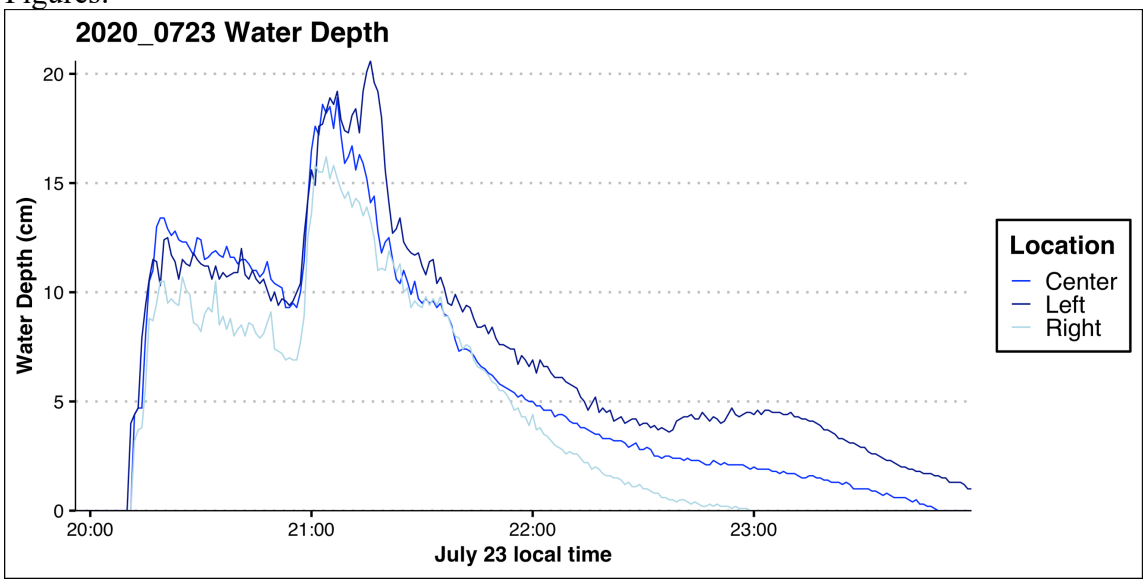

Figure 1: Water depth measured during the July 23, 2020 flood event as recorded by the stage pressure transducers located in each of the Reid slot samplers.

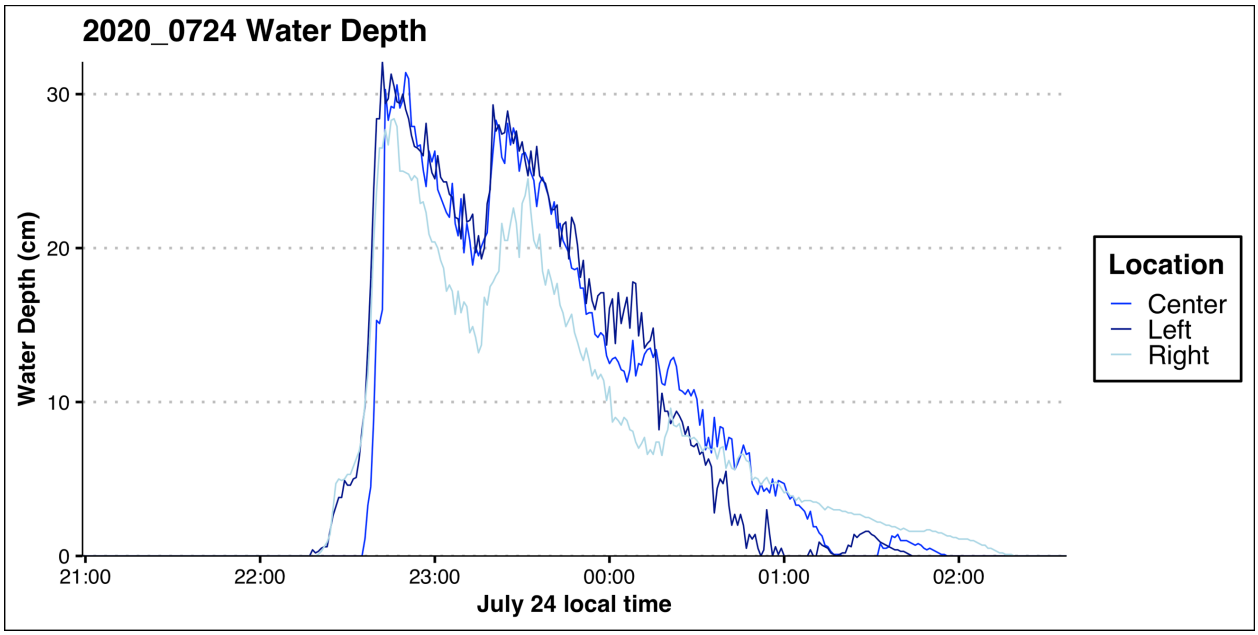

Figure 2: Water depth measured during the July 24, 2020 flood event as recorded by the stage pressure transducers located in each of the Reid slot samplers.

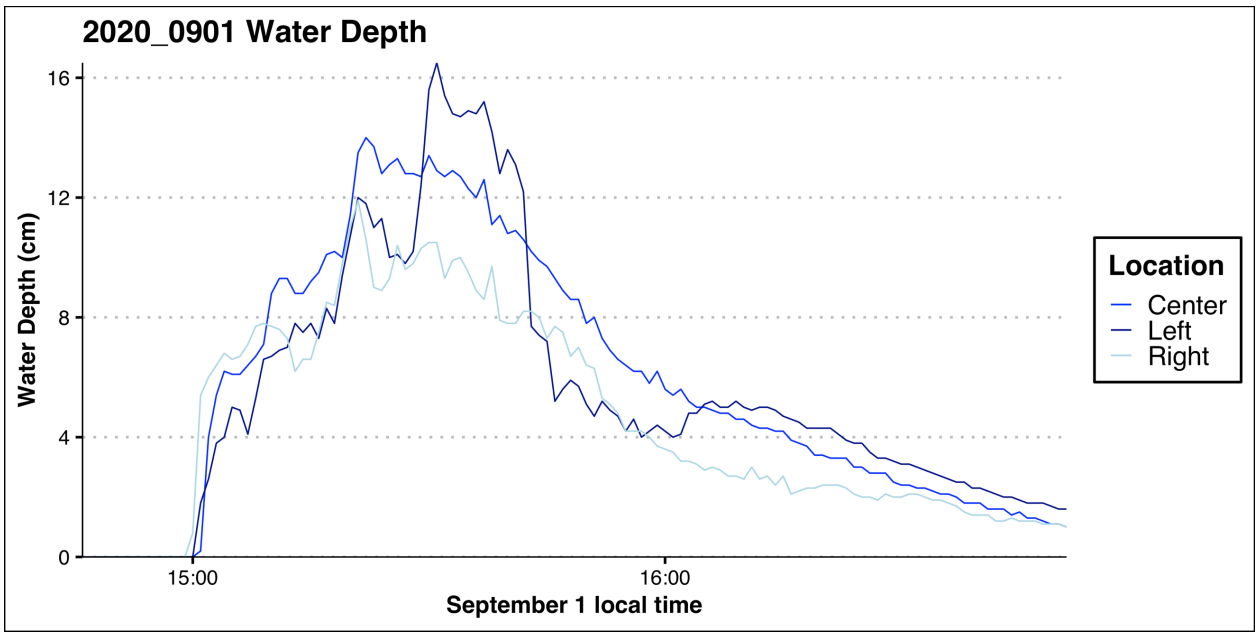

Figure 3: Water depth measured during the September 1, 2020 flood event as recorded by the stage pressure transducers located in each of the Reid slot samplers.

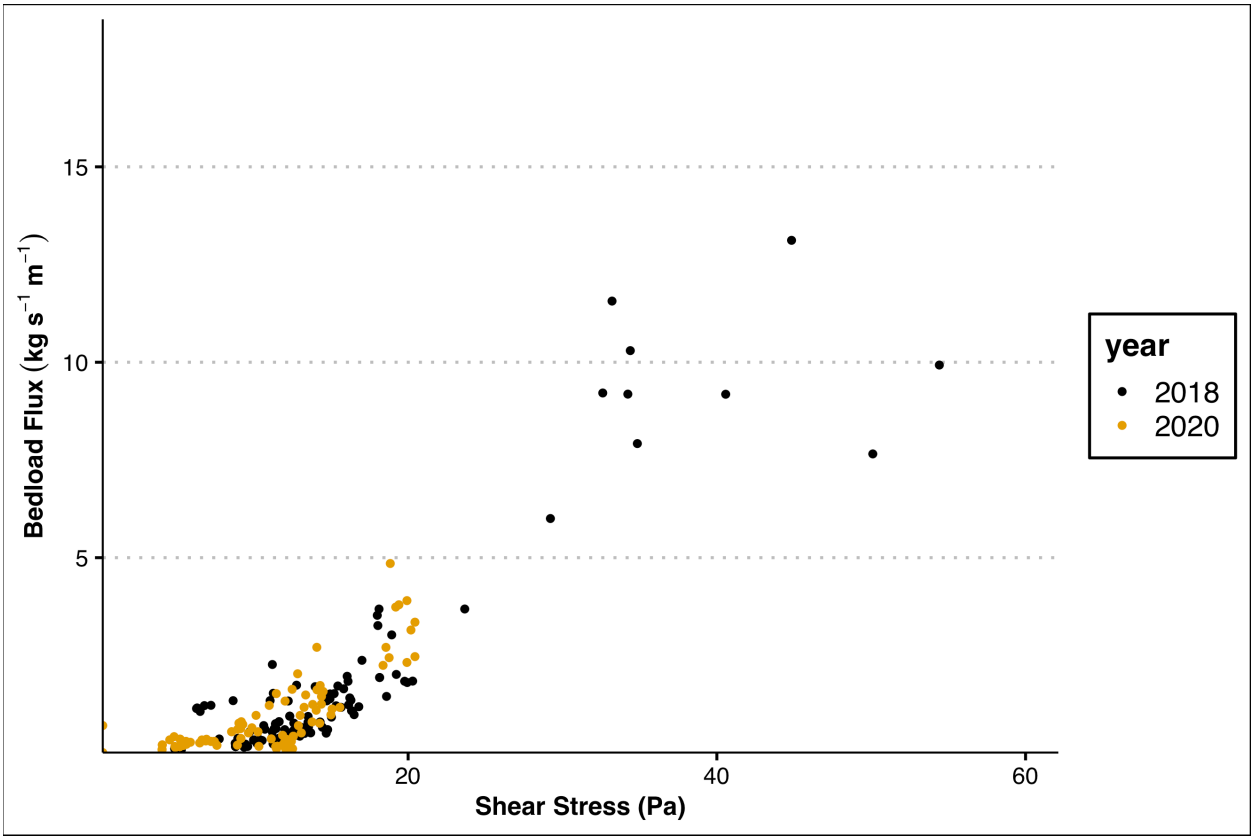

Figure 4: Calculated average bedload flux (measured by the Reid slot sampler) vs shear stress. Data from 2020 were extremely similar to data collected from 2018.

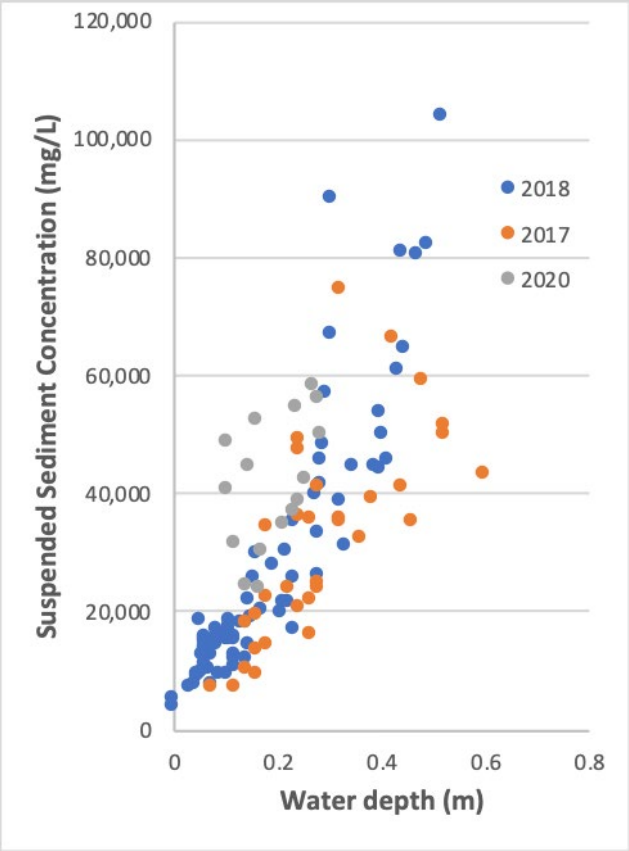

Figure 5: Suspended sediment concentration vs water depth. Data collected this year match well with data collected in previous years.

3. Conclusions:

The Arroyo de los Pinos has been chosen as a prime location to study sediment flux in the Middle Rio Grande Valley. It is a direct tributary to the Rio Grande and drains many common lithologies found along the valley. This work focused on enhancing the operations of the principal monitoring station, located 200 meters upstream of the confluence with the Rio Grande. Large quantities of sediment were collected in the summer and processed in the fall and spring. Students helped in the laboratory is crucial for sample processing and analysis. One undergraduate student is conducting their own thorough research project focused on the suspended sediment dataset.

Data collected from the third fully-operational monsoon season highlights the strengths of the Pinos sediment monitoring station. These flows were markedly smaller than the data collected in 2018, the most recent year with bedload transporting flows. Although smaller, the new dataset reveals similar trends from previous years, suggesting that the Pinos monitoring station is an ideal location to monitor sediment transport and test the effectiveness of various surrogate instruments deployed there.

4. Acknowledgements:

Project funding comes from the U.S. Army Corps of Engineers, U.S. Bureau of reclamation, and from the New Mexico Water Resources Institute and NM State legislator grant #: NMWRRI-SG-2020. The authors would like to specifically thank students Madeline Richards, Sharllyn Pimentel, and Sandra Glasglo, and Kelsey Romero for the enormous help gathering and processing the data presented here.

Budget update:

Expenditures totaled $6,493.87, grant funds were used for student salary/wages and fringe, travel to field site, and project supplies.