

26-33 - Booth No. 54: A TALE OF TWO FLOODS: COMPARING PEAK DISCHARGES OF THE 1918 AND 2022 NORTHERN YELLOWSTONE NATIONAL PARK FLOODS

Thursday, 16 May 2024

9:00 AM - 5:30 PM

Grand Ballroom (Davenport Grand Hotel)

Booth No. 54

Abstract

A rain-on-snow event in June 2022 led to extreme flooding in northern Yellowstone National Park (YNP). Extensive erosion and overbank deposition altered stream morphology and destroyed park infrastructure including campgrounds, facilities, and roadways. In northern Yellowstone, the previous flood of record was in 1918. The aim of this project is to compare the magnitude of the 1918 flood with the 2022 flooding event. We studied the Lamar River (LR), Soda Butte Creek (SBC), and Pebble Creek (PC) in the summer of 2023. These reaches are the same reaches used by Meyer (2001) to estimate the 1918 peak discharge. Pebble Creek and Soda Butte Creek are tributaries of the Lamar River, which has its headwaters in northern YNP. The reach of the Lamar River surveyed was upstream of the confluence with Pebble Creek and Soda Butte Creek. We used cm-scale RTK GPS to survey channel cross-sections and stage indicators. We used an acoustic doppler velocimeter to calculate current discharge to estimate channel roughness. We then reconstructed the 2022 peak discharges in HEC-RAS. Our models produced estimated peak discharges of 80-90 m<sup>3</sup>/s at PC, 120-170 m<sup>3</sup>/s at SBC, and 104-172 m<sup>3</sup>/s at the LR. Meyer (2001) estimated the peak discharge of the 1918 flood to be 55-75 m<sup>3</sup>/s at PC, 110-260 m<sup>3</sup>/s at SBC, and 450-550 m<sup>3</sup>/s at LR. Based on these estimates, the 2022 peak discharges in PC and SBC exceed those of the 1918 flood, making it the new flood of record on those reaches. The 2022 LR peak discharge, however, was lower than the 1918 estimate. This could be attributed to lower precipitation and less snowmelt in the Lamar Basin that drains the northern Absaroka Range relative to the basins of Pebble Creek and Soda Butte Creek that drain the Beartooth Range. Late spring and early summer rain-on-snow events that cause extreme flooding are likely to occur more frequently in the future because of climate change. Considering the lower relative precipitation in the Lamar Basin during the 2022 flooding, there is potential for greater magnitude flooding in the future during more spatially extensive rain-on-snow events that would increase runoff in the Lamar drainage.

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