Environmental and Basin Analysis Sequence Stratigraphy Technical Divisions

GEOMORPHIC HISTORY AND PRESERVATION OF ARCHAEOLOGICALLY SIGNIFICANT AREAS IN THE HANFORD REACH OF THE COLUMBIA RIVER, WASHINGTON STATE

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ABSTRACT

Archaeological sites near rivers may be preserved through burial, altered by exposure, or destroyed through erosion. Preserved because of the unusual needs of the Manhattan Project, the Hanford Reach is the only remaining free-flowing reach of the Columbia River and ideal for research into the geomorphic settings of archaeological sites along this river. The 1894 (742,000 cfs [20,900 m^3/s]) and 1948 (690,000 cfs [19,000 m^3/s]) floods were the largest in the historical record through the reach, but their relationship with geomorphic change and site preservation are less understood. To understand how floods have preserved and destroyed archaeological sites, three objectives were applied: 1) stratigraphic reinterpretations and grain-size analysis of earlier archaeological sites; 2) elevation surveys and descriptions of overbank deposits; and 3) hydraulic modeling of historic floods.

Results showed that large Columbia River floods and archaeological sites are interconnected by cycles of inundation and subaerial exposure, but timing and frequency was not determined. Archaeological sites on terraces H3 and H4 are buried by fluvial sediments, which may help to preserve them. Archaeological sites were interpreted to have strata with sedimentological features characteristic of slackwater flood deposits.

Hydraulic modeling established that the maximum specific stream power for the 1997 flood was 566 W/m^2. This value, along with its documented geomorphic change, was compared to findings of the 1894 and 1948 floods, creating a risk potential map for areas of erosion and deposition. The left channel of Locke Island was identified as a high risk area for erosion. The three other study areas, Vernita Bridge, Coyote Rapids, and Wahluke Slope had credible risks for erosion. Downstream deposition from Coyote Rapids, Locke Island, and The White Bluffs Boat were identified by velocity decreases and geomorphology.

Present-day dams have ceased deposition on these terraces, with the 1997 flood used as a standard for future events. Future large discharge floods will not assist preservation on archaeological sites, rather they will have the opposite effect of bank erosion and loss of cultural material. In contrast, the loss of large episodic floods has allowed the growth of riparian vegetation that will help mitigate bank erosion.

BIOGRAPHY

Benjamin J. Deans is a first-generation college graduate and is now beginning the graduate program at Washington University in St. Louis. Prior to this, he received his B.S. in Earth and Environmental Science from the University of Texas-Arlington (2018) and M.S. from Central Washington University (2022). He was awarded the Geological Society of America's Claude C. Albritton Jr. award for his research in geoarchaeology along the Hanford Reach of the Columbia River. His research interests include fluvial geomorphology, Quaternary geology, geoarchaeology, and archaeology. Professionally he is a registered Professional Geologist for the State of Texas.