MOUNT ST. HELENS UPDATE: RECENT TRENDS, UNDERSTANDINGS AND PROJECTS TO MANAGE DEBRIS AVALANCHE SEDIMENTS

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Abstract: Since the eruption of Mount St. Helens (MSH) in 1980, the US Army Corps of Engineers has been actively managing debris avalanche sediment in the Toutle River and lower Cowlitz Rivers in southwest Washington State. The Sediment Retention Structure (SRS), a 125 foot tall sediment trap constructed in 1987, is the primary long-term sediment management action. The SRS was designed to trap sediment high in the watershed and prevent problematic deposition in the lower reaches where floodplain development has occurred. The SRS has been effective at trapping sediment since construction and continues trap on the order of 30% of inflowing sediment 27 years after construction.

Since 2006 however, sediment has begun passing the SRS in sufficient quantities such that deposition in the leveed and populated downstream reaches has become a concern. USACE has responded to this change in trends by initiating multiple technical and planning studies as well as management actions. The primary purpose of the studies was to establish a sediment management plan through the current planning period that would be cost effective and responsive to the current economic and environmental landscape. The sediment management actions were designed to reduce flood risk to affected communities in the lower basin. This presentation will provide an update of recent trends, studies, actions and environmental concerns.

Forecasts for large scale and uncertain trends such as sediment load from the MSH debris avalanche are necessarily simplified to express the overall average volumes or rates of decay. Observed data is rarely so well behaved. In the case of MSH sediment load up to two orders of magnitude of annual variation are observed. Downstream deposition is complicated by the non-linear relationship between flow, load and erosion. While overall load from the mountain is lower than predicted in 1985, peak sediment events have deposited large amounts of material which persist for multiple years without physical removal.

Two new studies predicting sediment load from MSH have been received by USACE; a 2012 study by USDA prepared by Simon and Klimetz and a 2014 University of Nottingham Ph.D. thesis by T. Meadows. Using different methodologies for predicting future loads, the two studies come to significantly different conclusions. Simon argues for significant and persistent near term decay in load while Meadows argues for decreased overall load with mild decay into the next century. With continued uncertainty about the future sediment load trends, let alone peak sediment, USACE has prioritized flexibility in its management approach.

In addition to the planning effort that re-evaluated the long term sediment management plan, USACE has responded to increased deposition in the lower Cowlitz River with several actions: 2008 Castle Rock Levee Improvements, 2010 Pilot Grade Building Structures and the 2012 SRS Crest Raise. Purpose, effectiveness, and morphological response to each action will be discussed. Features of the project designed to comply with Endangered Species Act (ESA)

listings will be described. Additional sediment related ESA concerns within the management area will be introduced.

Simon, A. and D. Klimetz. January 2012. Empirical Analysis of Long-Term Sediment Loadings from the Upper North Fork Toutle River System, Mount St. Helens, Washington. U.S. Department of Agriculture, Agricultural Research Service, National Sedimentation Laboratory Technical Report, Watershed Physical Process Research Unit.

Meadows, Tim. May 2014. Forecasting Long-Term Sediment Yield from the Upper North Fork Toutle River, Mount St. Helens, USA. Ph.D. Thesis. University of Nottingham: U.K.