Dam Breach Analysis using HEC-RAS

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Abstract:

Dams are human-made structures designed to impound water for hydroelectric power production, flood prevention, irrigation, reservoir creation, and recreation. Humans have been in the business of building dams for over 5,000 years and there are approximately 50,000 dams throughout the world at present day. While dam designs range from massive earthen gravity to ultra-modern concrete arch-gravity, every dam is designed to tame the very nature of a river – one of the most powerful, unpredictable, and persistent natural features on Earth. Dams hold mind bending amounts of water, which gives way to a fundamentally problematic question on the very nature of a dam: what if it fails? This project aims to explore the consequences of that question through a dam breach analysis of the Hoover Dam and visualization of the resulting flood of the Colorado River by Lake Mead, the largest reservoir in the United States, using The U.S. Army Corps of Engineers' River Analysis System (HEC-RAS). HEC-RAS is a sophisticated hydraulic modeling software that enables users to employ an array of modeling strategies to emulate the flow of water through a variety of natural and man-made channels to varying degrees of complexity. The software's capability of modeling both one-dimensional steady flow and two-dimensional unsteady flow, as well as its relatively few required inputs, makes HEC-RAS stand out for use in dam breach analysis. This project hopes to inform its readers on the fundamentals of hydraulic modeling in HEC-RAS, as well as visually convey the importance of dam management and safety.