

Screening Technique to Identify Risky Emergency Spillways

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Abstract: This research builds onto the existing methodology to assess spillway erosion by developing a screening technique to analyze and identify potentially risky emergency spillways in the United States. Spillways are outlet structures designed to control the water flow from an embankment or a dam, hence, to ensure the safety of the dam. The purpose of emergency spillways is slightly different than service spillways, as they are designed to provide protection against overtopping of the dam during extreme events. As such, emergency spillways are loaded very infrequently. Dam operators often do not know whether the emergency spillway will fail until it is loaded, which can be once every 10, 50 or even 100 years. The failure of emergency spillways depends highly upon the earthen materials like soil and rocks. Such failures have the potential to result in failure of a dam, which can lead to loss of life and billions of dollars in property damage. Therefore, the spillways with high risk of erosion should be identified prior to loading. This is especially important given the fact that the dams in the US are aging with an average age of 57 years according to the National Inventory of Dams (NID) 2018 data. Hence, the purpose of this research is to develop an empirical method to examine and identify potentially risky unlined emergency spillways by analyzing the erodibility of soil and rocks present underneath the spillways that vary from cohesionless granular soil to huge massive rocks. The NID data provides size and location of dams which are combined with the State Geologic Map Compilation (SGMC) soil survey geodatabase - taken from the U.S. Geological Survey (USGS) to identify the soil and rock type of the dams and spillways. This primary identification of different types of earth materials is analyzed with the help of GIS software. Then, a logistic regression model is applied to assess the erosion potential of the emergency spillways controlling for the parameters like width of spillway, height of the dam, maximum discharge, erodibility index, and stream power. Presently, spillway erosion is assessed on a case-by-case basis without a comprehensive screening tool to help identify risky spillways. Development of this assessment technique will be a significant contribution to the profession as it studies multiple dam database. **Keywords:** Emergency Spillways, Soil and Rock Erosion, Spillway Safety