

ASPECTS OF GULLY EROSION RELATED TO EMBANKMENT OVERTOPPING AND BREACH

Greg Hanson, USDA-ARS-HERU, 1301 N. Western Stillwater OK, 74075,
greg.hanson@ars.usda.gov; Darrel Temple, USDA-ARS-HERU,
darrel.temple@ars.usda.gov

Abstract: Embankment erosion due to overtopping is one of the main causes for embankment accidents and failure. Seven large scale embankment overtopping tests using three material types from a silty-sand to a lean-clay have been conducted at the USDA-ARS Hydraulic Engineering Research Unit Laboratory in Stillwater, OK to observe the erosion processes, quantify erosion rates, and develop a computational breach model. Based on test observations, the erosion process has been broken up into four stages with one of the primary processes of erosion involving gully erosion (figure 1). The rate of gully headcut migration through the embankment was observed to vary several orders of magnitude, from 0.04 to 7.6 m/h, depending on the material type and placement. The rate of gully widening was observed to correlate to the headcut migration rate. The rate and episodic nature of the gully erosion was also observed to affect the timing and rate of water released during an embankment breach. The research conducted and observations made from the large physical testing described in this presentation provide an important basis for model development and validation.



Figure 1 Observed gully erosion during embankment overtopping test.