Use of Tractive Force Methods for Determining Railroad Bed Instability and Assessing Corresponding Flood Risks

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When assessing flood hazards, engineers often rely on model-generated estimates of flood intensity, namely flood depth, velocity, or other derivative parameters easily generated by most state-of-the-practice flood modeling software. Flood intensity parameters are compared with empirically-derived lethality benchmarks or nomographs to determine if a flood hazard exists for various impacted areas such as structures, roads (cars), and people. While many flood inundation areas impact railroads, little information or guidance exists on how to make a comparison with model-estimated flood intensity parameters to determine the flood hazard or risk. The importance of understanding this situation was underscored in Cherry Valley, Illinois in 2009 when a small stormwater pond embankment failed causing a wash out of downstream railroad tracks and subsequent derailment of a freight train that resulted in one fatality. This paper investigates the use of tractive force methods to make flood hazard assessments on railroad tracks by assuming a failure of the tracks via mobilization and erosion of the ballast structure supporting the rails.