Using dual-drainage modeling to assess the impact of green stormwater infrastructure networks on events of roadway flooding

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Abstract. Roadway flooding occurs during storm events when the stormwater network does not have sufficient capacity to drain all runoff. The roadway flooding that results from these system failures is not necessarily catastrophic, but the effects of smaller flooding events, often called nuisance flooding, are cumulative. The addition of Green Stormwater Infrastructure (GSI) to a stormwater network has the potential to help decrease events of nuisance flooding. GSI has been shown to reduce flooding at a single structure or small-scale, but the effect of GSI networks on flooding at a catchment-scale is less established. The ultimate goal of this study is to examine how GSI may influence events of roadway flooding, but additionally whether the modeling techniques are adequate to visualize impacts of GSI on roadway flooding across the watershed. In order to assess the interactions between the 1D flow in the stormwater network and the 2D overland flow within the watershed, a dual drainage model was developed in PCSWMM for the Harvard Gulch watershed in Denver, Colorado. Following calibration, a theoretical green stormwater infrastructure network will be added to the model. The location of the GSI will be determined using critical link analysis to assess where the most frequent and significant interactions between roadway flooding and traffic are occurring. A challenge in modeling urban flooding is a lack of validation data; this study will utilize citizen reports from the Flood Tracker app, social media posts, and municipal records to qualitatively assess flood model results. Following the evaluation of GSI network impacts on roadway flooding, the flood model results will be used in a probabilistic traffic model to analyze the effect of roadway flooding on traffic patterns under hazardous conditions.