

Research Project Title: RES# 2020-24: Quantifying support practice sub-factor values for erosion-control and sediment retention devices - Phase II

Purpose of the Project

The purpose of the project is to quantify support practice sub-factor values for erosion prevention and sediment control (EPSC) devices to provide more accurate C and P factor values when using the Revised Universal Soil Loss Equation (RUSLE) for roadway erosion. This study will quantify ranges of C or P factor values for select EPSC practices using a physically-based numerical model, and develop an online erosion calculator for contractors and engineers in Tennessee.

Scope and Significance

The scope of the research project includes using an in-house, physically based, runoff-erosion model to quantify sediment fluxes for scenarios both with and without different EPSC practices in each of the TDOT regions across the state. The model will be calibrated with data from physical experiments performed as part of RES: #2016-20 and validated with new field and/or laboratory experiments. From each set of simulations, C or P factors will be determined as the ratio of sediment fluxes with the EPSC practice to sediment fluxes without the practice. We will provide a statistical distribution of the C and P factors for each EPSC practice that are reflective of the heterogeneity in characteristics within a region and will capture variances arising from the different rainfall-runoff, erodibility, and slope-length characteristics across the region.

Expected Outcomes

We will provide simple regression relationships for easy determination of the C and P factors. From the relationships, nomographs will be developed that suggest C and P factors for known rainfall-runoff, soil, and slope-length characteristics across the state. The nomographs are the basis of an integrative decision support tool for EPSC practices at construction sites in Tennessee. This decision support tool will connect to on-line data repositories for up-to-date geospatial data, and use advanced analytical tools to compute the RUSLE R, K, and LS factors for sites across the state. Based on user-specified goals and soil management objectives, the tool will propose the most optimal EPSC practices and estimate erosion rates using the appropriate C and P factors.

Time Period

The time period for the project is from August 2019 through November 2021.

Contact Information

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