AN ABSTRACT OF A THESIS

PART I: FACTORS AFFECTING ESTIMATES OF AVERAGE WATERSHED SLOPE

PART II: A HYDROLOGIC FUNCTIONAL ASSESSMENT MODEL FOR DEPRESSIONAL WETLANDS

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Part I: This study examined the effects of DEM grid size, estimation method, and DEM source on estimates of average watershed slope. Average watershed slope, or Y-slope is an input parameter to the commonly used NRCS lag time equation. DEMs with grid sizes ranging from 5 to 100-m were analyzed for 47 watersheds representing varied terrain in Louisiana and Washington. Y-slope decreased with increasing DEM grid size, with a greater rate of decrease for watersheds with steep terrain. Three methods of estimating the Y-slope parameter were compared: (1) grid-based (DEM) method, Y_1, (2) contour-based method, Y_2, and (3) slope of the longest flow path, Y_3. Relative to the Y_1 estimate from the 5-m data, the Y_3 slope resulted in an average underestimate of 87.2 %. Variation in the estimates was found to be greatest for steep terrain. The effect of DEM source was examined by comparing Y-slope estimates from 30-m USGS DEMs to estimates from DEMs of the same resolution generated from LiDAR data. Estimates from LiDAR generated DEMs were found to be systematically greater than estimates from USGS DEMs by an average of 13.0 %. The implications of Y-slope estimate variability on estimates of triangular unit peak discharge, Q_p, was examined for select sites representing varied terrain. Estimates of Q_p based on the Y_3 slope were lower by an average of 65.4 %.

Part II: The hydrogeomorphic (HGM) approach to wetland classification and functional assessment was developed to facilitate the rapid assessment of wetland functions and support implementation of the 404 regulatory program. For this study, a functional assessment model (FAM) for the hydrologic regime function was developed for depressional wetlands within the Tennessee Highland Rim. Four model variables for the FAM were identified: (1) average annual runoff depth, (2) average depth of wetland, (3) source area modification, and (4) evapotranspiration potential. An initial FAM was developed and its functional capacity index scores were compared to those derived independently from a water budget model of a depressional wetland in the study area. All of the model variables except evapotranspiration potential differed significantly. The simulation results were used to develop a revised FAM. Evaluation of the revised FAM indicated significant improvement from the initial model. The average reduction in mean absolute error was 75.8 %.