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Development of online estimation tool for calculation of stream fecal coli form load from non-point and point sources

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Abstract

The Regional Watershed Assessment and Modeling (WAM) Team is implementing a program called, "**W**atershed **A**ssessment **T**ools for **E**xtension and **R**esearch" (WATER), with its purpose to make spatial technologies such as GIS, GPS, remote sensing, and computer modeling available for watershed protection and restoration purposes to educators and natural resource managers across the Southern Region. One of tools developed for watershed management decision support was online estimation of point and non-point source fecal coliform (FC) in the stream. The main goal of this study was to provide watershed stakeholders an easy, efficient and 'point and click' tool so that they can estimate the FC load at a location in a stream. To achieve the goal, the objectives of the study were to: i) Collect and develop a database for the FC load from different research sources including Virginia Tech, University of Texas, EPA, and others and ii) Develop a program (Forms) in Visual Basic Studio to calculate the FC load from point and non-point sources of a watershed and incorporate that in the WATER (http://web.gsc.edu/gis/water/) website for online calculation of FC. Microsoft Visual Web Developer 2010 Express and Microsoft Visual Studio 2010, and programming software like Visual Basic, ASP.net, XHTML, and CSS were used to develop this online web tool. Non-Point Source FC Calculator uses an average annual run-off algorithm derived from a GIS precipitation model and FC loads constants derived from Ann Quenzer's empirical equations developed at University of Texas Center for Research in Water Resources for different land-use types. On the page, a hyperlink to the 'annual precipitation data' provided by the Southeast Regional Climate Center is shown and the user can determine the annual precipitation value based their study area and put into the appropriate text box. The watershed boundary (that contributes point and non-point source FC) for a location in the stream is calculated online through a procedure developed from the USDA-NRCS Web Soil Survey (WSS) site-linked on the page. The online watershed boundary development procedure also suggests how to calculate the area (coverage) of different land-uses, which is used in the calculation of FC from non-point sources. User would put the land-use coverage values in the appropriate text boxes on the 'non-point source FC calculator page. Then the user will get the total amount of FC from the non-point source once he/she clicks the submission button. The Point Source FC Calculator uses an average annual run-off algorithm and point source load from different animals, birds, and septic tanks, etc., derived from Virginia Polytechnic Institute's 'Bacteria Source Load Calculator.' On the point source FC calculator page, a hyperlink to the USDA Livestock Census pages is provided. User can determine the total number of those animal counts in the watershed and put those values in the appropriate text boxes. Thus, the user can obtain the amount of point source FC load by clicking the submit button. This online FC estimation tool provides a quick and simple, updated web interface for estimating annual FC colonies potentially present in the stream location.

Key words: Fecal Coliform, Point and non-point source, watershed, Web Soil Survey, NASS.