Extended Capability to Support Multiple Watersheds in STEPL WEB

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Background Information

The STEPL model is a web-based spreadsheet tool designed for the estimation of pollutant load and to analyze how creation or practicing certain sustainable activities will reduce pollution in a watershed. For example, leaving a strip of grass between a farm field and a water feature like stream or lake, will have an estimated impact on the amount of soil and fertilizer which runs off into the river. The model uses soil properties database, precipitation database and other factors to make an estimate of pollution reduction after an action. It can then calculate the cost of applying the action.

How it works:

Our STEPL model works by first computing the annual direct runoff obtained using daily precipitation data generated by CLIGEN. The model computes the runoff using the SCS-CN method, annual contribution to shallow groundwater by soil infiltration fractions for precipitation, and annual pollutant loads by pollutant coefficients multiplied by annual direct runoff and groundwater.

Next, STEPL will then generate a priority list of best management practices (BMPs) based on the implementation cost per mass of pollution reduction.

Finally, the model performs iterative simulations on the list of BMPs to identify the most cost-effective BMP implementation plans. (Park, 2014)

Problem Statement

The STEPL model was designed and written in Fortran, a general-purpose, imperative programming language that is especially suited to numeric computation and scientific computing. After many years of maintaining, many of the original source code had been modified or removed. Our current model is kept running using our code utilizing the executables generated beforehand. As a result, this placed a huge obstruction for upgrading and enhancing the services.

Our STEPL WEB program is designed such that the user can easily estimate and optimize the cost to maintain a watershed. One of the feature is users are able to fill in tables and obtain the optimized BMP as shown below.

Results

We are now able to run each watershed without any error.

Methods

As we are restricted to only the executables, we need to find a way to generate data for each watershed. Going through all the generated data files is inevitable.

Sample data sets fed into the STEPL model

After going through and weeding out the non-related data sets, we narrowed down the necessary files and created independent files for each watershed.

With the newly made data sets for each watershed, we then provide users the options to pick and optimize any of their watersheds. We run the STEPL model on each of the watersheds.

Conclusion

After snooping through the data generated by the STEPL model, we are able to create an alternative method to support multiple watersheds without modifying the original source code.

References


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