Tool Motivation, Development, and Background

Motivation/Need for a Hydrologic Characterization Tool

There is an increasing awareness among scientists that many management practices are not universally effective. A management practice that is effective in Iowa may not be effective in Idaho. Intuitively this makes sense because each region of the country has unique a climate, soils, and topography and the crops grown in each region vary greatly. As a result the dominant hydrologic and pollutant flow paths in each region will be unique. In addition many management practices are designed to address specific pollutants depending mostly on whether the pollutant is bound to sediment particles or is soluble in water.

Although these concepts are widely recognized in many research institutions there are few tools available to help watershed managers identify these dominant flow paths and subsequently match relevant (i.e. both socially and economically viable) management practices to these flow paths within a specific ecoregion. Without a fundamental understanding of the processes which detach, transport, and deliver a pollutant to a water body there is a risk that sub-optimal management practices are selected and applied based on flawed understanding of the most important sources of pollution.

Specifically, there is a great need for a process-based tool which describes the transport of water and soil not only at the outlet of a hillslope but also within the hillslope including riparian buffer regions. By understanding the specific pollutant source within a hillslope (i.e. steep portion of the slope or a saturated toe slope), managers can either directly apply targeted management at the source of the pollution or investigate indirect practices that may divert water from entering into a source area. In many watersheds the source of pollution may come from very small areas with unique soil, topographic, and climatic conditions (e.g. shallow soils in converging landscapes with little vegetative cover). The tool should be able to identify these sensitive management areas to help prioritize and target management within a watershed.

In addition many management practices are highly depending upon the timing of events and wet seasons, therefore the tool should at minimum be able to provide monthly predictions. For example, monthly predictions allow managers to better understand the benefits of fall versus spring application of fertilizers or quantify the risk/pollution of alternative manure spreading schedules.

CEAP Synthesis

The goal of the CEAP synthesis project is to analyze and assess the effectiveness of suites of management practices on reducing watershed-scale pollutant loading at the 13 CEAP watersheds across the country. Much like the challenge of a watershed manager the analysis process begins with developing a process-based understanding of the water flow and sediment transport within a watershed. The CEAP synthesis team developed the Hydrologic Characterization Tool to help characterize the hydrology and pollutant transport of a region. Although the primary motivation of the tool was to help CEAP synthesis team build a conceptual understanding of the dominant hydrologic flow paths within a landscape, the success of the approach motivated the research group to develop the approach into a web-based decision support tool directed primarily to watershed managers having a fundamental understanding in the variability of topography, soils, and climate within their watershed.

Currently the Hydrologic Characterization tool focuses on water flow and erosion however future versions of the model will incorporate nutrient and pesticide transport.

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