DEVELOPMENT OF A WEPP-WATER QUALITY (WEPP-WQ) MODEL

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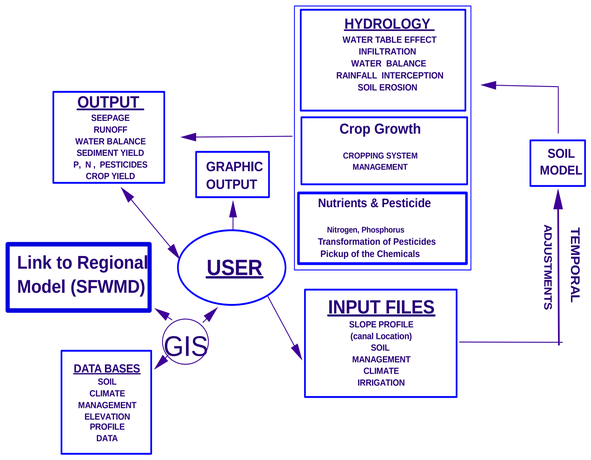
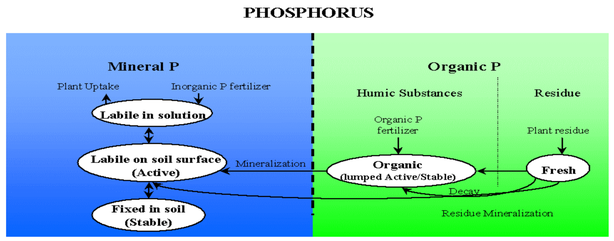
Introduction

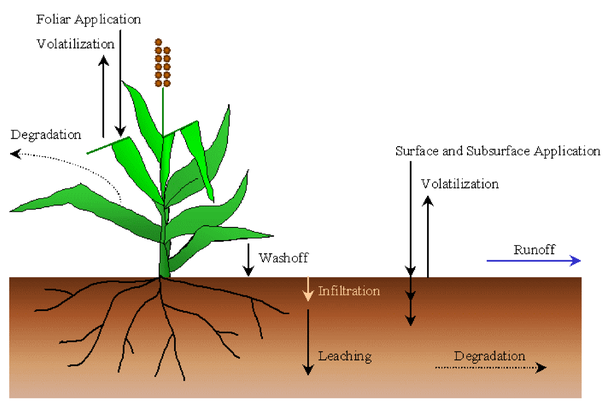
Water movement on the landscape carries chemicals and sediments from the soil and causes environmental concerns. There is increasing evidence that agricultural chemicals (pesticides and nutrients) are leading to surface water contamination in many parts of the U.S. To date, the pesticides most frequently found in surface waters are simazine, carbofuran, atrazine, terbufos, fonofos, metribuzin, alachlor, linuron, metolachlor, cyanazine, and butylate. The nutrients are mainly nitrogen and phosphorus. There have been several modeling approaches to simulate pesticide and nutrient losses in surface runoff and/or leached below the root zone. However, these models mainly use runoff and erosion algorithm prediction methods that were developed during the 1950's. In order to simulate nutrients and agricultural chemicals in surface runoff, attached to sediments and/or leached below the root zone, the model has to simulate hydrology and soil loss with acceptable accuracy under various environmental and field management conditions.

The USDA Water Erosion Prediction Project (WEPP) model is designed to predict water induced soil erosion, root zone soil water, storm runoff, plant growth, and subsurface drainage. The model provides several major advantages over existing hydrologic models; namely, it reflects the effects of land use changes due to agricultural, range, and forest practices, and it models spatial and temporal variability of the factors affecting the hydrology, crop growth, and erosion of a farm field, hillslope, and/or entire watershed. The WEPP technology contains several databases and a Windows driven interface that is easy to use. A nutrient and pesticide routine has been linked with the WEPP hillslope model in order to develop the WEPP-Water Quality (WEPP-WQ) model. This new model will be evaluated using plot and small farm field data, with different soil types and crop cover. The model's simulated storm runoff, soil loss, nutrient will be compared with measured values, including those from the University of Georgia (UGA) Gibbs Research Farm near Tifton, Georgia.

The WEPP-WQ Model







After SWAT model

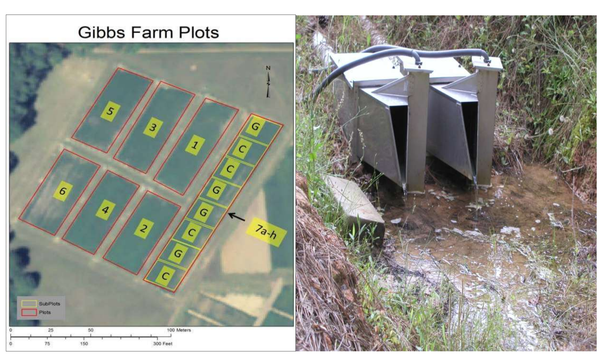
WEPP-WQ Model Main Routines

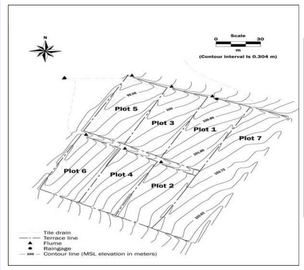
- **Soil Water Intake**
- **Soil erosion**
- **Upward Flux**
- **Surface Runoff routing**
- **Soil Water Distribution**
- **Subsurface Lateral Flow to/or From Canals**
- **Evapotranspiration (Soil vs. Plant Transpiration)**
- **Crop Growth**
- **Irrigation**
- **Soil Erosion**
- **Nutrients and pesticide routine**

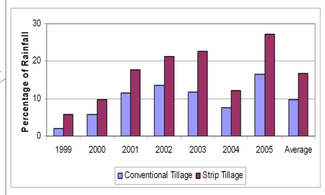
The nutrients and pesticide routines are similar to the GLEAMS and SWAT computer model.

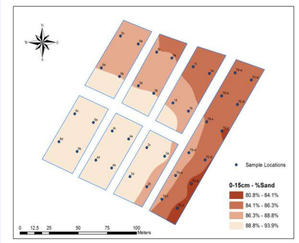
Model Validation

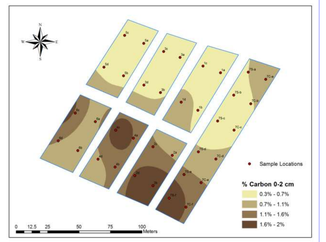
The model's simulated storm runoff, soil loss, nutrient is compared with measured values, including those from the University of Georgia (UGA) Gibbs Research Farm near Tifton, Georgia.

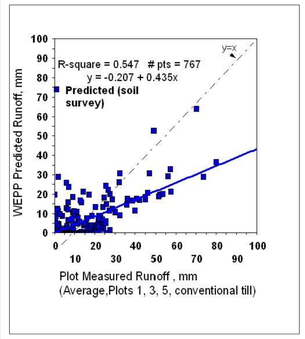


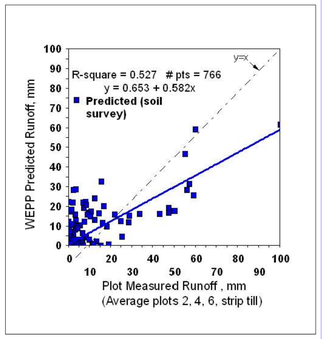












This is a preliminary result. We will continue working on the WEPP-WQ prediction of runoff and erosion. The nutrient and pesticide routines of the model will be evaluated once confidence in the accuracy of the hydrology and erosion components are established.

Acknowledgements:
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