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Parameterization and Validation of APEX to Support Nation-wide Deployment of Nutrient Tracking Tool

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Rationale: The USDA is using the Nutrient Tracking Tool (NTT) as one of interactive environmental market tools to account for environmental benefits of conservation practices. The Agricultural Policy Environmental eXtender (APEX) is the core model on which NTT is based. NTT is a web-based interface that compares agricultural management systems to calculate a change in nitrogen, phosphorous, sediment loss potential, and crop yield. There is a need to parameterize and validate the APEX model in multiple regions to increase confidence over the reliability and consistency of simulated results.

Objective: To parameterize and validate the APEX model for the nation-wide deployment of NTT

Methods: Sites where multiple years of measured streamflow and water quality data for model calibration and validation are available were selected from several regions. These regions include the Pacific Northwest, Great Lakes and Ohio River Basin, Mississippi River Basin, Gulf Coast, Plains, and California regions. Available data is obtained from collaborators, QA/QC performed, and formatted for use in APEX. Using DEM, soils, and landuse GIS layers and PRISM weather data obtained from reliable sources, projects are built using the ArcAPEX and NTT interfaces. To parameterize and validate APEX, the framework (page 37 for more information) developed for this purpose is utilized using APEXSENSUN software package (See page 39 for more information).

A global sensitivity analysis is carried out to determine the most sensitive parameters for each study site. Calibration is performed to ensure that the resulting hydrologic and water quality constituent budgets and crop yields are reasonable. Model runs that meet multiple model performance criteria are used to determine reasonable combination of values for the most sensitive parameters. The parameter values for these model are validated by running them for a different time period. If the model outputs meet the criteria, the parameter values are considered robust. Finally, confidence intervals and uncertainty ranges of outputs of interest are computed from successful model runs.

Current/Future Study Sites:

- Rock Creek, Ohio; Great Lakes region
- Upper Walnut (subwatershed B), Ohio; Ohio region
- Willamette, Oregon; Pacific North West region
- Klamath, Oregon; Pacific North West region
- Yakima, Washington; Pacific North West region
- Mason Creek, Idaho; Pacific North West region
- Bushlands, Texas; Plains regions

Additional Research Questions: Due to resource constraints, availability of long-term monitoring data for calibrating and validating H/WQ models are rare. As a result, most models are calibrated and validated using limited measured data. Uncertainty of the simulated outputs due to use of limited calibration and validation data is unknown. We are examining the effect the impact of the length of calibration period (amount of data available for calibration) on APEX calibration parameters and the associated simulation performance and output uncertainty.

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