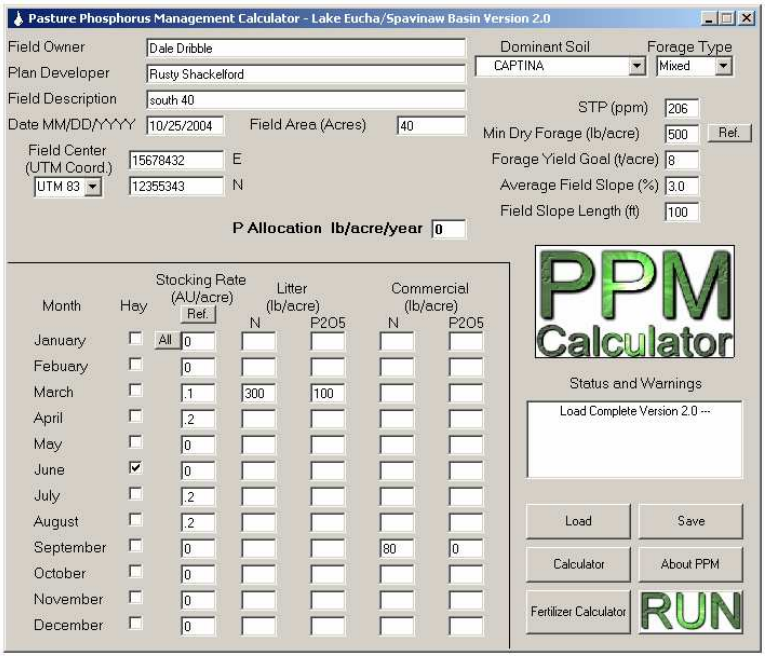
Pasture Phosphorus Management Tool to Increase Informed Decisions

Issue

Thirty-seven percent of the surface waters in Oklahoma are impaired or threatened and do not meet Oklahoma's water quality standards. Agriculture has been identified as the primary source of these impairments. Too much phosphorus leaving agricultural fields can result in excessive algal growth and suffocation of streams, rivers and lakes. To address excessive phosphorus loss and prevent impairments of surface waters, farmers and ranchers need to voluntarily implement Best Management Practices which can minimize their off-site water quality impacts. A tool is needed to efficiently and accurately determine the types BMPs to be implemented at a field level in order to meet water quality standards.

Resolution

The Pasture Phosphorus Management Calculator has been developed to predict phosphorus losses from pastures in an easy to use interface. PPM Calculator is intended as a replacement for qualitative phosphorus indexes that are currently used across the United States to develop Comprehensive Nutrient Management Plans in pasture systems. The PPM Calculator is a quantitative P Index, based on the Soil and Water Assessment Tool model (Arnold et al., 1996). It has a simplified interface for the SWAT model and is designed to make predictions for a single field. The PPM Calculator was designed to be easy to use and thus the user does not see or directly interact with the SWAT model. By insulating the user from the complexities of SWAT, the PPM Calculator allows CNMP developers to take advantage of the predictive capacity of a complex hydrologic/water quality model typically reserved for use by hydrologists and engineers. The PPM Calculator user interface is shown below.



PPM Calculator 2.0 interface.

Potential Impact

The potential impact of the PPM Calculator is significant. As more and more litigation is being pursued to improve and/or protect Oklahoma's surface waters, there is a possibility that overly restrictive requirements may be imposed on farmers and ranches by court decisions. In order to prevent this, acceptable phosphorus loads at the field level must be determined to meet water quality standards. The PPM Calculator can then be used to accurately estimate the loss of phosphorus from an individual field based on site specific management and BMP implementation. This will result in water quality based CNMPs that will allow farmers and ranchers to implement only the practices necessary to meet water quality standards.

Research Needs for Future Impacts

Additional refinements to the PPM Calculator are needed in order to incorporate small grain and row crop production systems. This will allow the PPM Calculator to be used across the entire state of Oklahoma. In addition, extensive validation and testing will be required in order to reduce the uncertainty in the predictions.

Contact Information

Daniel E. Storm, dstorm@okstate.edu, Professor, Biosystems and Agricultural Engineering Department.

References

Arnold, J. G., J. R. Williams, R. Srinivasan, and K. W. King. 1996. SWAT: Soil and Water Assessment Tool. Temple, Texas: USDA-ARS.