TECHNICAL NOTES

US DEPARTMENT OF AGRICULTURE — NATURAL RESOURCES CONSERVATION SERVICE
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AGRONOMY TECHNICAL NOTE NO. 55

WIND EROSION PREDICTION SYSTEM (WEPS)

Introduction

Soil erosion by wind is a serious problem in the United States and the world. Wind erosion is a threat to agriculture and the earth's natural resources. It renders soil less productive by removing the most fertile part of the soil, namely, the clays and organic matter. This removal of clays and organic matter also damages soil structure. In addition to the soil, wind erosion can damage plants, primarily by the abrasive action of saltating particles on seedlings and fruits. Eroded soil can also be deposited into waterways where it impacts water quality and emitted into the air where it degrades the air resources. By affecting these resources, wind erosion can also become a health hazard to humans and other animals. The ability to accurately simulate soil loss by wind is essential for, among other things, environmental and conservation planning, natural resource inventories, and reducing air and water pollution from windblown sources.

WEPS Modeling Approach

WEPS is a windows based model that predicts many forms of soil erosion by wind, including PM-10. It completely replaces the Wind Erosion Equation in use prior to January, 2008. WEPS is a process-based, daily time-step model that simulates weather, field conditions, and erosion. As such, it simulates not only the basic wind erosion processes, but also the field processes that modify a soil's susceptibility to wind erosion. In 2008, WEPS was released to NRCS for field office implementation.

The following website: http://www.weru.ksu.edu/nrcs/wepsnrcs.html is the official USDA-NRCS site for WEPS. This site allows access to the only version of WEPS to be used for official purposes by NRCS field offices. The NRCS developed and maintains the database components on this site. These components comprise the Official NRCS WEPS Database. The official NRCS WEPS database is the only database to be used for official purposes by NRCS field office employees.

WEPS was designed to:

1) **Provide more accurate and detailed estimates of soil loss by wind from agricultural fields.**
2) **Develop more cost-effective erosion control methods.**
3) **Simulate the amount of soil loss by direction.**
4) **Separate soil loss into creep/saltation, suspension, and PM10 components.**

WEPS Model Use

WEPS is a comprehensive wind erosion model with many options for inputs and outputs. For basic simulations however, WEPS is simple to operate. Only four types of information are entered on the main screen:

1) **Describe of the simulation region geometry by defining the field dimensions and field orientation**
2) **Select the field location for which to generate simulated weather**
3) **Select the soil**
4) **Select a management scenario**

New input files will usually be created using previous input files as templates modified within the user-interface. By varying inputs, particularly the field management, the user can compare various alternatives to control soil loss by wind. Interpreting the outputs of WEPS is an integral part of using WEPS as a tool to develop conservation plans for controlling wind erosion.

WEPS provides options for viewing very detailed outputs by periods (default is two weeks) including soil loss as saltation/creep, suspension, and PM10. Period output is also available for weather parameters such as wind energy, as well as surface conditions such as soil erodibility and biomass amounts. Such information is useful in determining which Period is resulting in severe erosion and the conditions that are contributing to the loss.

WEPS outputs also include amount of loss for each direction which aid the user in the placement of barriers, strip cropping, or other directional erosion control methods.

Examples for using WEPS

The following website: http://www.weru.ksu.edu/nrcs/wepsnrcs.html contains field examples (i.e., step by step) on how-to use the WEPS model; this website also has additional WEPS training materials, such as power points on becoming familiar with the use of the WEPS model. Also, the National Agronomy Manual, Part 502 Wind Erosion, Subpart 502D Using WEPS, contains additional guidance in the use of WEPS and understanding the wind erosion process.

Conclusion

WEPS development was in response to customer requests for improved wind erosion technology. It is intended to replace the predominately empirical Wind Erosion Equation as a prediction tool for those who plan soil conservation systems, conduct environmental planning, or assess offsite impacts caused by wind erosion. The WEPS model is continually being improved with periodic updates.