USDA-CSREES 2006 National Water Quality Conference

Assessing Ephemeral Gully Erosion using Aerial Remote Sensing

One aspect of erosion often overlooked is the quantity of sediment produced by ephemeral gullies. Ephemeral gullies are channelized flow areas formed downslope of rills or rill networks in locations controlled primarily by microrelief expressed by tillage and are small enough to be repeatedly obliterated by normal tillage operations. Ephemeral gully formation is the result of complex meteorological, fluvial and agronomic processes including: precipitation distribution, intensity and magnitude, snowmelt distribution, antecedent soil moisture, soil freezing and thawing, ground slope, size of the catchment, tillage and conservation practices, and crop biomass and sequence.

Although Bernard (1997) concluded that ephemeral gully erosion could be a significant source of sediment, Bennett et al (2000) acknowledged that little research exists on sediment yield rates from gully erosion. Furthermore, since ephemeral gullies act as collection and transport systems for rill networks, effective strategies for preventing erosion from entering waterways would benefit from identifying both the likely location and the quantities of sediment produced by the gullies. Researchers note the difficulty modeling erosion and transport processes of ephemeral gullies especially at a watershed scale. Many models avoid explicit estimation of gully erosion. Ephemeral gully erosion is not estimated by the RUSLE methods (Foster et al. 2003). The WEPP model (Flanagan and Nearing 1995) and the Ephemeral Gully Erosion Model (Woodward 1999) predict ephemeral gully erosion with physical process algorithms but are restricted in application because they require topographic position and gully length as input parameters that are not easily determined by conventional methods in watershed scale assessments.

This research developed an Erosion Potential Index (EPI) that uses high resolution aerial imagery combined with readily available soils information and digital elevation model to predict the location of ephemeral gully development. The EPI and the aerial imagery were then used to quantify ephemeral gully losses in a predominately agricultural watershed. This information can be readily used to identify critical areas within the watershed for prioritization of conservation reserve program (CRP) planning, implementation of conservation tillage practices, or carrying out other best management practices (BMPs) for sediment control.

Author: Michael Barber
Coauthor(s): Gregg Teasdale