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A validated GIS expert system to map relative soil vulnerability and patterns of erosion during the muddy floods of 2000-2001 on the South Downs, Sussex, UK

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The soils on the South Downs in East Sussex, England are particularly vulnerable to erosion because they are typically less than 25cm thick, dominated by loessial silt ($>$70%) and prone to crusting. With continuing erosion, soils become stonier, droughtier and less easy to work. Although annual rates of erosion are relatively low, during extreme events on some land-uses, on- and off-site flooding is a current and long-term risk. Property damage due to muddy flooding is of particular concern (Boardman, 2003).

Due to a long history of research interest, a rich database exists on the frequency and distribution of local muddy floods. In particular, during the winter of 2000-2001, Hortonion overland flow caused intensive rill and gully erosion on certain crop types in one particular 75km^2 area of thin calcareous soils. Since aerial photography dated late June 2000 is available, a map of soil vulnerability that is sensitive to land-use practices that year could be devised. The method whereby land-use and slope angle layers were weighted to map soil vulnerability to erosion, and then accumulated using the ARCGIS© flow accumulation algorithm to predict rill and gully positions is described and illustrated. Because a detailed map of the actual distribution of rills and gullies following the winter events of 2001 also exists (Boardman, 2001), these can be used to validate the predictive efficacy of the algorithm used.

In a further survey of the utility of the map, it was discovered that farmers' recollections of the events were vivid. It is suggested that erosion models can be validated by

inviting farmers to comment on their efficacy to predict known histories.

Boardman, J. 2001. Storms, floods and soil erosion on the South Downs, East Sussex, autumn and winter 2000-01. *Geography* 84 (4), 346-355

Boardman, J. 2003. Soil erosion and flooding on the South Downs, southern England 1976-2001. *Transactions Institute British Geographers* 28(2), 176-196