Predicting Post-fire Hillslope Erosion and Small Watershed Response with Online Interfaces Using WEPP Technology

Peter R. Robichaud[1], Marianna Dobre[2], Roger Lew[2] William J. Elliot[1], Erin Brooks[2], Mary Ellen Miller[3], Dylan Quinn[2]
[1]USDA-Forest Service, Rocky Mountain Research Station, Moscow, Idaho, [2]University of Idaho, Moscow, Idaho, [3]Michigan Technology Research Institute, Michigan Technological University, Ann Arbor, Michigan. probichaud@fs.fed.us; mdobre@uidaho.edu; rogerlew@uidaho.edu; welliot@fs.fed.us; ebrooks@uidaho.edu; memiller@mtu.edu; quinnd@uidaho.edu

Wildfires continue to be a frontline priority for forest management throughout the western US. The threat of erosion, flooding and debris flows after fire is a major concern for land managers and water purveyors around the world. Decision support tools that incorporate the range of burn severity conditions are essential to accurately determine the risk of erosion and flooding. Various online interfaces have been developed using the Water Erosion Prediction Project (WEPP) model as the engine; aimed to evaluate the risks of upland erosion, sediment delivery and flood flows from forest and rangeland watersheds smaller than 5000 ha. Considerable efforts have been made to improve model algorithms and input parameters, and the interfaces restructured to be meaningful and end-user-friendly for post-fire assessments. Various interfaces allow users to run simulations for hillslopes and watersheds and even employ cloud computing power with online GIS or in ArcGIS environments. After a wildfire, managers develop a soil burn severity map from remotely sensed imagery and ground surveys. The spatially explicit map showing the distribution of soil burn severity on the landscape can be easily uploaded as a raster layer for model use. The various interfaces allow the user to run WEPP with menu-driven input selections to access databases of topography, soils and climate layers for the areal extent of the burned area. Numerous erosion prediction calculations are automatically carried out then results are displayed in both spatial and tabular data formats, and a graphical display of hillslope erosion rates is color-coded for ease in visualizing high erosion risk areas. Batch programs allow for assessment over large burned areas and can easily compare mitigation treatments (e.g. mulching) on reducing hillslope erosion. Outputs are available for return interval comparisons at hillslope or watershed scales and can be sorted by precipitation, total runoff or peak flow. Validation efforts have been completed at various hillslope- and small watershed-scale burned areas with satisfactory results.