

Nutrient Loss Model from wildfires using ArcGIS Pro and Python modeling.

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The Nutrient Loss Model (NLM) tool was originally developed to model influxes of carbon, nitrogen and phosphorus from wildfires. The capability of the model has been expanded to also generate fluxes of aluminum, cadmium, iron, lead, manganese, and zinc based on published data from the Rocky Mountains, USA. The model has evolved from ESRI's ArcMap version 10.3, using Python version 2.7 to ArcGIS Pro 2.8, using Python version 3.3. The NLM tool also was modified by creating a modular structure which allowed adding new chemical elements. This required recoding of the Python script.

In this iteration of the NLM tool we utilize the user friendly WEPPCloud platform and which incorporate soil burn maps from the BAER and MTBS databases. WEPPCloud uses elevation data from the USGS National Elevation Dataset and TOPAZ for watershed delineation. The soils are built using SURGO/STATSGO data. Land cover and climate data are generated from the CLIGEN database. The WEPPcloud Post-Fire Erosion Prediction (PEP) model allows users to upload a burn severity map and predict erosion based on fire severity. The results of the modeling have successfully reproduced initial increases in elemental fluxes triggered by rain precipitation/snow melt events which followed severe wildfire events. Depending on topography, types of geologic sources, and magnitude of rain events, the increased elemental fluxes varied from less than 100% to more than two orders of magnitude. Modelled fluxes diminished below 50% after five years since the last major wildfire event. The calibration of the model used mainly data from western North America.