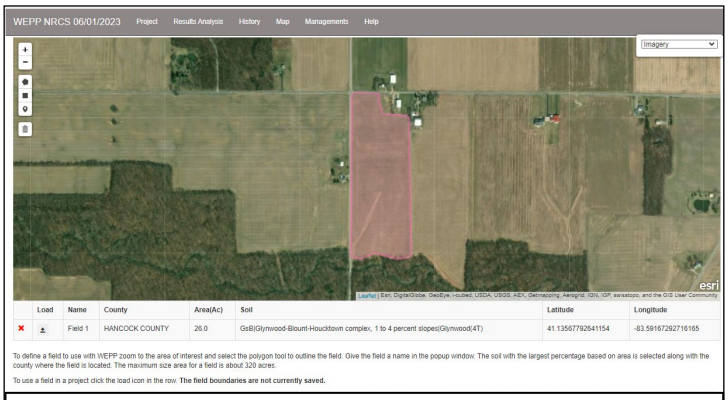
# National Soil Erosion Research Laboratory
# WEPP Erosion Prediction Technology

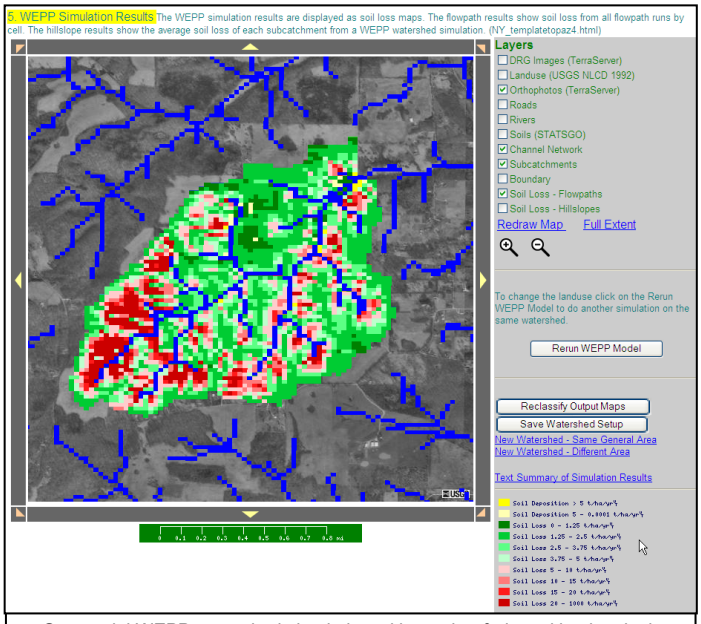
The USDA-ARS National Soil Erosion Research Laboratory (NSERL) conducts research into processes, control, and prediction of soil erosion by water. This federal facility is located on the campus of Purdue University. There is a long history of development of erosion prediction technology at this location - the Universal Soil Loss Equation (USLE), was developed by ARS researchers at Purdue in the 1950's - 1970's and the erosion component of the CREAMS/GLEAMS models was developed in the 1970's. The Revised Universal Soil Loss Equation (RUSLE) was initially developed at the NSERL in the late 1980's, and the **Water Erosion Prediction Project (WEPP)** model has been under development here since the late 1980's. WEPP is a process-based model that simulates important hydrologic and erosion physical processes. A climate generator program is used to create a series of typical climate inputs to WEPP based upon long-term weather station statistics. If rainfall is predicted for a given day, the model computes infiltration and runoff. If runoff is predicted, the rates of soil detachment by raindrop impact and flowing water are estimated. Results for all storm events during the period of simulation are summed to come up with long-term average annual runoff, soil loss, and sediment yield predictions. Model results can also be used to calculate return periods and conduct risk analyses.

WEPP can be used for estimates of soil erosion and sediment yield on hillslope profiles and small watersheds up to about 250 hectares. The size of the area of application is limited conceptually by the processes to be simulated (WEPP simulates interrill, rill, ephemeral gully and channel erosion due to overland flow from rainfall, snowmelt or irrigation). A large amount of WEPP-related research and model validation results can be found in the peer-reviewed literature.

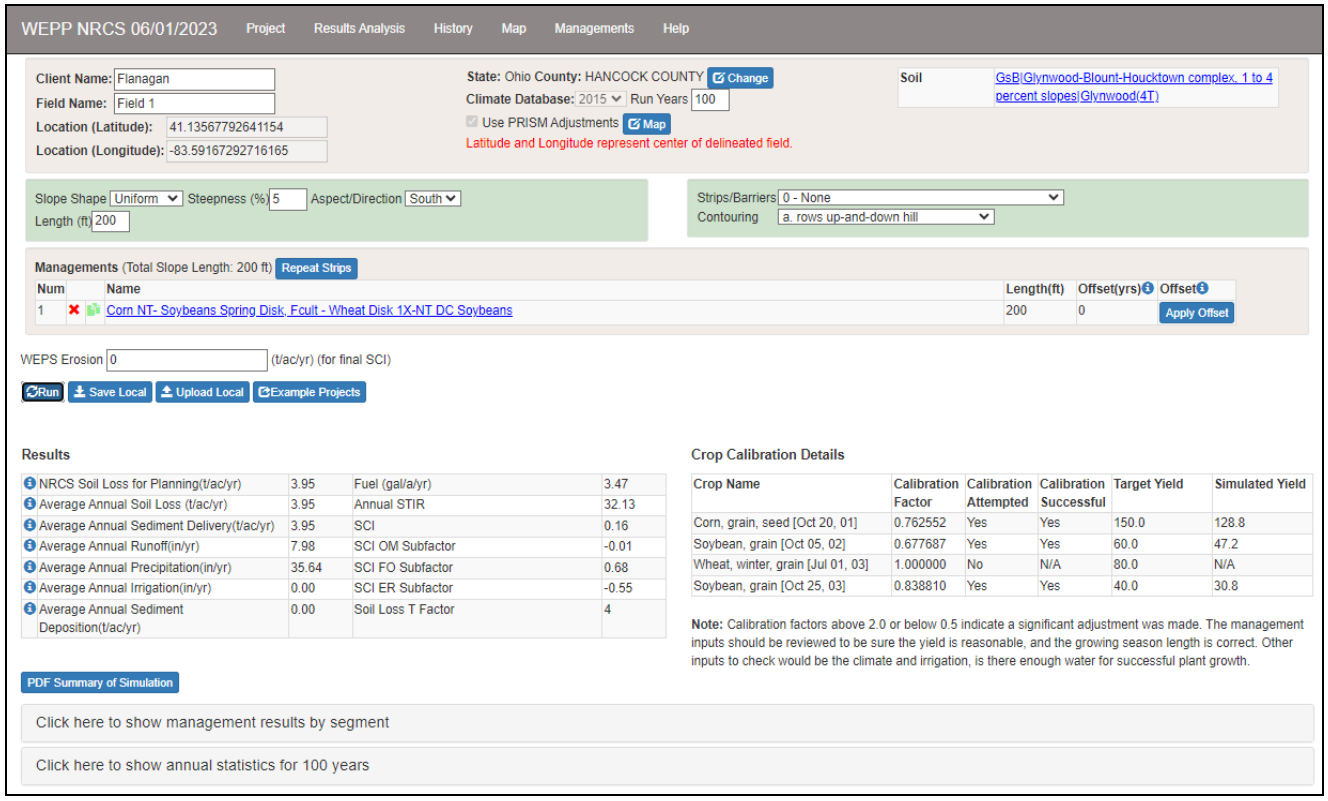
Some recent WEPP activities have focused on creation of easy-to-use and powerful user interface programs for the USDA Natural Resources Conservation Service (NRCS). The hillslope NRCS web interface utilizes the nationwide NRCS SSURGO soils database, an updated nationwide temporally-consistent climate database, and the new comprehensive NRCS CRLMOD (Conservation Resources - Land Management Operations Database), available at https://brenton.nserl.purdue.edu/wepp. A stand-alone Windows interface for installation and use on a personal computer also allows for detailed simulations of hillslope profiles and small watersheds. Model documentation and links to other resources and interfaces are available at https://www.ars.usda.gov/nserl/wepp. A more powerful GIS interface (GeoWEPP) is an ArcGIS extension that can utilize user-specific digital elevation model (DEM) and other data to display and automatically delineate a watershed boundary, channels, and contributing hillslopes, and predict runoff and erosion (https://fargo.nserl.purdue.edu/geowepp). External collaborators have also developed their own interfaces with WEPP, including the Iowa State University Daily Erosion Project (https://www.dailyerosion.org/) that utilizes WEPP with NEXRAD radar precipitation data, NRCS SSURGO soils data, detailed LiDAR topographic data, and remotely-sensed field management data to estimate daily erosion across a six state region. Cooperators at the University of Idaho and the U.S. Forest Service have developed WEPPcloud (https://wepp.cloud/weppcloud/), that can be applied to undisturbed/disturbed areas, and is useful for examining wildfire impacts and siting remediation efforts. Further information on erosion prediction and other research activities at the National Soil Erosion Research Laboratory is available at our Web site at: https://www.ars.usda.gov/midwest-area/west-lafayette-in/national-soil-erosion-research/.




NRCS web-based WEPP hillslope interface – field polygon on map screen.




Geospatial WEPP watershed simulation with erosion & deposition by pixel.




NSERL - NRCS web-based hillslope interface – inputs and outputs on main screen.


NSERL - NRCS web-based hillslope interface – some detailed output graphs.