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# An Overview about Water Erosion Prediction Project Model (WEPP) for Finding Water Erosion

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WEPP is a computer model for predicting soil erosion and sediment delivery from fields, farms, forests, rangelands, construction sites and urban areas. In 1985, the Water Erosion Prediction Project (WEPP) was initiated by USDA, at a meeting in Lafayette, Indiana.

The goal of this project was to develop next generation erosion prediction technologies including a physical process-based soil erosion model, to ultimately replace the existing empirically-based USLE and derivatives. Identifying the zones of sediment deposition and detachment within permanent channels or ephemeral gullies. Model representing the spatial and temporal variability in erosion and deposition processes. The WEPP model integrates hydrology, plant science, hydraulics and erosion mechanics to predict erosion at the hillslope and watershed scale

## Major Model Components

Climate simulation, surface and subsurface hydrology, water balance and percolation, soil component (tillage impacts), plant growth and residue decomposition, overland flow hydraulics, hillslope erosion component, channel hydrology and hydraulics channel erosion and surface impoundment element this are the model components.

## Hydrology Components

**Infiltration -** Single layer Green and Ampt equation for unsteady rainfall

$$f_t = K_e(1 + \frac{Ns}{F})$$

Where, $f_t$ = infiltration rate, cm $hr^{-1}$

$K_e$ = effective hydraulic conductivity, cm $hr^{-1}$

t = time, hr

F = cumulative infiltration depth, cm

Ns = effective matric potential, cm

**Runoff:** Computed by using kinematic wave equations or an approximation to the kinematic wave solutions.

## Model Framework

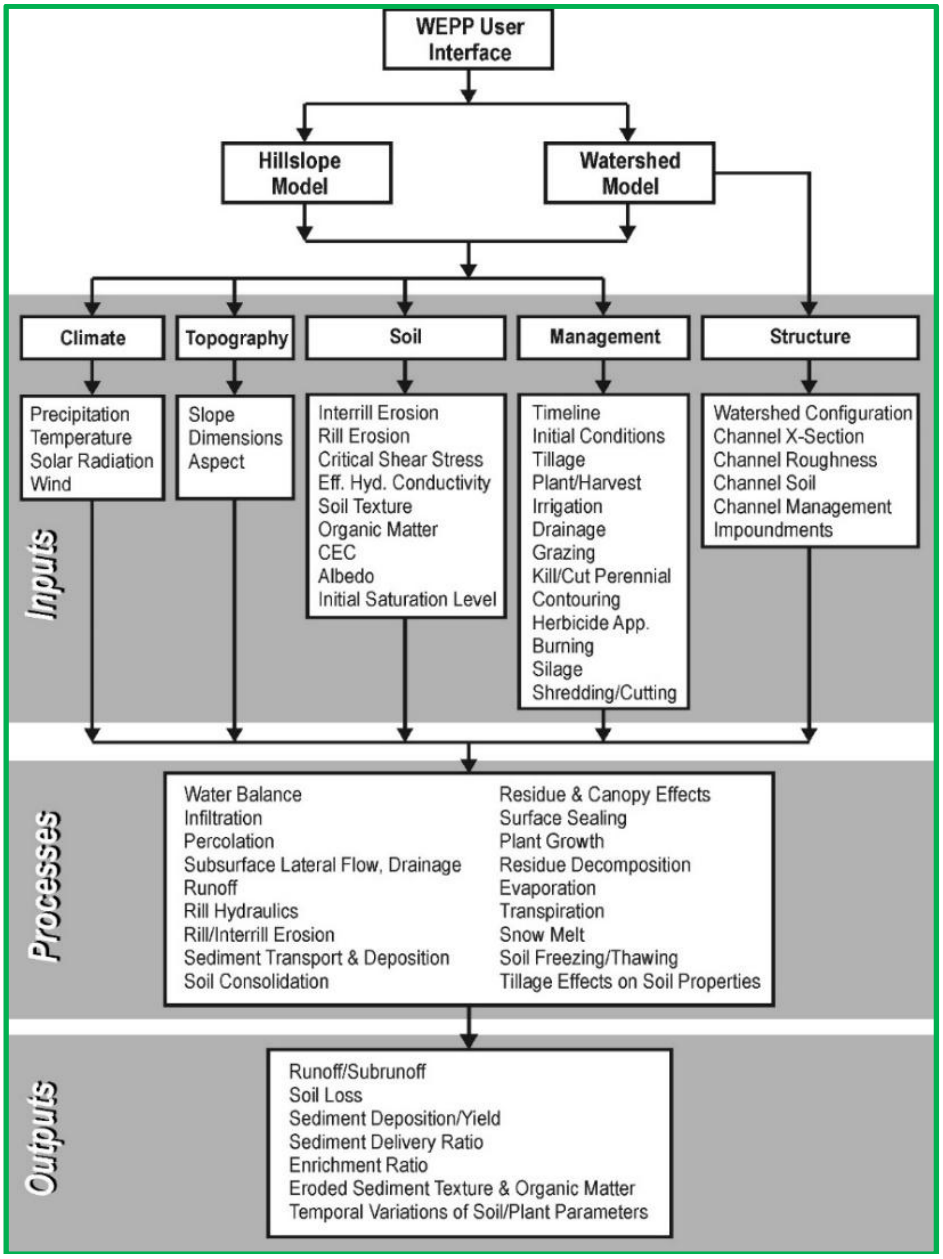


**Figure 1: Frame work of WEEP model**

## Soil Tillage Component

**Erosion process is influenced by the four soil variables-** random roughness, Ridge height, Bulk density, Hydraulic conductivity

## Plant Growth Component

**WEPP uses EPIC concepts of phenological crop development based on** –Daily accumulated heat units, harvest index for partitioning grain yield, potential biomass, water and temperature stress adjustments

## Erosion Component

Erosion components are embedded in the WEPP model which uses a closed-form solution to a steady-state form of the continuity equation applied to estimate the hillslope sediment movement and delivery.

**Interill Erodibility ($K_i$)** is a measure of sediment delivery rate to rills as afunction of rainfall intensity and runoff rate.

$$D_i = K_i I^2 S_f f(c)$$

$D_i$ = detachment rate (kg/m2/sec)
$K_i$ = interrill erodibility(kg-sec/m4)
$I^2$ = rainfall intensity (m/sec)
$S_f$ = Slope factor(17)
$f(c)$ = function of canopy & residue

**Rill Erodibility ($K_i$)** is a measure of soil susceptibility to detachment by concentrated flow.

$$D_r = K_r(t - t_c)\left(1 - \frac{G}{T_c}\right)$$

$D_r$= rill erosion rate (kg/m2/sec)
G= sediment transport rate (kg/m/sec)
$K_r$ = rill erodibility (sec/m)
$t$ = hydraulic shear of the water flowing in the rill (Pa)
$t_c$ = critical shear below which no erosion occurs(Pa)
$T_c$ = rill sediment transportation capacity (kg/m/sec)

## Inputs and Outputs

### Inputs

Model inputs: *Watershed Topography* - Digital Elevation Model (DEM) for slope length, steepness along the slope, and aspect for a single hillslope. *Soil* - Soil texture, depth, and erodibility, *Land use and management* and *Climate*

### Outputs

Outputs from WEPP water balance, the distribution of soil detachment and deposition along a complex hillslope, and sediment delivery from a hillslope or a channel segment within a watershed. output of daily vegetation growth and senescence, and the accumulation and decomposition of leaf litter are also available.

## Conclusions

Expand the ability of WEPP to simulate the loss and transport of nutrients and pesticides. In this article discuss about improve erosion model interface programs that can be used for WEPP. WEPP model be improved to allow access to sub-daily time scale results so that it can be better integrated with other watershed models. The applicability of WEPP model has not been examined yet for extremely steep slopes (470 – 600).

## References

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