Soil Loss Prediction Techniques:

Universal Soil Loss Equation

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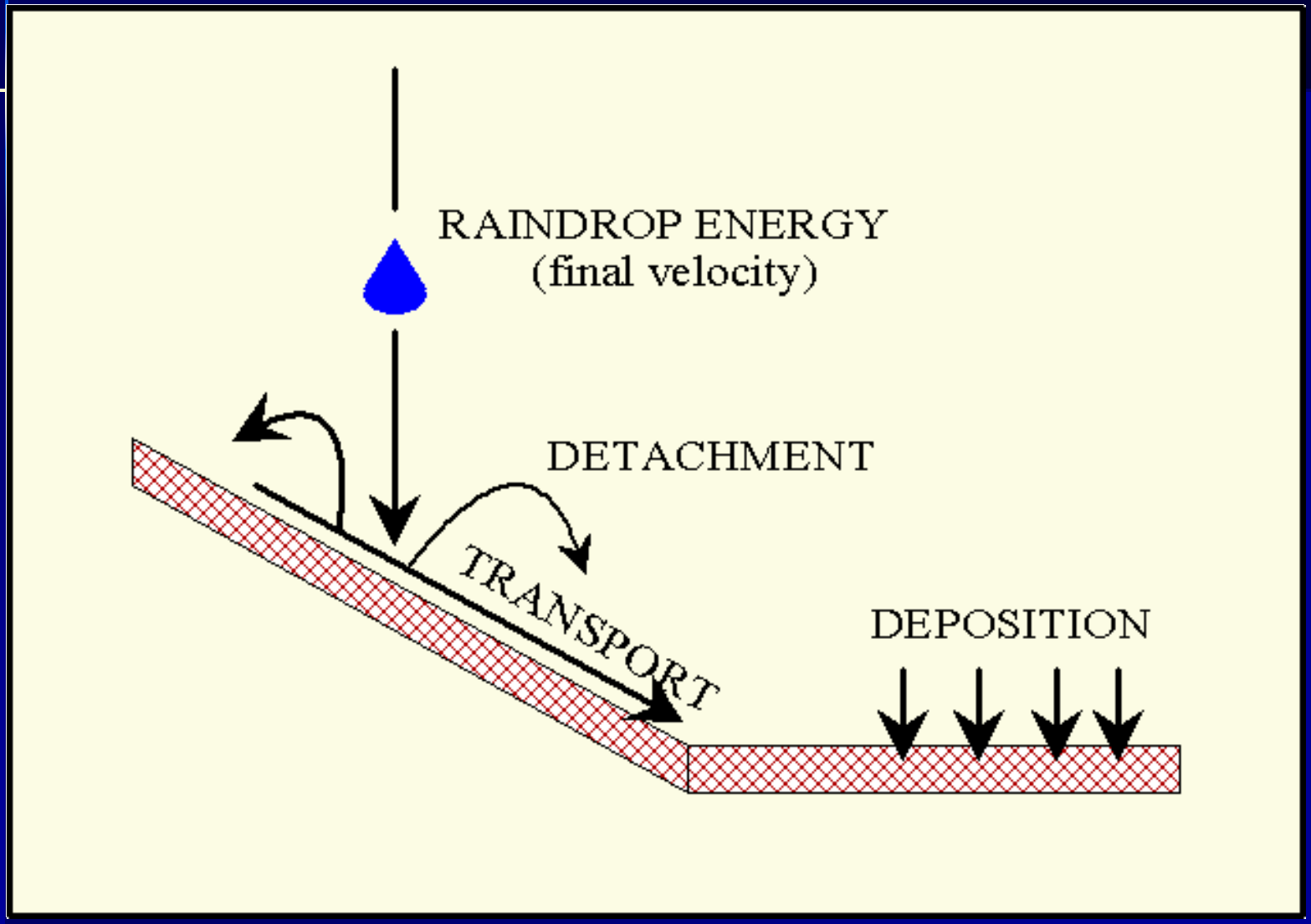
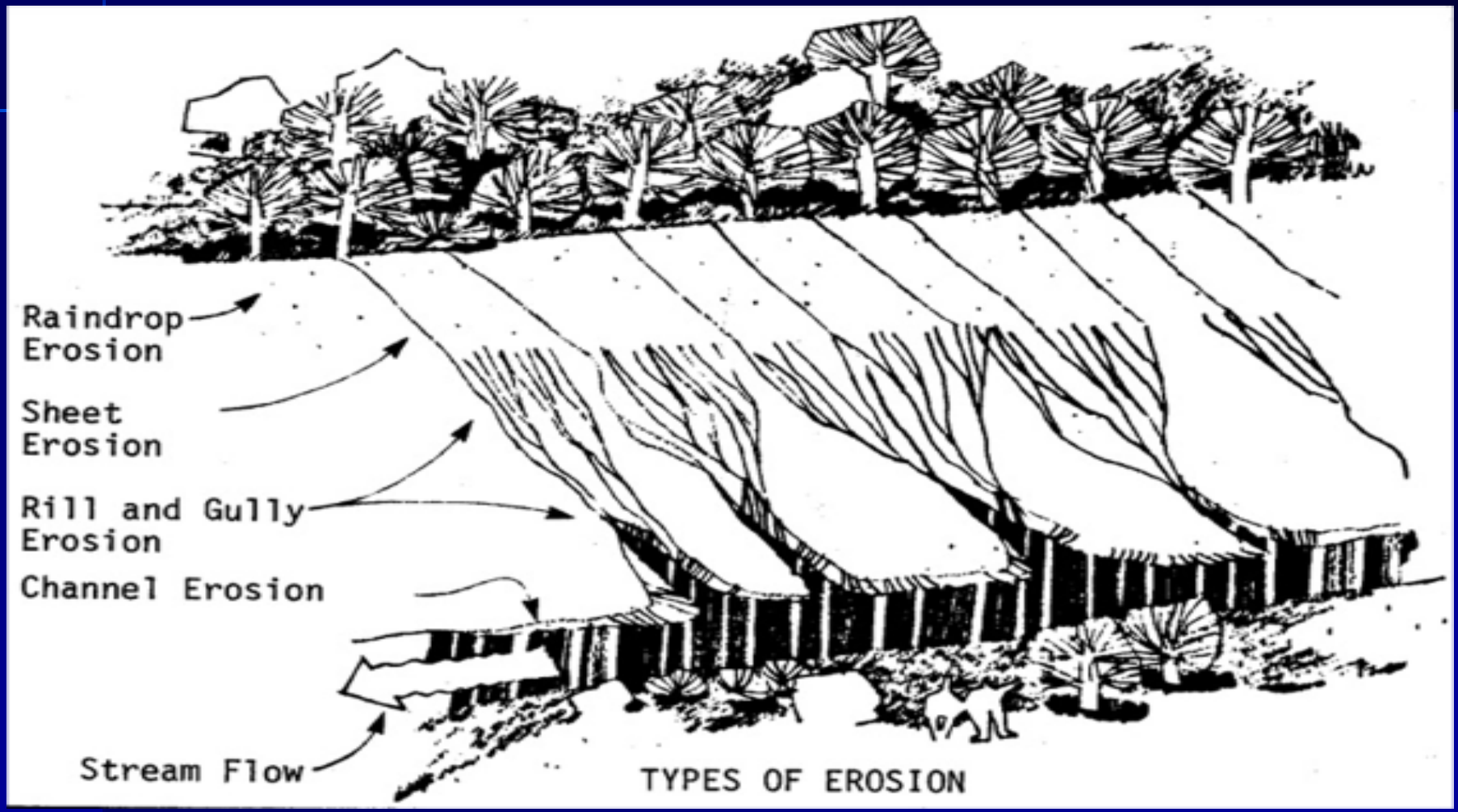
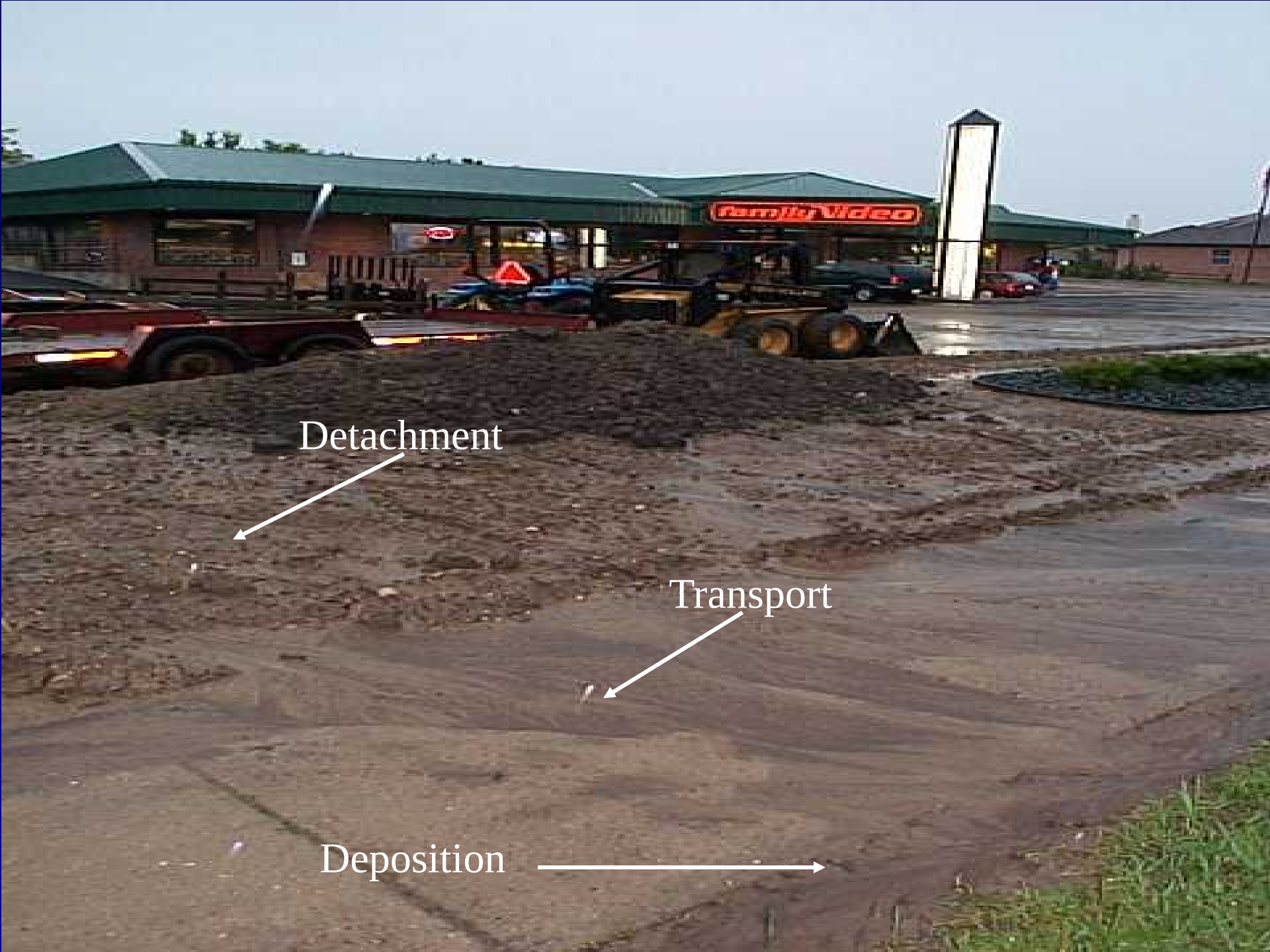
Conceptual Model of Erosion



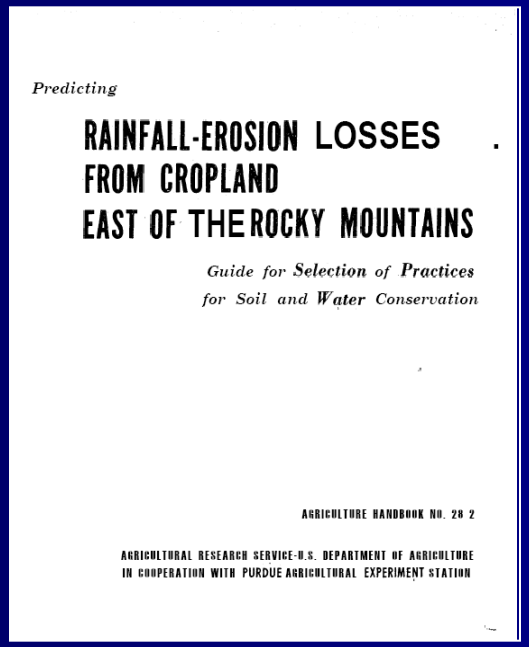
Conceptual Model of Erosion

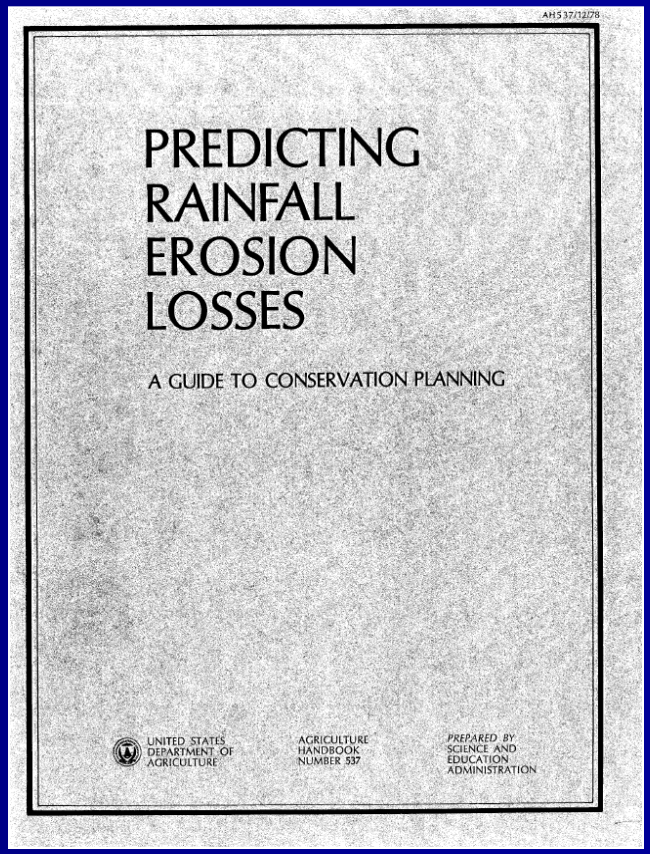



family video
Detachment
Transport
Deposition

USLE History

- Universal Soil Loss Equation – USLE
  - AH 282; 1965
  - AH 537; 1978





USLE / RUSLE Equation

- Set of mathematical equations that estimate average annual soil loss.
- Has been well validated with monitored data from erosion-plots using natural and simulated rainfall.

6-12 feet wide

72.6 feet long

USLE Equation

A=(R)(K)(LS)(C)(P)

A = average annual soil erosion (T/A/Y)

R = rainfall erosivity (awful units)

K = soil erodibility (awful units)

R * K gives units of T/A/Y

LS = topographic factor (dimensionless)

C = cover-management (dimensionless)

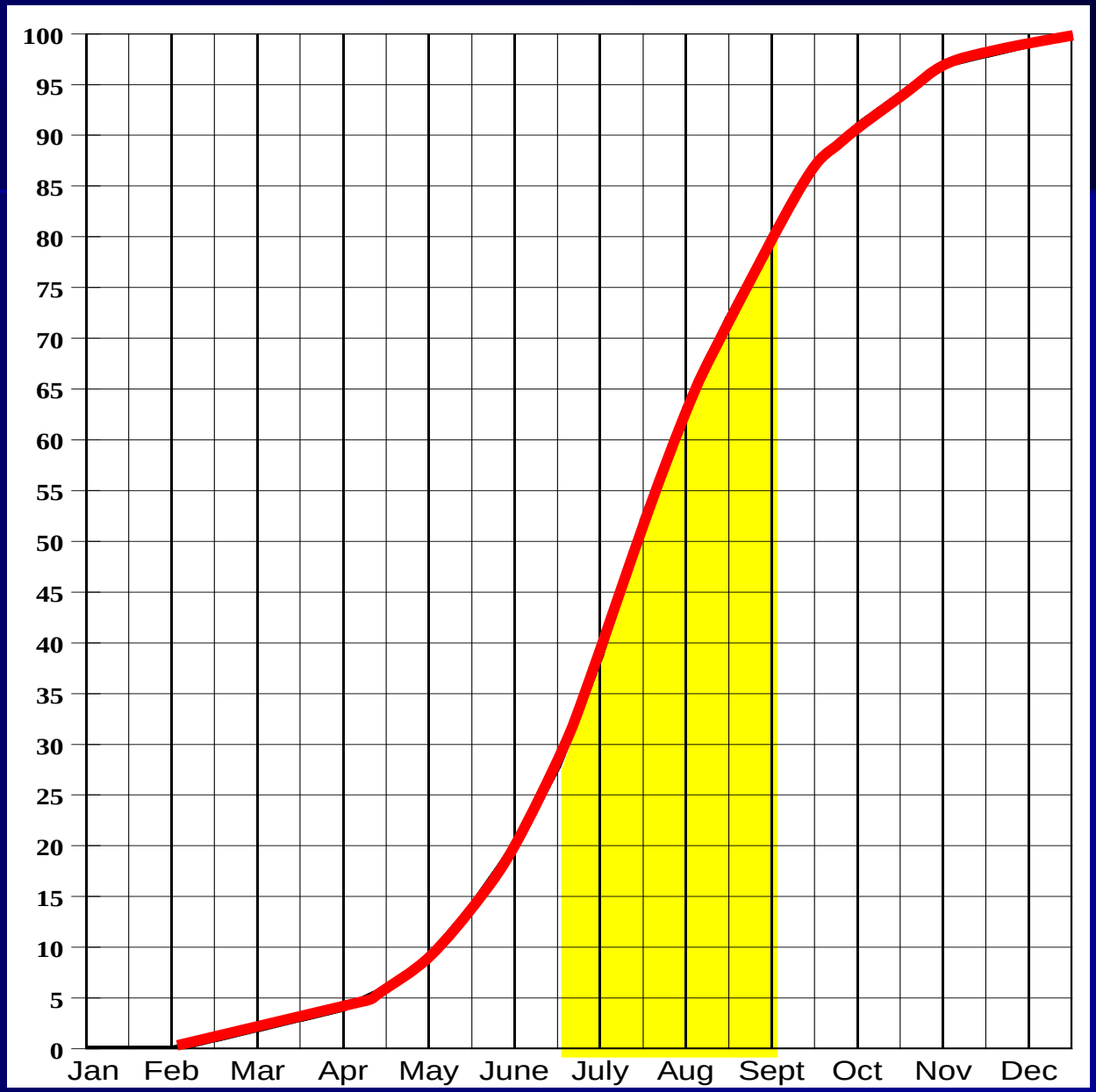
P = conservation practice (dimensionless)

Rainfall and Runoff Factor (R)

- Amount of energy in a location's annual rainfall and intensity varies by location and time of year.
- For example, the average annual R factor for Dane County is 150.

Monthly Distribution of R

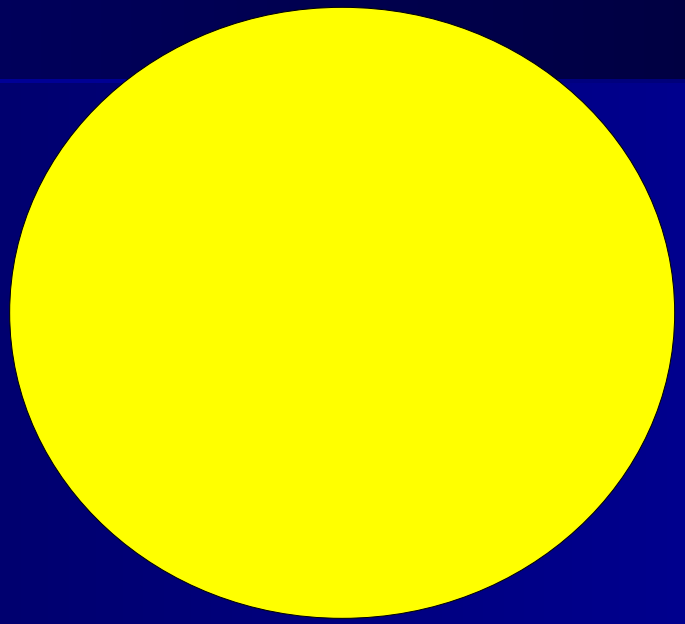
Percent of Annual R



Soil Erodibility Factor (K)

- Based on the soil type of the site, independent of management.
- Corresponds to the erosivity of the soil in a bare condition.
- Major factors: texture, organic matter, structure, permeability

Relative Sizes of Soil Particles



Sand, 50 microns

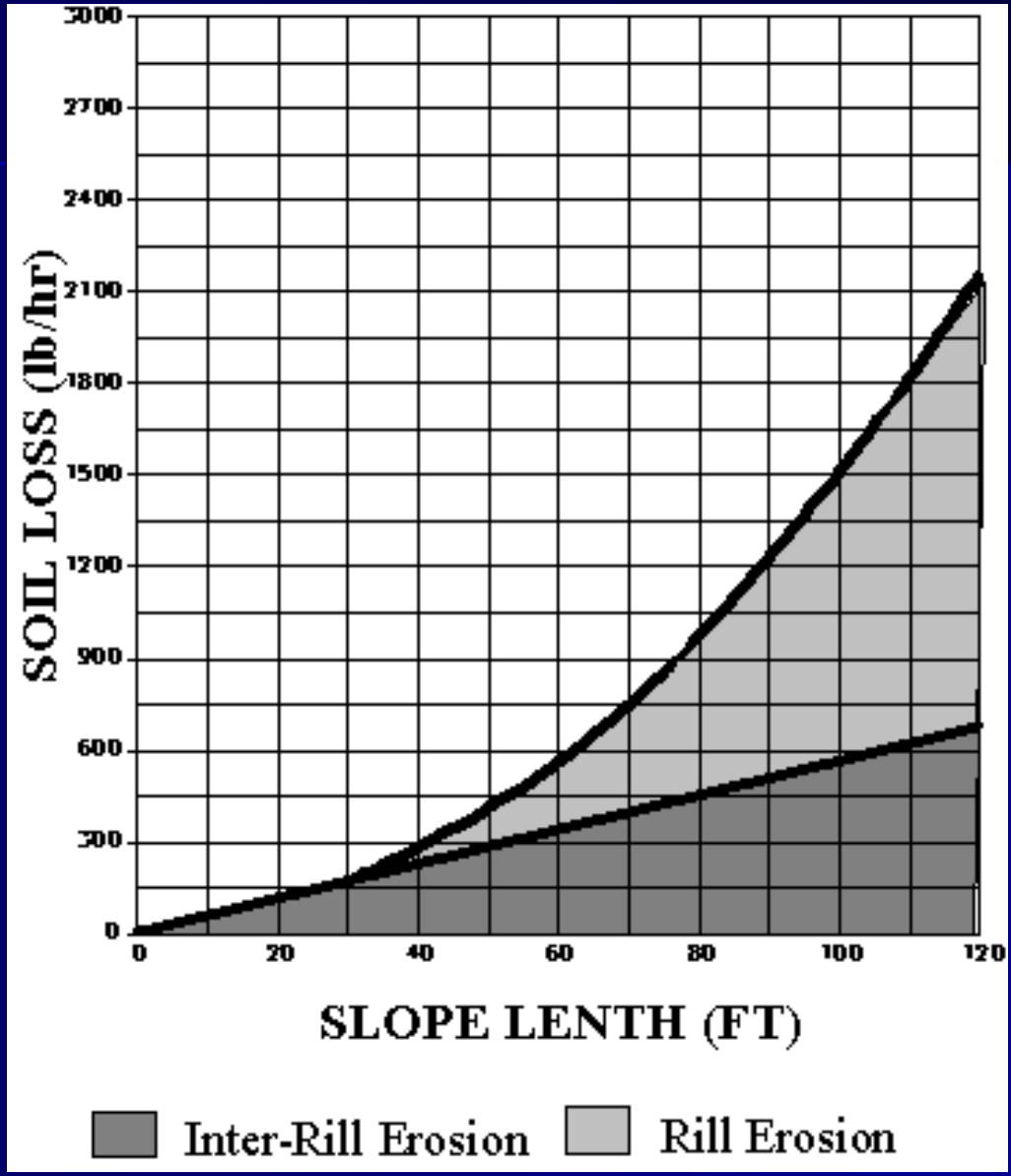
Silt, 10 microns

Clay, 2 microns

Slope Length/Steepness Factor (LS)

- Ratio based on the relationship between the percent slope and slope length of the disturbed area.

Soil Erosion vs. Slope Length



Cover and Management Factor (C)

- The factor representing the site's cover protection from rainfall impact.
- The ratio of erosion between a specific ground cover and bare ground.


Tyvek
HomeWrap
DUPONT


Pellitteri

Dane Co. USLE Spreadsheet

- Developed based on USLE and later updated to reflect RUSLE
- Calculates EI values on a daily basis thus allowing daily management.
- Version modified for Commerce

Universal Soil Loss Equation for Construction Sites

for use in the State of Wisconsin

commerce.wi.gov
Wisconsin Department of Commerce

Developer: _____

Project: _____

Date: 03/01/2006

County: Bayfield

PRINT SHEET | HELP PAGE

Version 3.0

Land Disturbing Activity	Begin Date	End Date	Period % R	Annual R Factor	Sub Soil Texture	Soil Erodibility K Factor	Slope (%)	Slope Length (feet)	LS Factor	Land Cover C Factor	Soil loss A=%RxRxKxLSxC (tons/acre)	Percent Reduction Required
												(5.0 tons/acre)
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										TOTAL	-----	NONE

Land Disturbing Activities:

input	definition
Bare Ground	activity which leaves the ground devoid of vegetation
Seed and Mulch	application of straw at 1.5 tons/acre with or without seeding
Seeding	temporary or permanent seeding without the use of mulching materials
Sod	installation of sod
End	end of 60 day cover establishment or permanent stabilization (required input)

Notes:

Designed By:	
Date	
Checked By:	
Date	

Practice Efficiencies

- Straight forward reduction
- Simple calculation
- Calculated efficiency using an approved model

Silt Fence Efficiency

A silt fence prevents soil loss by reducing the flow velocity of runoff by forcing it through filter fabric. When properly installed and maintained, a silt fence with a 20-micron pore size yields an efficiency of 42%.

Diversion Efficiency

Diversions effectively reduce the slope length by diverting runoff away from slopes and other areas that are prone to erosion. The efficiency for this practice is thus derived from the reduction in slope length that it provides. To calculate the efficiency, simply use the new, reduced slope length in place of the pre-existing one in the USLE and recalculate. The difference is the efficiency for the practice.

Sedimentation Basin

Sedimentation basins reduce peak flows and act as a sediment trapping device during construction. An approved sedimentation model must be run to determine the practice's efficiency.

Advantages of Soil Loss Standard

- Able to target areas for more effective control.
- Gives credit for limiting exposure time and phasing construction.
- Aids in the design of practices.
- Requires the development of a plan.

Principles of Erosion Control Addressed with Soil Loss Prediction

- Fit development to the site.
- Timing of grading and construction.
- Retain existing vegetation.
- Minimize the length and steepness of slopes.

Erosion Estimation vs. Stormwater Models

- SLAMM / P-8 and other storm water pollutant models should not be used to simulate erosion processes.
  - Models rely on build/up wash-off routines
  - Models use particle size distributions for urban storm water runoff

Questions