

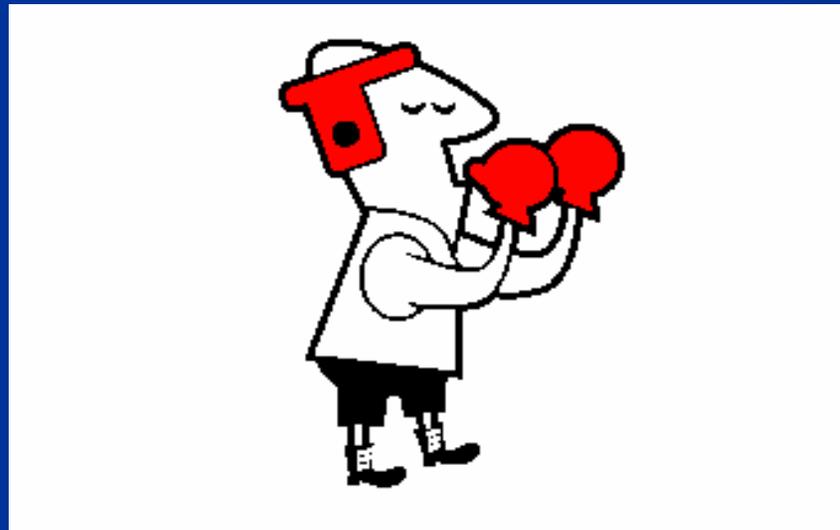
# *Slope Lengths & Considerations*

**What criteria do we use to measure slope length?**

- *General Discussion*

# Slope Length

- RUSLE2 VS USLE



# USLE SLOPE DEFINITION

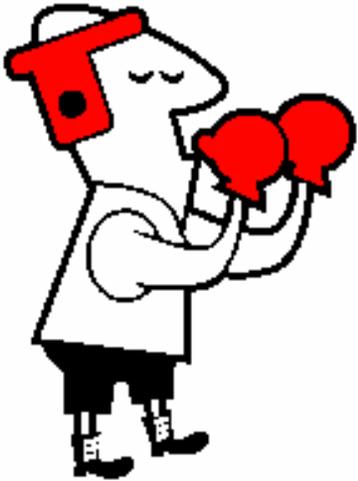
- Overland flow to

- concentrated flow

- or deposition

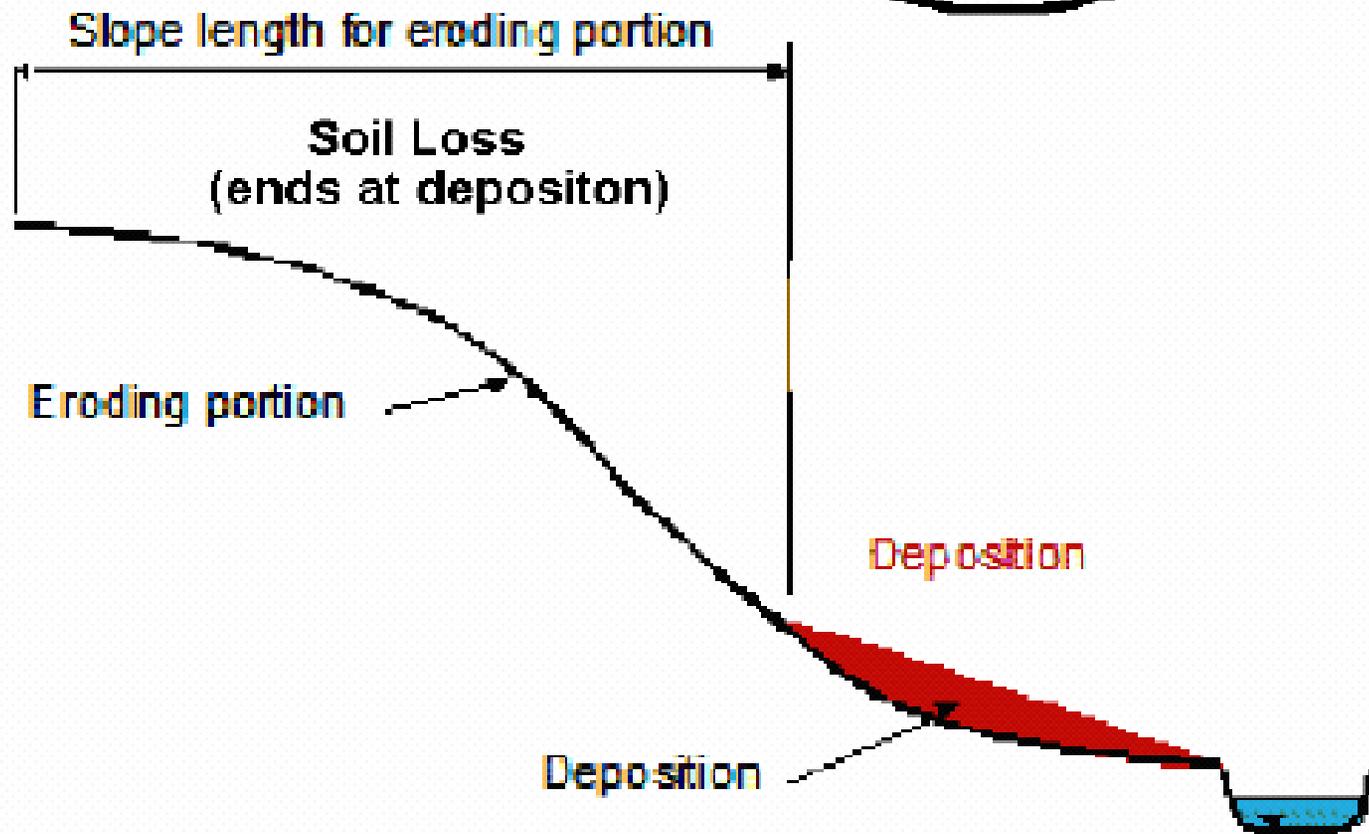
- However

- Overland flow continued beyond the point of deposition



# 'OLD' USLE Slope Length Guidance (1980s vintage)

## 'OLD' USLE Guidance for Slope Length



# RUSLE2 TOPOGRAPHY

- Overland flow path length
- Slope lengths for eroding portions of hillslopes
- Steepness
- Hillslope shape

# Hillslope Shape

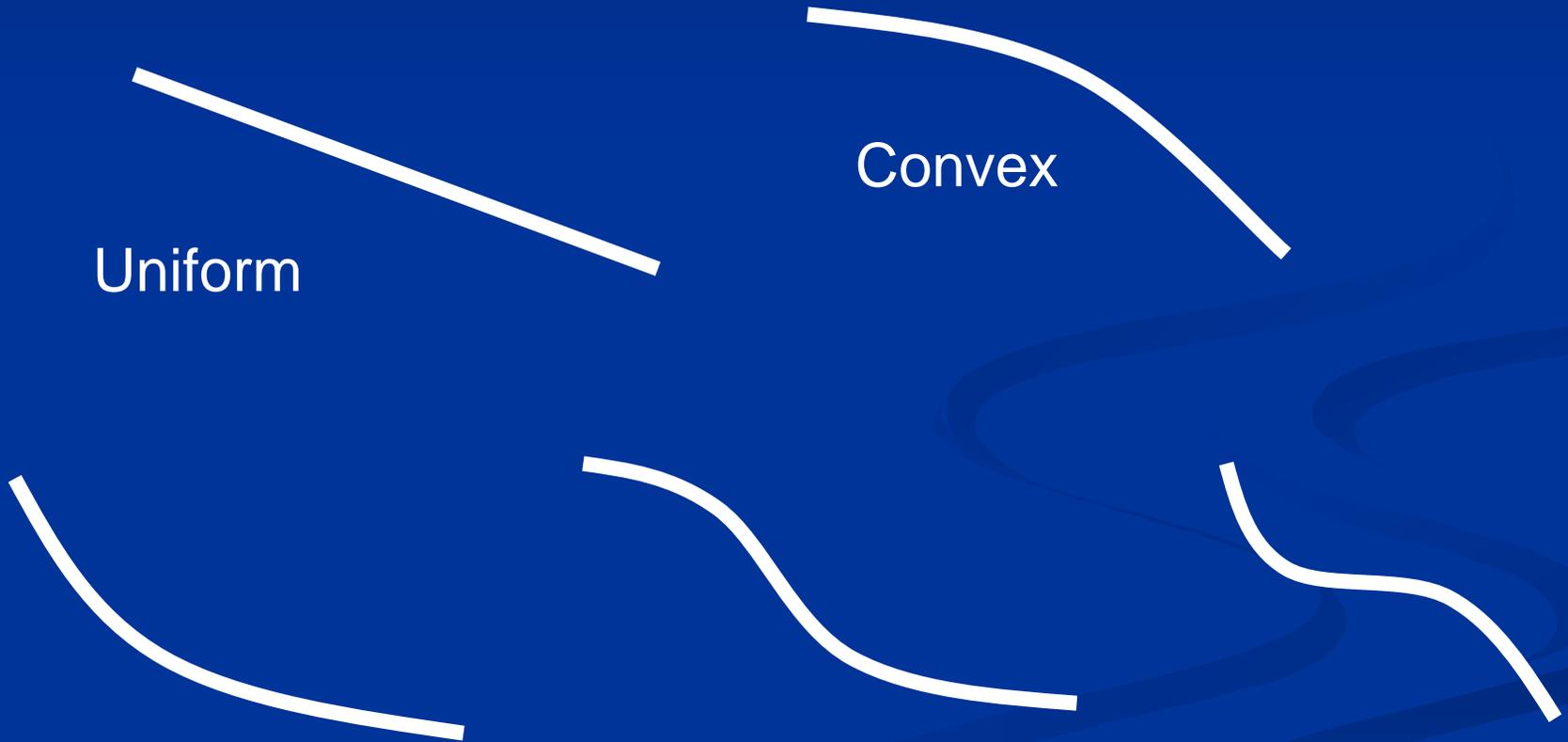
Uniform

Convex

Concave

Complex-  
Convex:concave

Complex-  
Concave:convex



# Overland Flow Path Length

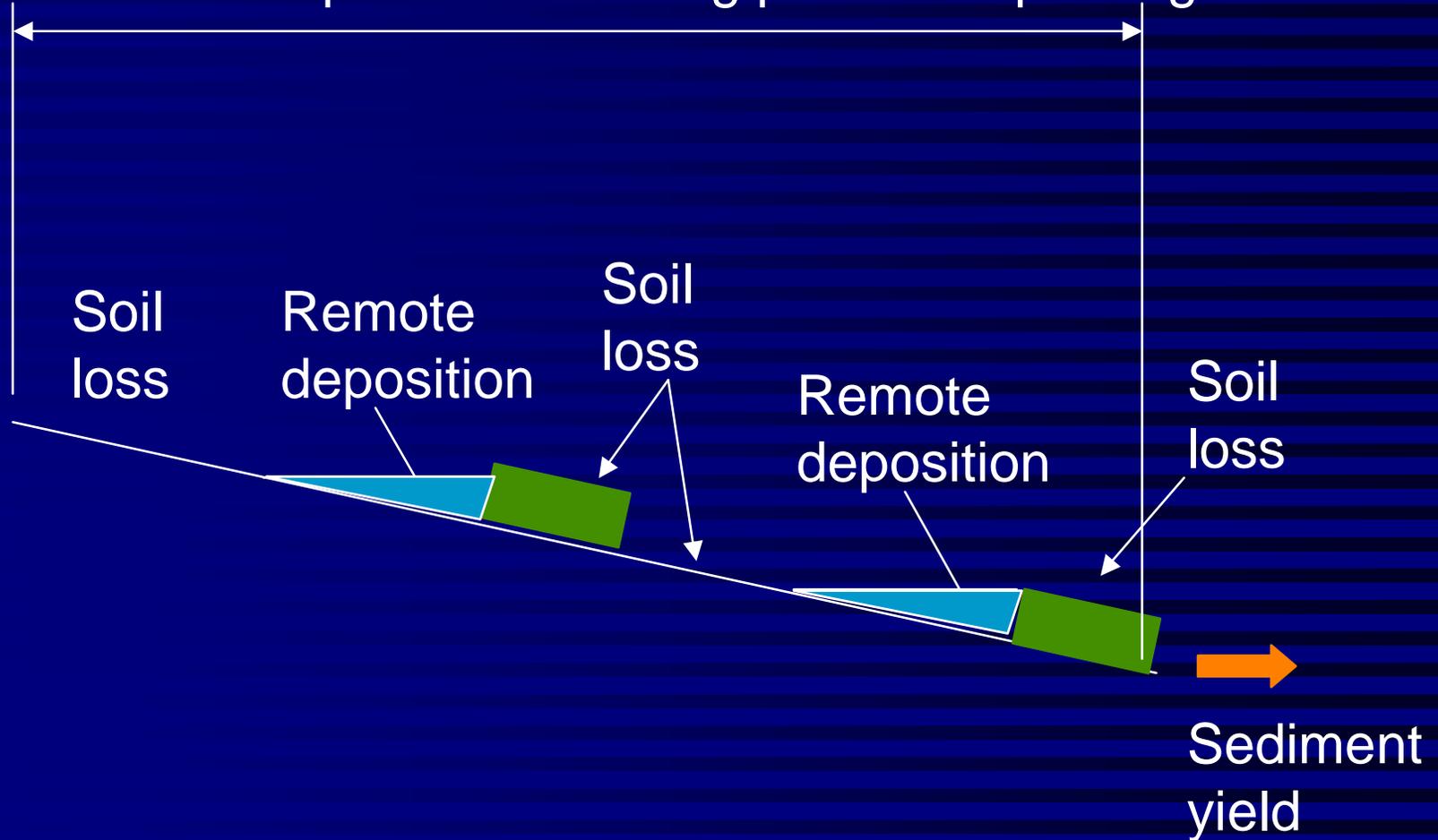
- Distance from the origin of overland flow to a concentrated flow area
- This length used when the analysis requires that the entire flow path length be considered.

# Slope Length for Eroding Portion of Slope

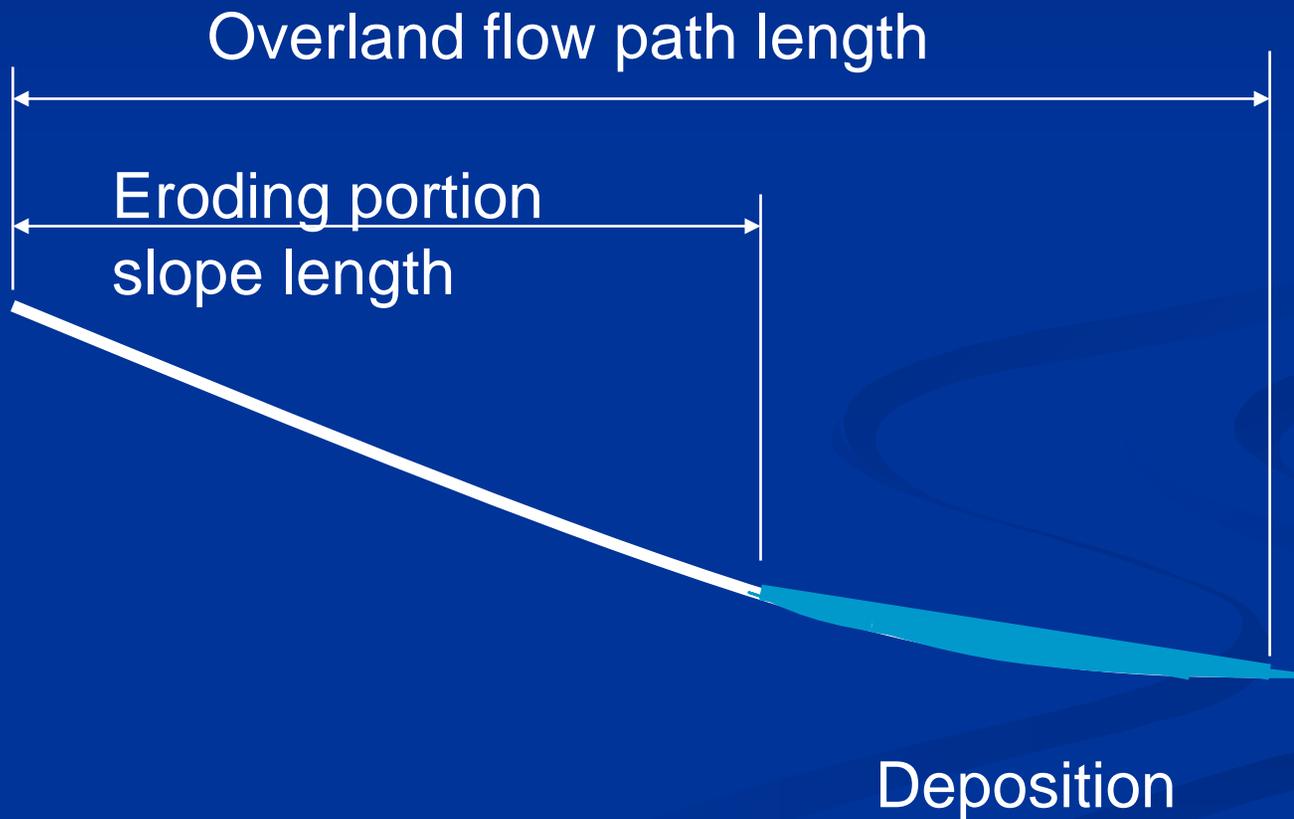
- Only works for simple slopes
- Traditional definition
  - Distance from origin of overland flow to concentrated flow or to where deposition begins
  - Definition is flawed for strips and concave:convex slopes
- Best approach: Use overland flow path length and examine RUSLE2 segment erosion rate values

# Slope Lengths for Strips

Overland flow path and eroding portion slope length



# Slope Length for Concave Slope



# Rule of Thumb for Deposition Beginning on Concave Slopes

Average steepness of concave portion

Example:

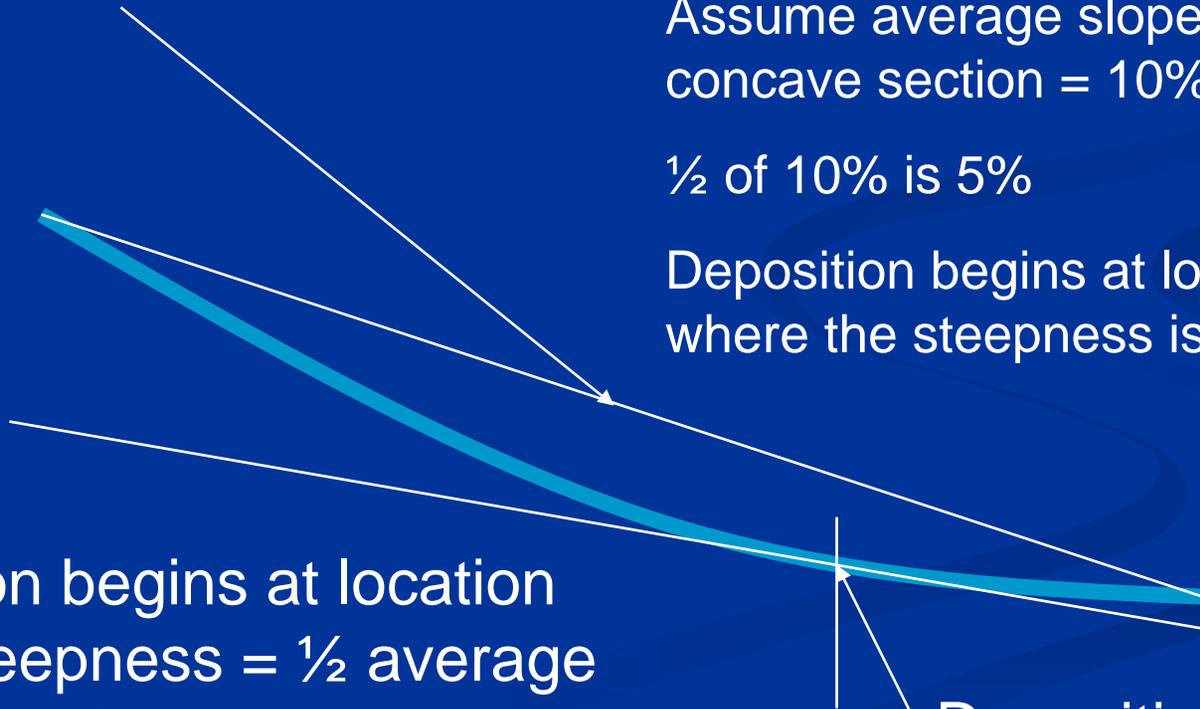
Assume average slope of concave section = 10%

$\frac{1}{2}$  of 10% is 5%

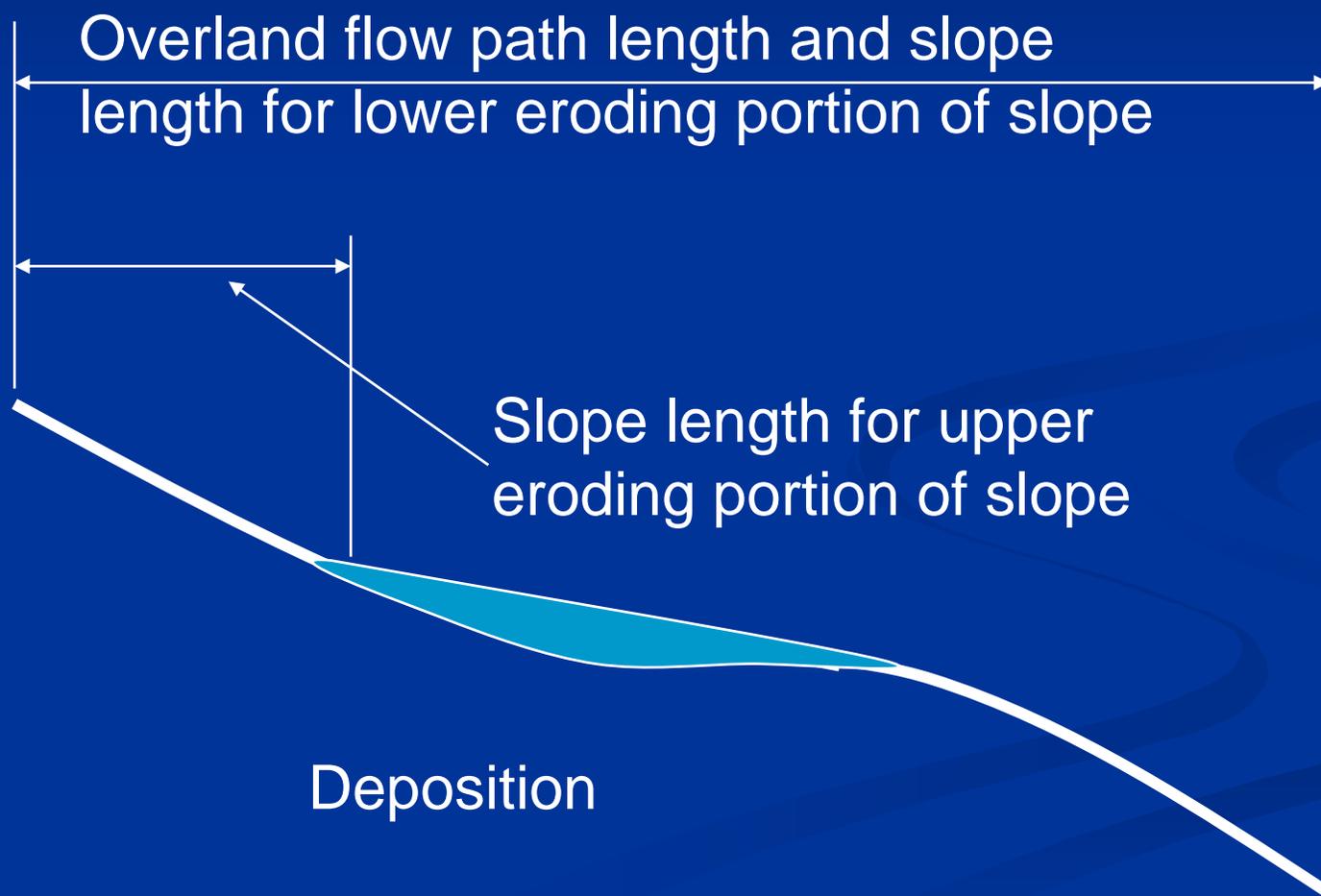
Deposition begins at location where the steepness is 5%

Deposition begins at location where steepness =  $\frac{1}{2}$  average steepness of concave portion

Deposition begins



# Slope Length for Concave:Convex Slope



# Basic Principles

- Sediment load accumulates along the slope because of detachment
- Transport capacity function of distance along slope (runoff), steepness at slope location, cover-management, storm severity (10 yr 24 hr precip)
- Deposition occurs where sediment load becomes greater than transport capacity

# Slope Length Effects

- Slope length effect is greater on slopes where rill erosion is greater relative to interrill erosion
- Examples:
  - Steep slopes
  - Soils susceptible to rill erosion
  - Soils recently tilled
  - Low soil biomass

## What type(s) of Erosion Does RUSLE(2) measure?

RUSLE2 estimates rates of:

rill and interrill (sometimes referred to as **sheet erosion**) caused by **rainfall** and its associated **overland flow**.

# Rill Erosion

- **Rill erosion** is the removal of soil by concentrated water running through little streamlets. As detachment continues or flow increases, rills will become wider and deeper.
- Rill erosion is one of the most common forms of erosion. **The rill channels can temporarily be obliterated by tillage.** Tillage loosens the soil making it more susceptible to rill erosion. Thus, every time they are destroyed - the rills can reform, resulting in much more soil lost.



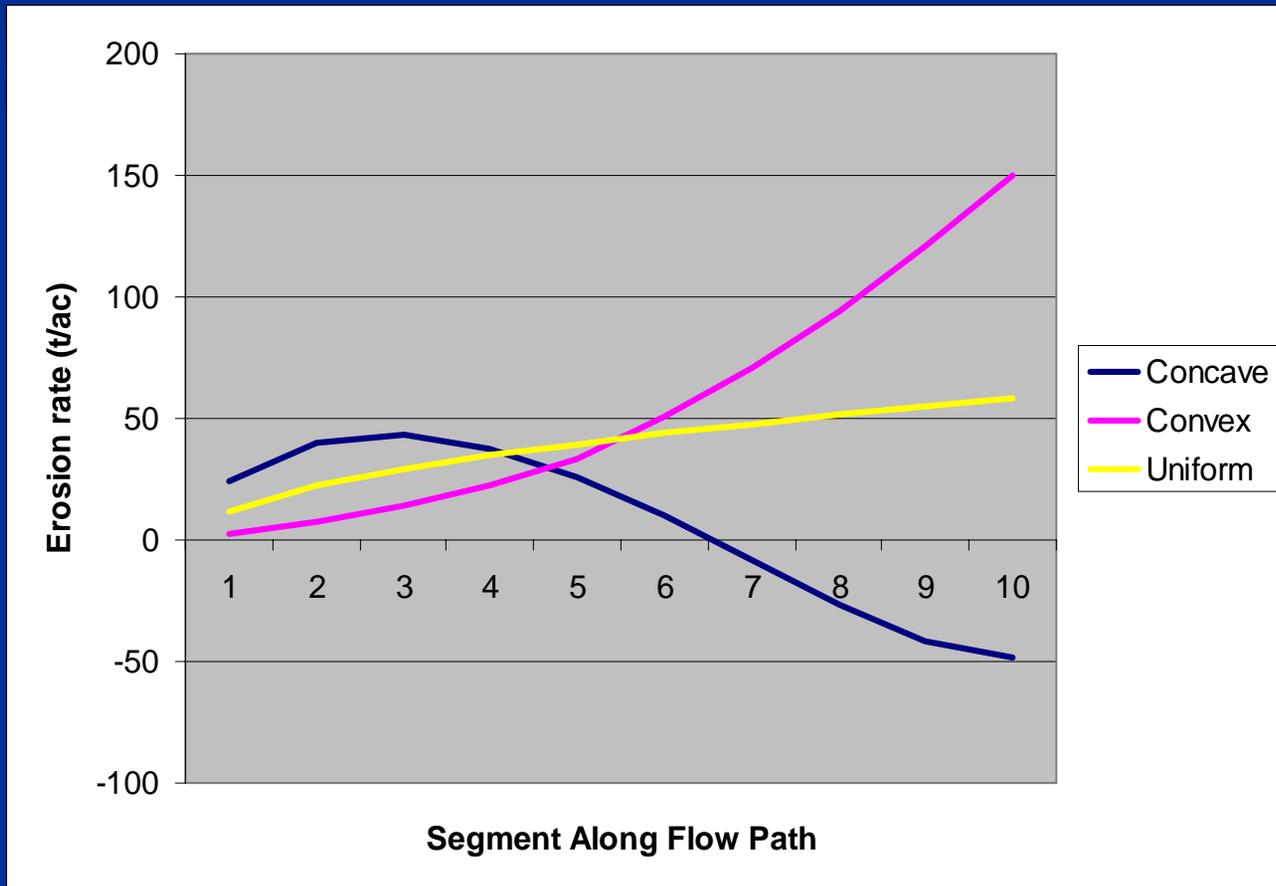
# Interrill Erosion

- Erosion on the areas between the rills, the *interrill areas*, is called **interrill erosion**.

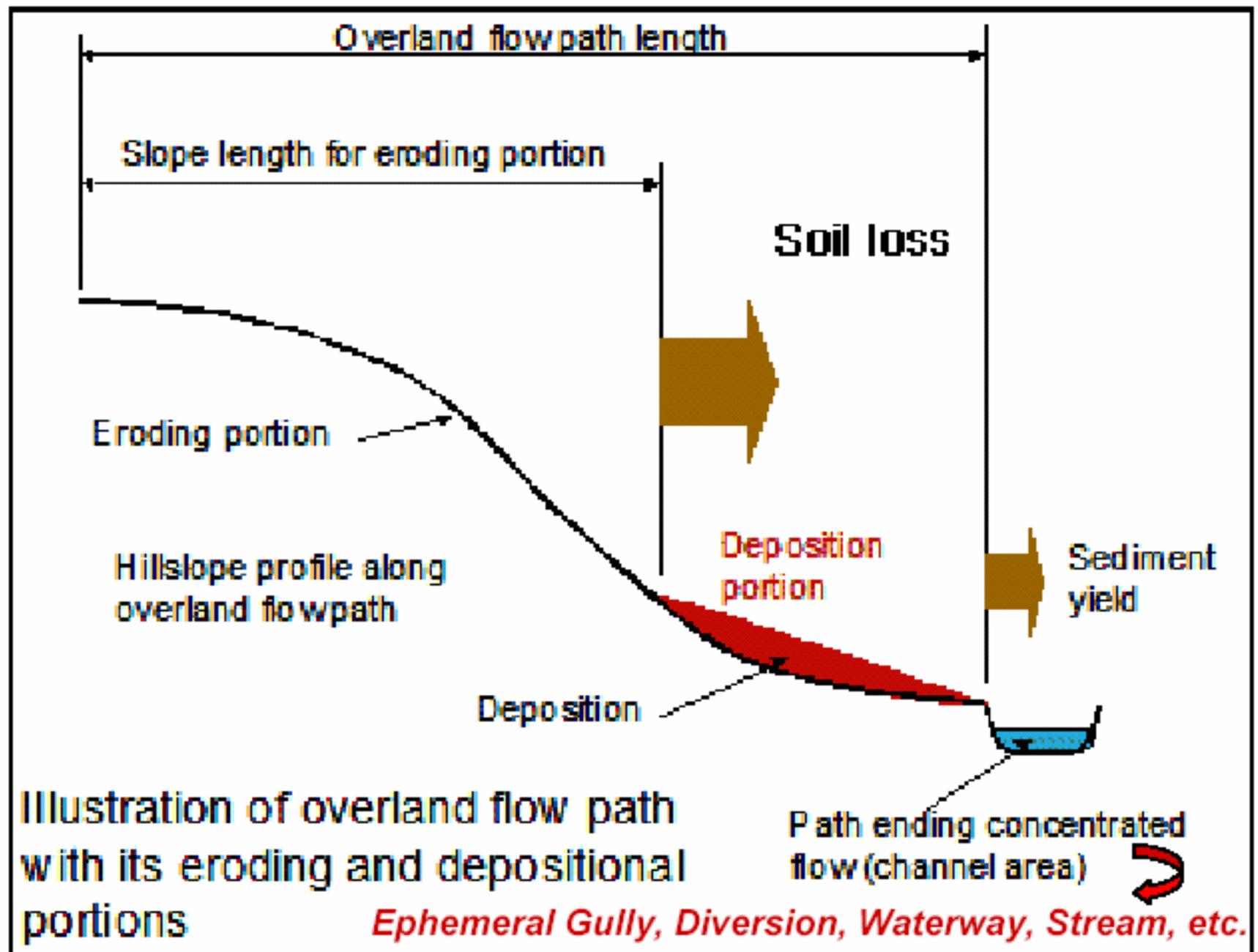


# Effect of Slope Shape on Erosion

100 ft long, 1% to 19% steepness range



# RUSLE(2) Slope Length Ends at Concentrated Flow



# Landscape

Overland flow



Interrill



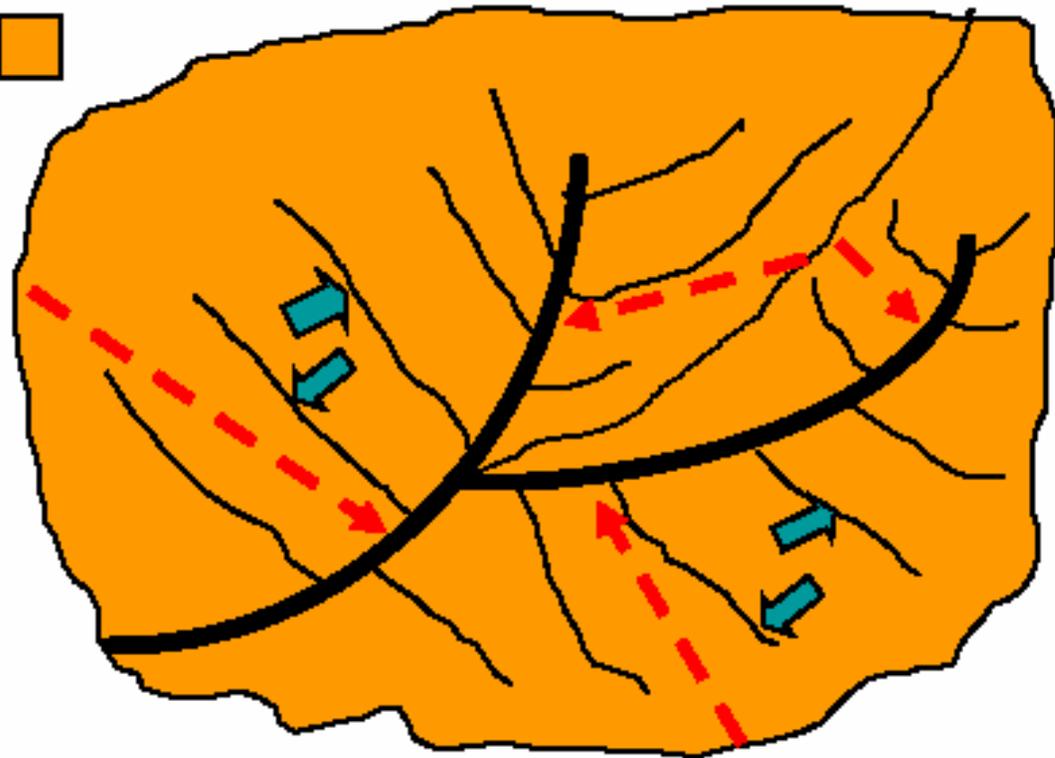
Rill



Ephemeral

Gully

(Concentrated  
flow)



Erosion Types



Rusle2 slope Length

# Critical Slope Lengths

- Critical Slope Length is a determining factor for the **Stripcropping-585 Standard**.
- At long slope lengths, contouring (contour farming, row arrangement, etc) loses its effectiveness. Critical slope lengths are those beyond which contouring is assumed to lose much of its effectiveness.
- Critical slope length increases based on residue cover (typically above 50%)
- Critical slope length is affected by soil hydrologic group (based on shear stress exerted by the runoff on the soil).
- To Find Critical Slope Length in Rusle2: **Must have Contouring specified. Find Critical Slope in the PROFILE view.**

# RUSLE2 Profile View

RUSLE2 Version Sep 22 2003

File Database Edit View Options Window Help

Auto update

Profile: default\*

STEP 1: Choose location to set climate: Location

STEP 2: Choose soil type: Soil

STEP 3: Set slope topography: Slope length (along slope)  Avg. slope steepness, %

STEP 4a: Select base management: Base management

STEP 4b: Modify/build man. sequence if desired:

Management sequence				
Man.	Management	Starting date, m/d/y	Ending date, m/d/y	Correct dates by:
1	...Records/Rotational_Corn-Hay/55%legCorn-5D-5LegumeHay-Manure	5/8/1	9/2/10	==>

STEP 4c: adjust management inputs if desired

Adjust yields  General yield level

Adjust res. burial level

Adjust ext. res. additions

Rock cover, %

Apply rot. builder manag

Save temp. management as perman

STEP 5: Set supporting practices:

Contouring  Actual row grade, %

Strips/barriers

Diversion/terrace, sediment basin

Subsurface drainage

Crit. slope length, ft

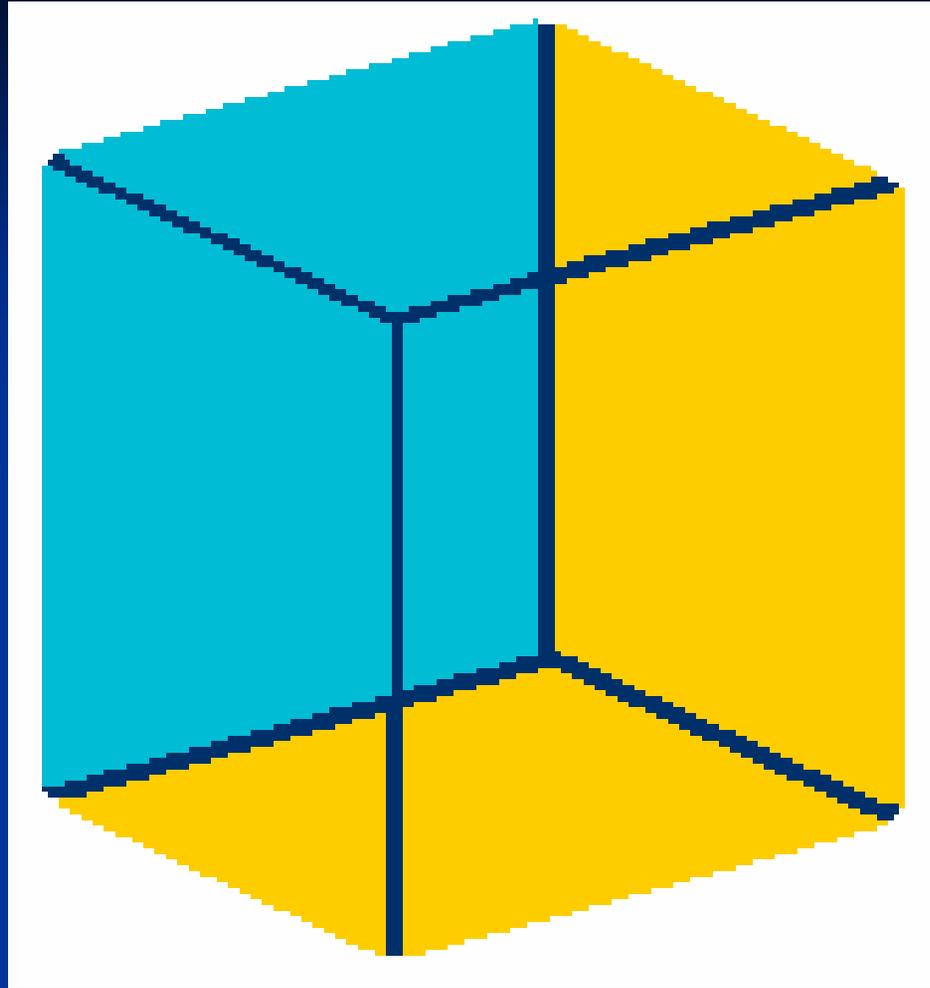
Results Additional Results

Soil loss for cons. plan, t/ac/yr	4.8
T value, t/ac/yr	3.0
Surf. res. cov. values	<input type="text" value="open"/>

Info

Finished calculating

R2\_NRC5\_Sta\_Agron NRC5 simple 101703 moses



**Is the blue on the inner left back or the outer left front?**