GUIDELINES FOR SELECTING THE DOMINANT CRITICAL

AGRONOMY TECHNICAL NOTE NO. IL-3 May 2005

CHOOSING THE PLANNING AREA OF A FIELD

NRCS requires the use of the Revised Universal Soil Loss Equation- Version 2 (RUSLE 2) to estimate sheet and rill erosion rates on fields or on conservation treatment units and to compare erosion rates of alternative treatment systems to a target soil loss tolerance value.

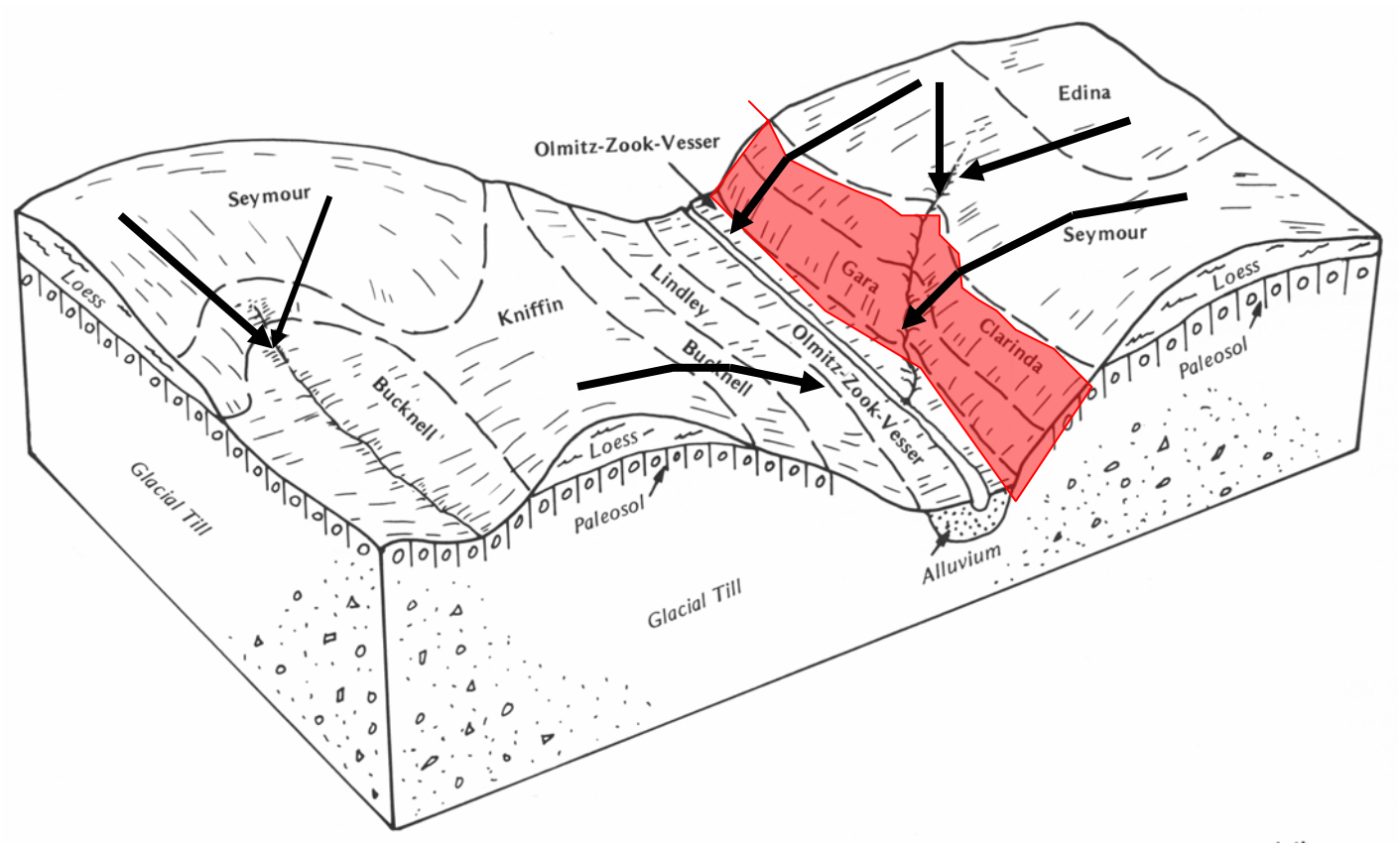
Producers typically desire to farm a whole field to the same cropping sequence (rotation) and residue management (tillage) system. As a consequence, NRCS often plans the treatment for the whole field rather than splitting it into smaller units with different treatments. Whole fields often have areas that are more erosive than the majority of the field. Since these areas are usually not dominant, it would be impractical to plan a treatment system for these areas and apply the system to the whole field. Supporting practices such as terraces, contouring, or contour buffer strips; however, should be planned for specific parts of the field to supplement the crop rotation and tillage system applied to the whole field. Opportunities to split out the severely erosive field portions and develop wildlife or recreation areas with permanent cover should be considered.

Fields rarely are comprised of a single soil map unit with uniform topography. There can be flat, upland, sloping, and bottomland areas all in the same field. Since the erosion rates will differ in each of these landscape areas, the planning decisions need to address the quality criteria or soil loss tolerance "T" value for the eroding areas. It is improper to plan the treatment for the largest common landscape in cases where it is the flattest and least erosive resulting in inadequate treatment of the erosive parts of the field.

Thus, a method is needed to choose a "dominant critical area" of a field for which erosion calculations and conservation treatment alternatives will be based. There are no specific criteria established to decide which slope profiles (Figure 1), in a particular field to select, as there are literally an infinite number of slope profiles in a field. The following guidelines will aid planners in selecting appropriate areas of a field on which to base conservation planning alternatives.

Observe a field from a prominent location. Together with the soil map, mentally divide the field into several landscapes and estimate the size of each or the percentage each comprises of the total field. Once the variation in topography is characterized, the most erosive portions of the field need to be identified. Erosion rate increases as the slope length increases. Since soil loss increases more sharply with small increases in slope percent, the most erosive portions of the field are where the slopes are steeper. Next, take several slope percent and length measurements until judgment determines that a common length and grade is representative of the landscape in question. Techniques to determine percent slope and slope length are described in the next section.

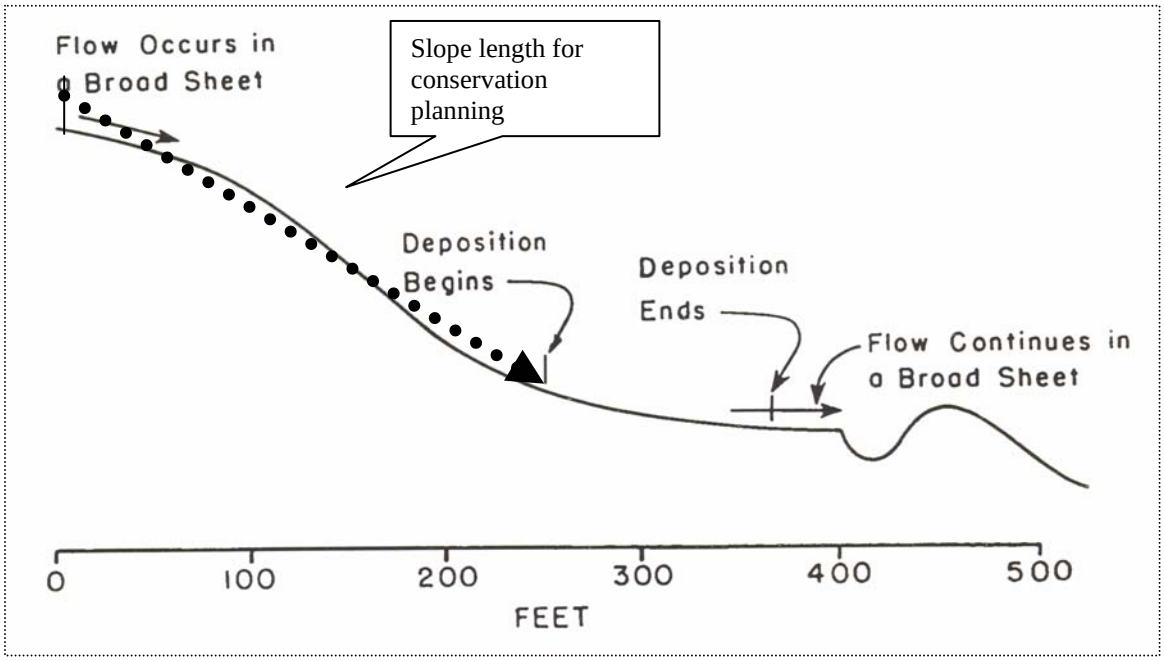
Figure 1. Example selection of a dominant critical area.



Determining slope lengths and grades.

Using RUSLE2 to determine the erosion rates for the sloping areas of the field involves determining slope lengths and grades, best done by an onsite evaluation. The accuracy of most topographic maps is not adequate to determine slope grades or lengths. Slope grades and lengths contained in soils databases are not site specific and may vary considerably from specific sites due to the nature and methods used in making soil surveys

Figure 2. Slope Profile



Determining slope grade

Percent slope is always measured perpendicular to the contour or directly up and down the slope in the direction that gravity forces the water to run. Slope grades can be measured using a hand level, clinometer or Abney level. Typically, the slope is measured using a 50 to 100 foot section in the middle of the slope. A grade rod or another person will be needed to establish "eye height" for the person using a hand level, clinometer or Abney level. When using a hand level, a sighting is made from a measured or paced distance such as 50 or 100 feet up or down from the grade rod or helper and the difference in elevation recorded and converted into percent slope. When using the clinometer or Abney level, the cross hair is lined up with the "eye height" on the distant grade rod or another person and the % slope is read directly.

Determining slope length

Slope lengths for RUSLE2 are measured perpendicular to the contour line starting at the origin of overland flow near the top of the hill slope and terminate at either significant deposition where the slope flattens significantly or at the point where flow concentrates in a larger channel, ephemeral gully or gully. Figures 1, 2, and 3 illustrate the concept of a slope length.

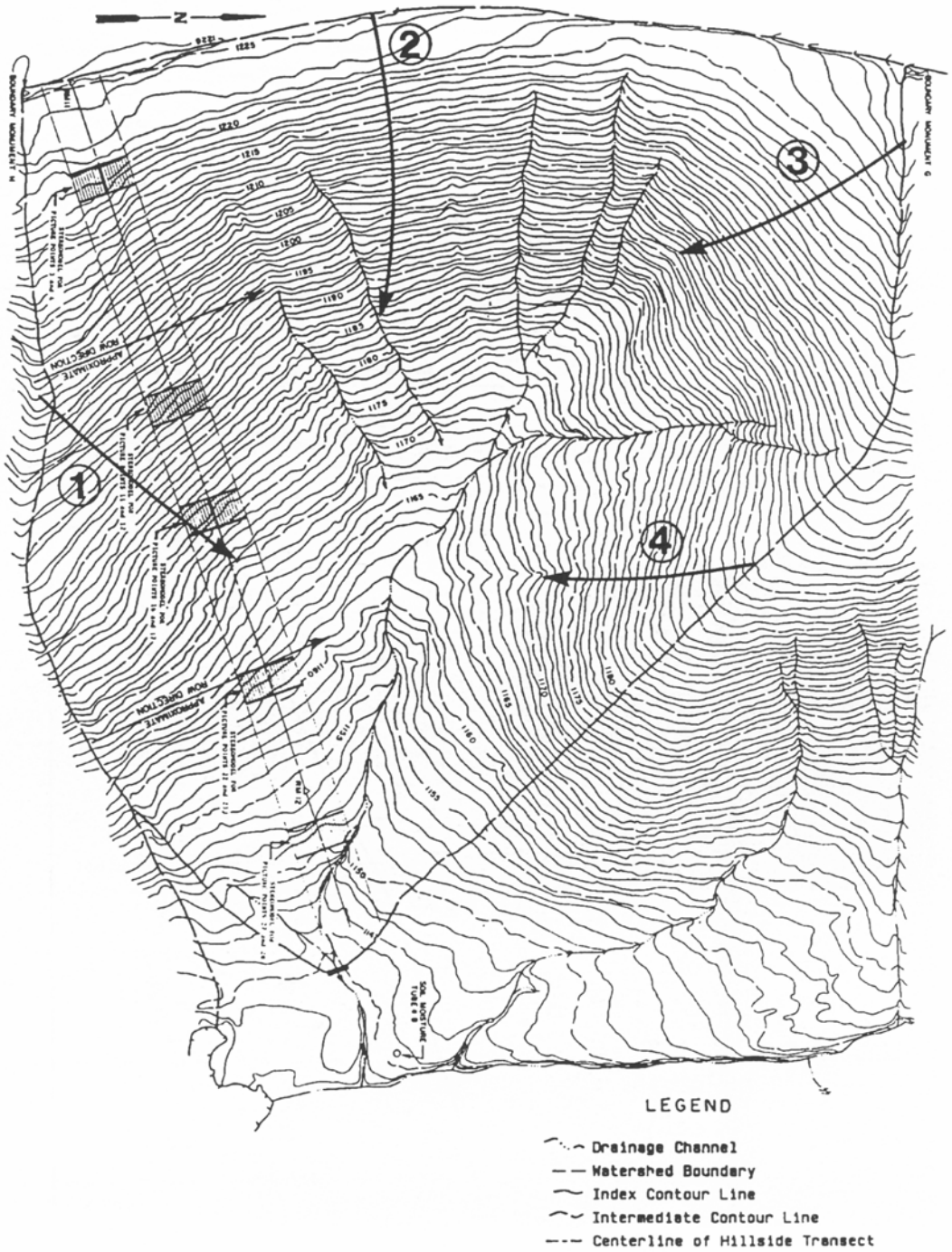
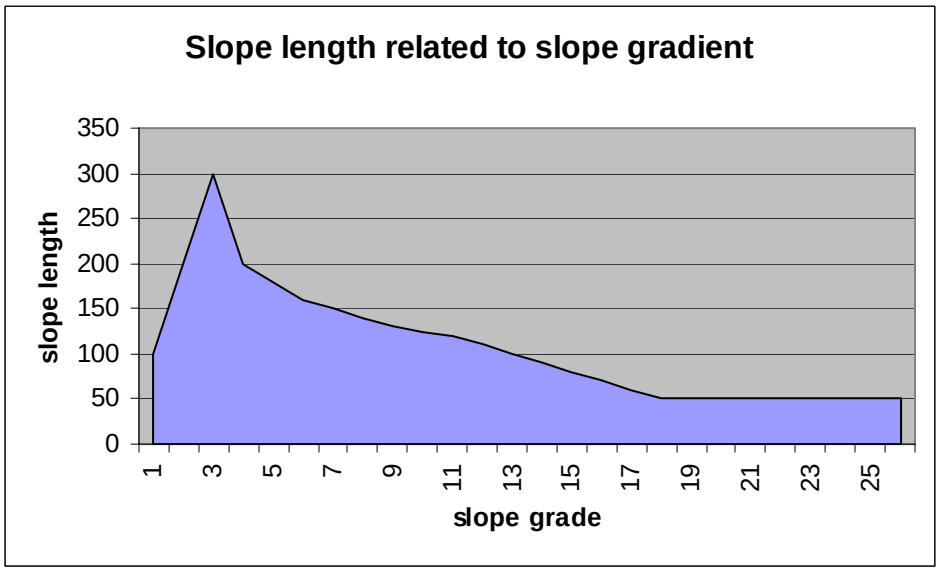


Figure 3. Slopes 2, 3, and 4 end at concentrated flow. Slope 1 ends at deposition.

Slope lengths are generally shorter on low gradients, longer at moderate gradients, and shorter again on steeper gradients (Figure 4). Most slope lengths are less than 250 feet. Slope lengths of 400 feet are rare. The longest plot used for deriving experimental data for RUSLE 2 was approximately 650 feet. Slope lengths longer than 650 feet should not be used in RUSLE 2.

Figure 4. Typical slope length depends on slope gradient.



Flow tends to spread out and be more diffuse at low gradients and tends to become more concentrated at steeper gradients. Concentrated flow channels tend to form higher on the slope as gradients increase, thus slope lengths tend to be shorter since they terminate at these concentrated flow channels rather than at depositional areas. RUSLE 2 currently does not estimate gully or ephemeral gully erosion and is confined to sheet and rill erosion. Thus, slope lengths are restricted to the erosion processes modeled by the program.