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ECOLOGICAL SCIENCE TECHNICAL NOTES - FOR IN SERVICE USE

## TECHNICAL NOTES

U.S.D.A., NATURAL RESOURCES CONSERVATION SERVICE - St. Paul, Minnesota

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**Subject:** ECS – AGRONOMY  
**Series No.:** Agronomy Technical Note No. MN-14

**Effective Date:** Upon Receipt.

**Purpose:** To transmit technical note Agronomy #14: Most Limiting Area for Conservation Planning.

**Filing Instructions:** File this Technical Note in the agronomy section of the MN Technical Notes binder and replace the table of contents. This note can also be found on line in section I of the eFOTG, under Technical Notes & References by Discipline, Agronomy.

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## **Agronomy Tech Note #MN-14 Conservation Planning Most Limiting Area of Significant Extent**

This Technical Note provides guidance on determining the most limiting area of significant extent in a field and how it is to be used during the conservation planning process. To insure that the planned conservation treatment system is adequate for the significant parts of the field or Conservation Management Unit (CMU), the “most limiting area of significant extent” needs to be identified. This is the part of the field that is used to represent the entire field or CMU for the purposes of conservation planning, including soil loss calculations.

When Conservation Planning involves sheet and rill erosion resource problems, NRCS requires the use of the Revised Universal Soil Loss Equation, Version 2 (RUSLE2), or the current erosion prediction model to estimate the erosion rate on the field or conservation treatment unit. RUSLE2 is used to compare erosion rates of alternative treatment systems to the soil loss tolerance (T) value to aid the producer in making sound treatment decisions.

Producers typically farm a whole field to the same cropping sequence (rotation) and residue management (tillage) system so we often plan the treatment for the whole field, rather than splitting the field up into small units with different treatments. Additional supporting practices such as terraces, contouring, nutrient management, contour buffer strips or grass waterways may be planned for specific parts of the field to supplement the crop rotation and tillage system used on the whole field.

Fields rarely are comprised of a single soil map unit with uniform topography. To insure that the planned treatment system is adequate for the significant parts of the field or conservation management unit, the most limiting area of significant extent needs to be identified. This is the area of the field that is used to represent the entire field or CMU for conservation plan development on that field. The sheet and rill erosion estimate (RUSLE2), Soil Conditioning Index (SCI), and Soil Tillage Intensity Rating (STIR) values and planning decisions are to be made based on this “most limiting area of significant extent”.

Planners typically observe the field from a prominent location and together with the soil map, mentally divide the field into several landscapes and make an estimate of the size of each or the percentage each comprises of the total field. Fields typically contain flat upland areas, sloping areas and depositional areas or bottomland areas. Obviously, erosion rates are different in each of these areas with the sloping areas having higher erosion rates. The planning decisions need to address the quality criteria for the most limiting areas of significant extent, which will ensure adequate treatment for the entire field. This is not the average of the characteristics of the field or the worst case scenario.

It is improper to plan the treatment for the largest common landscape in cases where it is the flattest and least erosive if there are other significant sloping areas that will be under treated. Additionally,



planning to average slope or weighted average slope in the field is improper since it also results in areas that are under treated. Some fields may also have a small, insignificant area of the field that is much steeper and more erosive. Such areas are critical or limiting but not of significant extent, and it would be improper to plan the treatment system for this area and apply it to the whole field. This would significantly over treat the field and would be impractical to the producer. Opportunities may exist to split out this area and develop it as a wildlife area with permanent cover, or to apply supporting practices on this area in addition to the cropping and tillage practices planned for the rest of the field. The definition of “significant extend” for these areas is site specific and will depend on the judgment of the planner.

The “most limiting area of significant extent” is best described as the area that is significantly large enough to effect a change in management. This is the area that is used for making soil loss estimates and treatment decisions for the entire field. This is described for making sheet and rill soil loss estimates for conservation planning as the area that represents the highest potential for sheet and rill erosion if it occupies at least 20% of the treatment unit. Otherwise, it is the area that is predominant in the field.

### **Determining slope lengths and grades (percents)**

Using RUSLE2 to make soil loss estimates for the field involves determining slope lengths and percents. This is best done by an onsite evaluation. Several slopes are typically shot until the planner determines what common length and percent slope is representative of the landscape in question. The accuracy of most topographic maps is not adequate to determine percent or length of slope in the office. Slope percentages and lengths contained in soil databases are not site specific and may vary considerably from specific sites due to the nature and methods used in making soil surveys.

### **Determining slope 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 percents can be measured using a hand level, clinometer or Abney level. Another person or a range pole or other device is used to establish the “eye height” at a point on the slope, and is placed at either the top or bottom of the slope, or at points where major slope breaks occur when dealing with slopes having segments with different grades. 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 range pole or helper, and the difference in elevation is 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 range pole or person, and the grade is read directly.

### **Determining slope lengths**

Slope lengths for RUSLEE2 are measured perpendicular to the contour line, starting at the origin of overland flow near the top of the hill slope and terminating at either a) the point where significant deposition begins or b) where flow concentrates into a larger channel or gully. Slopes are generally



shorter on low gradients, longer at moderate gradients and shorter again on steeper gradients. This is due to the fact that 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. RUSLE2 does not estimate gully or ephemeral gully erosion – it is confined to sheet and rill erosion. Thus, slope lengths are restricted to the erosion processes modeled by the program.

### **Estimating Sheet and Rill Erosion for Conservation Planning - Guidelines for Choosing the Length and Percent of Slope**

The following steps will be used when making sheet and rill soil loss estimates for conservation planning purposes:

1. Determine if the field will be divided into more than one Conservation Treatment Unit (CTU). Use no more than 3 CTUs per field.
2. For each CTU, determine the length and percent of slope representing the **highest potential for sheet and rill erosion**. Also determine the **predominant** length and percent of slope for the CTU.
3. Then select one slope length and slope percent per CTU to use for planning purposes. Select the slope length and percent representing the highest potential for sheet and rill erosion if it occupies at least 20% of the treatment unit. Otherwise, select the slope length and percent that is predominant in the field.
4. Select a soil for the part of the field represented by the length and percent of slope you chose to use.
5. Gather additional information required by RUSLE2 to estimate soil losses.
6. Complete the soil loss estimate.