CHAPTER 5

SUPPORT PRACTICE FACTOR (P)

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By definition, the support practice factor (P) in RUSLE is the ratio of soil loss with a specific support practice to the corresponding loss with upslope and downslope tillage. These practices principally affect erosion by modifying the flow pattern, grade, or direction of surface runoff and by reducing the amount and rate of runoff. For cultivated land, the support practices considered include contouring (tillage and planting on or near the contour), stripcropping, terracing, and subsurface drainage. On dryland or rangeland areas, soil disturbing practices oriented on or near the contour that result in storage of moisture and reduction of runoff are also used as support practices.

The support practice factor (P) does not consider improved tillage practices such as no-till and other conservation tillage systems, sod-based crop rotations, fertility treatments, and crop-residue management. Such erosion control practices are considered in the C-factor.

Values for P-factors contained in this chapter were obtained from experimental data, supplemented by analytical experiments involving scientific observations of known cause-and-effect relationships in physically based models such as CREAMS. Recommended factor values are generally rounded to the nearest five-hundredth.

An overall P-factor value is computed as a product of P subfactors for individual support practices, which are typically used in combination. For example, contouring almost always accompanies stripcropping and terraces.

SUPPORT PRACTICE FACTOR FOR CONTOURING

The effect of contour tillage on soil erosion by water is described by the contour P-factor in the Revised Universal Soil Loss Equation (RUSLE). If erosion by flow occurs, a network of small eroded channels or rills develops in the areas of deepest flow. On relatively smooth soil surfaces, the flow pattern is determined by random natural microtopography. When tillage is oriented along the contour, the ridges or oriented roughness will partially or completely redirect the runoff, thereby modifying the flow pattern. When tillage leaves high ridges, runoff stays within the furrows between the ridges, and the flow pattern is completely determined by the tillage marks. High ridges from tillage on the contour cause runoff to flow around the slope, significantly reducing the grade along the flow path and reducng the flow's detachment and transport capacity compared to runoff directly downslope.

When grade is sufficiently flat along the tillage marks, much of the sediment eroded from the ridges separating the furrows is deposited in the furrows. However tillage is seldom exactly on the contour. Runoff collects in the low areas on the landscape and if accumulated water overtops the ridges, then rills and concentrated flow erosion usually occur, especially in recently tilled fields. Runoff from contoured fields is often less than that from fields tilled upslope-

downslope. Contour tillage reduces erosion by reducing both the runoff and the grade along the flow path.

P-factors for RUSLE are based on erosion theory and analyses of experimental data. Data were from three sources: plots, small watersheds, and solutions of equations derived from erosion theory. RUSLE contour P-factors for on-grade conditions are shown in Table 4. The table contains values for very low, low, moderate, high, and very high ridges.

INSTRUCTIONS
FOR
RUSLE P SUBFACTOR VALUES FOR CONTOURING

Step 1. Gather appropriate information.

a) Identify the 10 year storm erosivity (10-yr EI) value for the site. This value has been assigned for each county in the state.

b) Select the Cover-Management Condition using Table 2, "Cover Management Conditions".

c) Select the appropriate ridge height using Table 3. "Guidelines for Selecting Ridge Heights for Contouring with RUSLE".

d) Identify the hydrologic soil group for the selected profile soil.

e) Determine the slope length (L) and slope gradient (S) of the landscape profile, and grade along the furrows or rows.

Step 2. Determine the P subfactor for contouring "on grade."

a) Within the assigned 10-yr EI value, select the appropriate cover-management condition, ridge height, and hydrologic soil group in Table 4, "RUSLE Contour P Subfactor Tables for On Grade Condition".

b) Enter the selected table preceeding across the row for the hydrologic soil group and read the value in the column for the slope steepness. The resulting value is the P subfactor value for contouring "on grade" (0% furrow or row grade).

Step 3. Adjust on grade contouring P subfactor for furrow or row grade.

a) Calculate the ratio of the field's average furrow or row grade to its landscape profile slope (downhill slope) used to describe the field's topographic factor and round to the nearest 0.1. For ratio values less than 0.05 no adjustment is required.

b) For ratio values of 0.05 and larger, go to Table 5, "Contouring P Subfactor Value Adjusted for Furrow Grade."

c) In the far left column of Table 5, locate the on grade contouring subfactor value obtained from step 2 above. If the P subfactor value is an odd number, round up to the nearest even number. On the located row, move right to the column for the appropriate ratio of furrow grade to slope steepness of the landscape profile calculated in Step 3a. This value is the RUSLE P subfactor value for "off grade" contouring.

Example

Step 1. Gather information.

a) For the site near Altus (Jackson Co.), Oklahoma, the 10-yr EI = 120

b) When row cropped, clean tilled cotton is grown, the Cover-management Condition is 6 from Table 2.

c) Ridges and furrows are 3 to 4 inches with cotton that is conventionally (clean) tilled with row cultivation. These are Moderate Ridges from Table 3.

d) Hydrologic soil group B

e) Landscape profile grade = 4%, slope length = 100 feet. Furrow grade = 0.5%.

Step 2. Determine the P subfactor for contouring "on grade."

a) In Table 4, 10-yr Storm EI = 120, and Cover Management Condition 6, select the section for Moderate Ridges (3-4'').

b) Find the row for hydrologic soils group B and the value in the intersected column for 4% slope. Read the P subfactor value of 0.46 for contouring "on grade".

Step 3. Adjust contouring P subfactor for furrow or row grade.

a) The furrow grade/slope grade ratio is calculated as 0.5% / 4% = 0.125 rounded to 0.1.

b) Go to Table 5 for correction to "on grade" contouring P subfactor.

c) Enter Table 5 with the on grade contouring P subfactor value of 0.46 and read across to the furrow grade/slope grade ratio of 0.1. The P subfactor value for "off grade" contouring is 0.63.