PART II

WIND

SECTION A

THE FOLLOWING SECTION CONTAINS INFORMATION NEEDED TO CALCULATE WIND EROSION BY BOTH THE CRITICAL PERIOD METHOD AND THE MANAGEMENT PERIOD METHOD.

I. THE WIND EROSION EQUATION

The wind erosion equation is used to predict soil loss by wind erosion. The equation is expressed symbolically as follows:

$$E = f(\underline{IKCLV})$$

where:

E is the estimated average annual soil loss by wind erosion in tons per acre per year.

f is an indication the equation includes functional relationships that are not straight-line mathematical calculations.

I is the soil erodibility index, is the potential annual wind erosion for a given soil under a given set of field conditions. This factor is expressed as the average annual soil loss in tons per acre per year from a field area that is isolated, unsheltered, wide, bare, smooth, level, loose, and noncrusted, and at a location where the climatic factor is 100.

K is the ridge roughness factor, is a measure of the effect of ridges made by tillage and planting implements. It is expressed as a decimal from 0.5 to 1.0. 1/

C is the climatic factor, characterizes climatic erosivity, specifically windspeed and surface soil moisture. The factor for any given locality is expressed as a percentage of the "C" factor for Garden City, Kansas, which has a value of 100. "C" factors in North Dakota range from 35 to 60.

L is the unsheltered distance along the prevailing wind erosion direction across the field, where no surface creep or saltation occurs and ends at the downwind edge of the area to be evaluated. 1/

V is the vegetative cover factor; considers the kind, amount, and orientation of vegetation on the surface. Vegetative cover is expressed in Flat Small Grain Equivalent (SGe) lbs./acre. 1/

1/ Value assigned is to express expected field conditions during specific time period selected for erosion estimates.

II. DETERMINING THE WIND EROSION PERIOD

The wind erosion management period is the time of year when the greatest amount of wind erosion would be expected to occur from the unprotected (unsheltered, smooth, bare, wide, loose, or noncrusted) field and the highest occurrence of erosive winds. It is best understood as the occurrence of a set of conditions which include expected windstorm occurrence and the vulnerability of unprotected field surfaces to windstorm events.

III. DETERMINING FACTOR VALUES FOR THE WIND EROSION EQUATION

"I" is obtained from Section II of the FOTG, Cropland Interpretations. Adjustments can be made for knolls using Table 2, Page C-5, Erosion Prediction, Part II, Section C.

"K" is obtained from Table 1, Page C-4, Erosion Prediction, Part II, Section C, when actual field conditions are unknown, or from Table 3, Pages C-6 C-7, or C-8, Erosion Prediction, Part II, Section C, when actual field conditions are known.

"C" is obtained from Figure 1, Page C-1, Erosion Prediction, Part II, Section C.

"L" is measured along the prevailing wind direction beginning at a stable area, where no surface creep or saltation occurs and ends at the downwind edge of the area to be evaluated. See Table 1, Page A-5, Erosion Prediction, Part II, Section A, and Figure 2, Page C-2, Erosion Prediction, Part II, Section C.

"V" is obtained from calculations and converted to flat small grain equivalent (SGe) from Chart 1, Flat Small Grain Equivalents, Pages C-19 to C-52, Erosion Prediction, Part II, Section C.

A. SOIL ERODIBILITY FACTOR "I"

For conservation planning purposes, named soils are assigned an "I" value and an Wind Erodibility Group (WEG). The "I" value for named soils within each county is found in the FOTG, Section II, Cropland Interpretations. The "I" value is obtained from the pages labeled "Cropland Interpretations for Erosion Prediction" (located in the header of each page). If the "I" factor is not known, contact the area agronomist or area resource soil scientist to determine the WEG and "I" value from the surface texture.

When considering I, the soil erodibility index, the following conditions apply:

* Isolated - Saltating soil particles are not entering the field.

* Unsheltered - Barriers are not present.

* Wide - The distance at which the flow of eroding soil reaches its maximum and does not increase with increased field size.

* Bare - Vegetative cover is not present.

* Smooth - Patterned ridge roughness is not present.

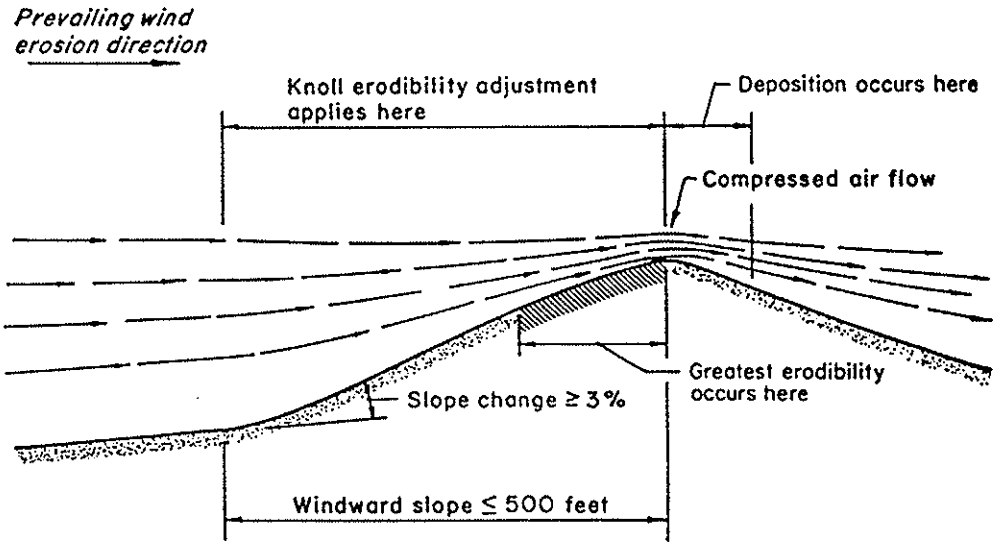
* Level - Knolls are not present.

* Noncrusted - Soil aggregates on the soil surface are not bound together and the soil surface is not sealed.

B. ADJUSTING "I" VALUE ON KNOLLS

Adjustments should be made to the Soil Erodibility Index "I" on windward facing knolls where the windward facing slope is less than 500 feet long and the increase in slope gradient from adjacent landscape is 3 percent or greater. Both slope length and slope gradient change are determined along the direction of the prevailing erosive wind. The adjustment should be completed if the planner determines the knoll will have a significant effect on the site.

The remainder of the field downwind from a knoll may have increased erosion due to the knoll effect. No method has been developed to estimate the increased amount of erosion on that portion of the field (See diagram below).



Contact the area agronomist if you need further assistance on how to use the knoll erodibility adjustment for wind erosion.

Table 2, Page C-5, Erosion Prediction, Part II, Section C, contains knoll erodibility adjustment factors for the Soil Erodibility Index "I." The "I" value for the Wind Erodibility Group is multiplied by the factor shown in Column A. This adjustment expresses the average increase in erodibility along the knoll slope.

C. RIDGE ROUGHNESS FACTOR "K"

"K" is a measure of the effect of ridges made by tillage and planting implements. Ridges absorb and deflect wind energy and trap moving soil particles. Too much roughness, however, causes turbulence which may accelerate particle movement. Use Table 3, Pages C-6 to C-8, Erosion Prediction, Part II, Section C, to determine ridge roughness "K" factor when actual field conditions are known.

D. CLIMATIC FACTOR "C"

The Climatic Factor is based on the average wind velocity and the precipitation-evaporation index for that location based on official weather records. Use annual "C" from Figure 1, Page C-1, Erosion Prediction, Part II, Section C.

E. UNSHELTERED DISTANCE "L"

The "L" factor represents the unsheltered distance along the prevailing wind erosion direction for the field or area to be evaluated. "L" begins at a point upwind where no saltation or surface creep occurs and ends at the downwind edge of the area being evaluated (Refer to the National Agronomy Manual, Subpart D - WEQ Factors, part 502.34(a)(1), Page 502-25). To be considered a stable area, the area should be capable of trapping and storing any expected saltation, and surface creep originating upwind should be a minimum of 12-1/2 feet wide. The annual prevailing wind erosion direction is shown in Figure 2, Page C-2, Erosion Prediction, Part II, Section C.

Field direction factors make it possible to convert back and forth from "L" to actual field widths in various directions. To select the correct wind erosion direction factor from Table 1, Page A-5, Erosion Prediction, Part II, Section A, the angle of deviation between the prevailing wind erosion direction and a line perpendicular to the long side of the field or strip must be determined. The angle of deviation for north to south or east to west fields is on Figure 2, Page C-2, Erosion Prediction, Part II, Section C.

To determine "L", multiply the wind erosion direction factor from Table 1, Page A-5, Erosion Prediction, Part II, Section A , by the field width, or measure the actual distance of the field along the prevailing wind erosion direction across the field in the direction of the prevailing wind. If the conversion factor is used, "L" cannot exceed the longest possible measured distance across the field (refer to the National Agronomy Manual, Page 502-28, part 502.34(d)(1).

If you want to convert "L" to an actual field width, divide the "L" by the appropriate direction factor (dependent on the field's angle of deviation.)

TABLE 1

WIND EROSION DIRECTION FACTOR	
ANGLE OF DEVIATION	DIRECTION FACTOR
0.0°	1.00
22.5°	1.08
45.0°	1.41
67.5°	2.61
90.0°	"L" = Length of field

Barriers

If a barrier is present, subtract 10 times the height of the barrier from the calculated or measured "L" to determine the distance to use in the equation for "L." A barrier can be a row of trees, a perennial planted grass barrier, or an annually planted crop barrier (12-1/2 feet width is not needed to function as a barrier.)

F. VEGETATIVE COVER FACTOR "V"

The vegetative Cover Factor "V" combines three conditions:

1. The kind of residue.

2. The quantity of residue.

3. The orientation of the residue.

The "V" value is expressed as a flat small grain equivalent in pounds/acre. Because of the nature of the wind erosion equation, it is necessary to relate the effectiveness of any particular type and orientation of crop residue to the equivalent effectiveness of flat small grain residue (refer to the appropriate Chart 1, Pages C-19 to C-52, Erosion Prediction, Part II, Section C.)