MIDWEST
NATIONAL
TECHNICAL
CENTER

TECHNICAL NOTE

Subject: ECOL SCI - FORESTRY

Series No.: 190-LI-3

Reference: EXAMPLES OF METHODS OF CONTROLLING WIND EROSION ON A GIVEN FIELD WITH AND WITHOUT WINDBREAKS AND WIND BARRIERS

Date: JANUARY 1983

DIST:
N (GERALD M. DARBY, ES; ROBERT E. HARTUNG, ES)
T
S (4 COPIES EACH)

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

NOTE:

This technical note is a followup to MNTC Technical Note Ecological Sciences 190-LI-2, Determining the Effect of Field Windbreaks and Wind Barriers on Wind Erosion (Soil Blowing) on a Given Field, January 1983. Technical Note MNTC 190-LI-2 should be reviewed prior to reading MNTC 190-LI-3.

EXAMPLES OF METHODS OF CONTROLLING WIND EROSION ON A GIVEN FIELD WITH AND WITHOUT WINDBREAKS AND WIND BARRIERS

Where low residue crops are grown on soils with a severe wind erosion potential, field windbreaks or wind barriers have often been the only measure used for wind erosion control. Their use in conjunction with other wind erosion control methods is generally poorly understood. Also, the results of using field windbreaks or wind barriers are rarely compared to other alternatives.

Figure 1 presents nine different alternatives where the various wind erosion control methods can be used alone or in combination to keep potential soil losses within T for a 160 acre field. The Existing Situation illustrates the basic field with an I of 86, K of 1, C of 30 and V of 500 pounds. The prevailing erosive wind direction is due north (0°) and the water erosion losses are insignificant.

NOTE:

The nine alternatives illustrated in Figures 1 and 2 do not represent all the wind erosion control practices that can be used alone or in conjunction to obtain the desired results. These are presented to stimulate the thought processes to consider all possible practices and combinations of practices that could be used on a given field.

Figure 1. BASIC INFORMATION FOR THE EXISTING SIUTATION AND ALTERNATIVES 1 THROUGH 9.

Field Size = 160 Acres

I 2/ = 86 (WEG 3, 4, 4L)

K 2/ = 1

C 2/ = 30

V 2/ = 500 Pounds 1/

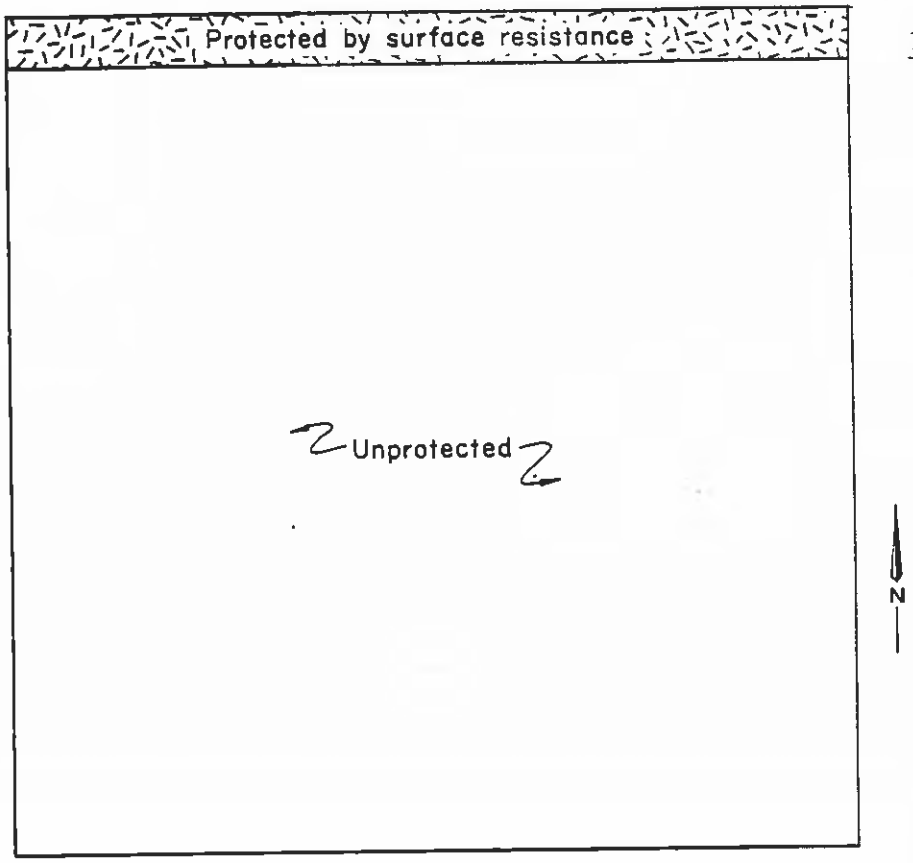
Water erosion losses are insignificant.

Prevailing erosive wind direction is due north or 0°.

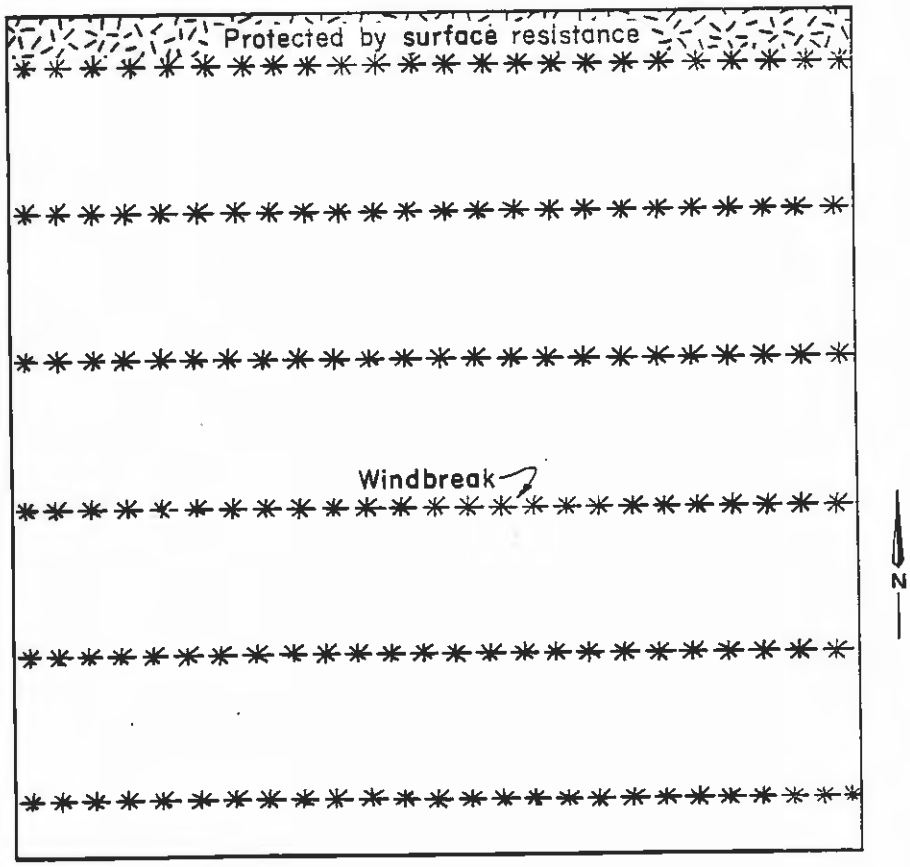
Five Tons per acre per year is the allowable soil loss to wind and water erosion.

1/ Flat small grain equivalent--could be any crop with residue amounts equivalent to 500 pounds per acre of flat small grain residue.

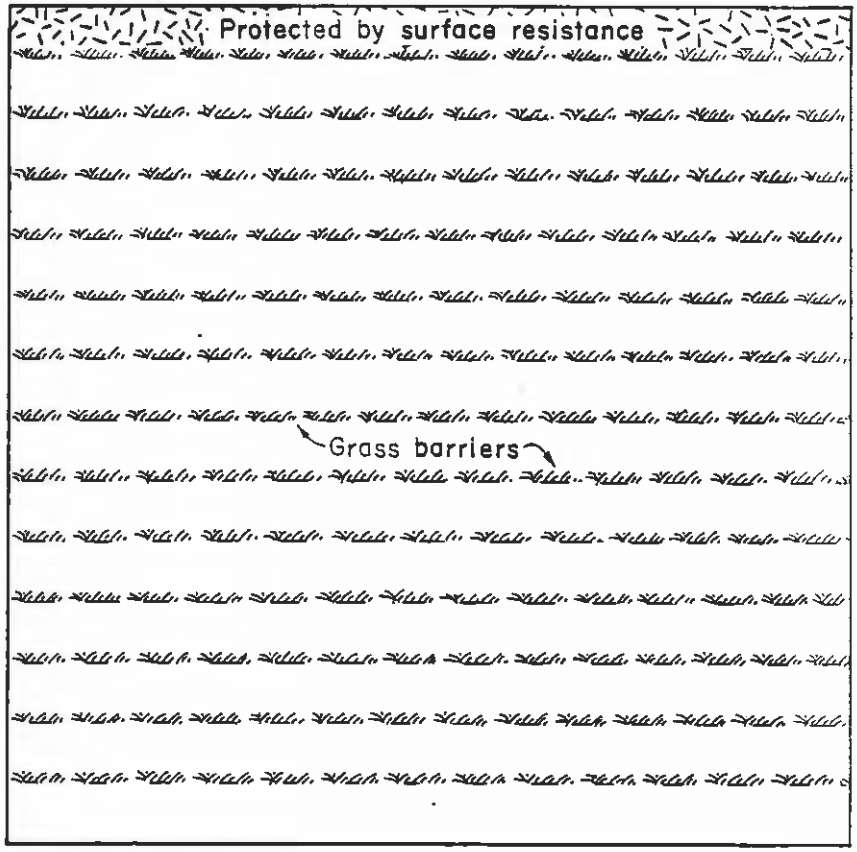
2/ Factors of the wind erosion equation.



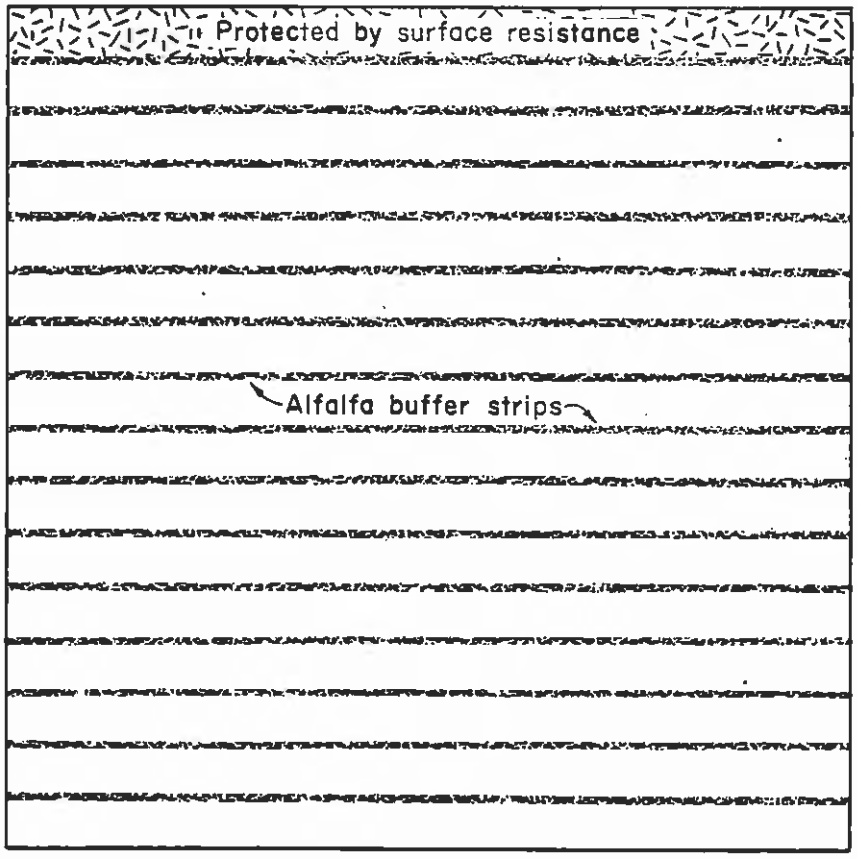
Existing Situation. Basic field with no windbreaks, strips, buffers or barriers. Field width protected by 500 lbs./ac. of residue--160 ft. Soil loss on the remainder of the field averages approximately 15T/Ac./Yr. It would take approximately 1,000 lbs./ac. of residue to protect this field without any additional practices.



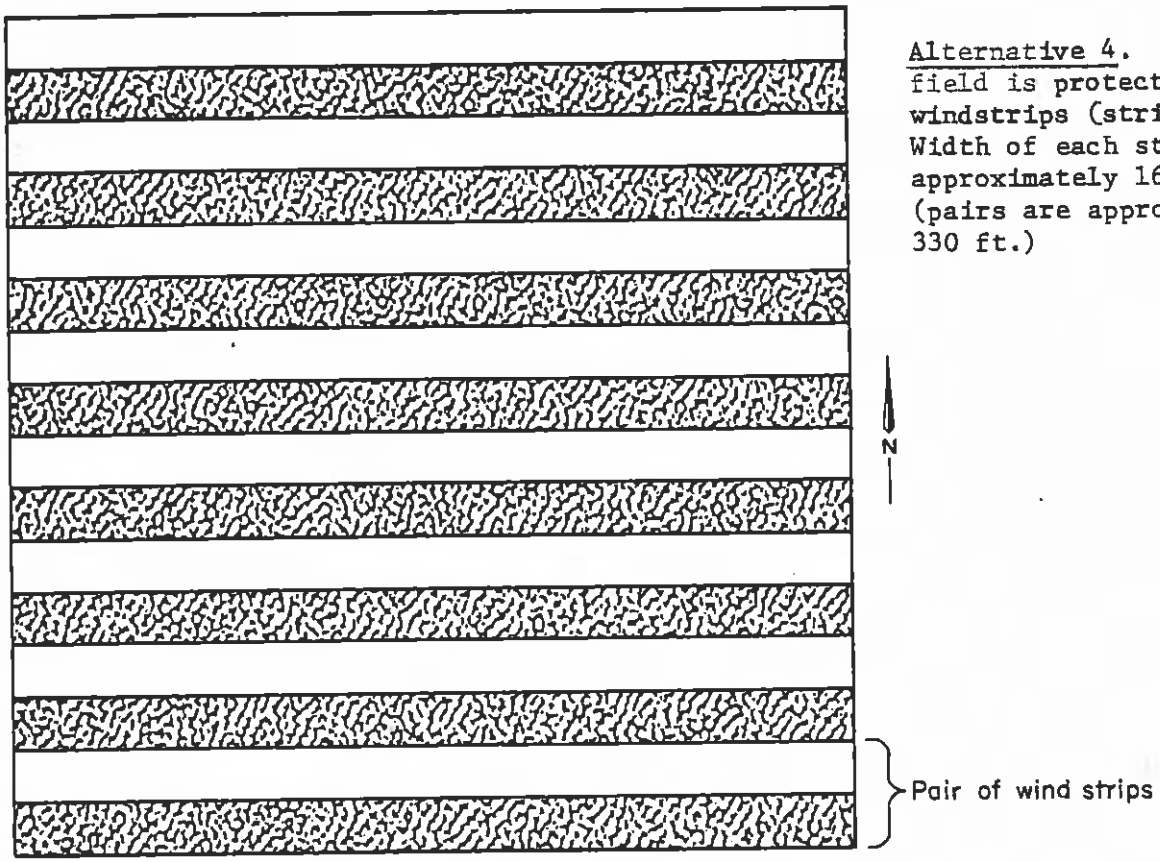
Alternative 1. Entire field is protected with six 30 ft. high windbreaks spaced at approximately 460 feet apart (10H + 160). Soil loss within 5T/Ac./Yr. over the entire field.



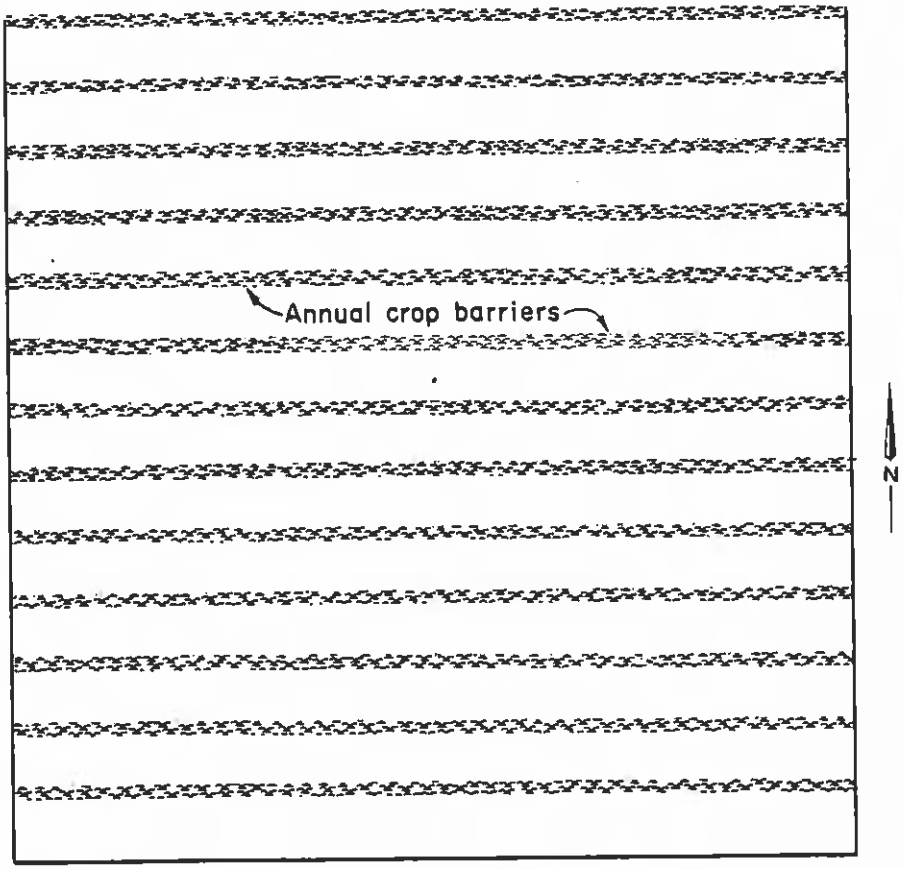
Alternative 2. Entire field is protected by 13 perennial grass barriers 3½ ft. high and 3½ ft. wide. Spacing interval between barriers is approximately 195 ft. (10H + 160).



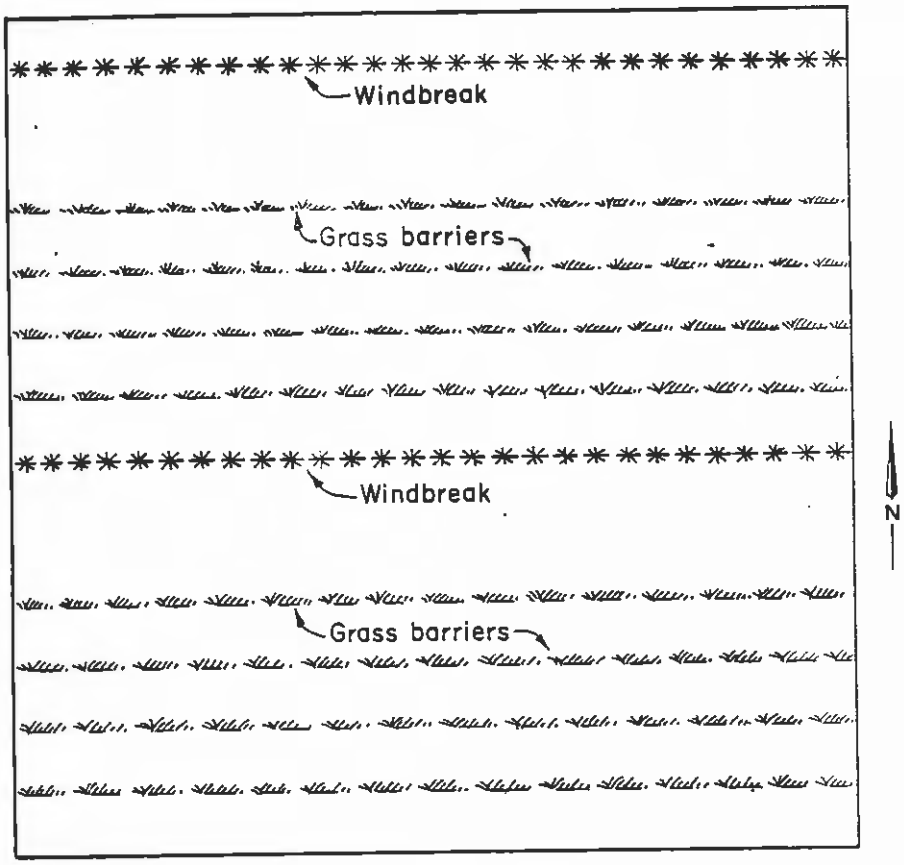
Alternative 3. Entire field is protected by 15 alfalfa buffer strips (minimum of 12 ft. wide). Spacing interval between buffer strips is 172 ft. (160 + 12).



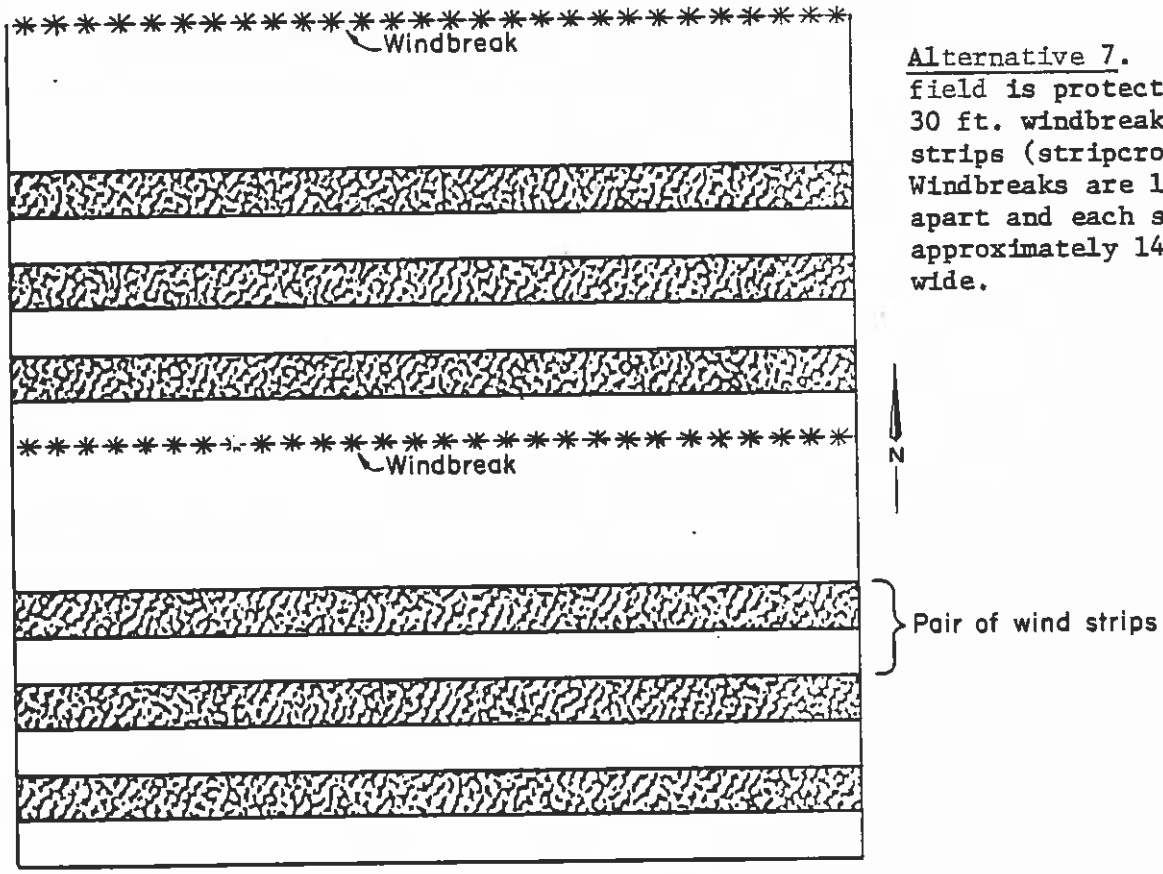
Alternative 4. Entire field is protected by 16 windstrips (stripcropping). Width of each strip is approximately 165 ft. (pairs are approximately 330 ft.)



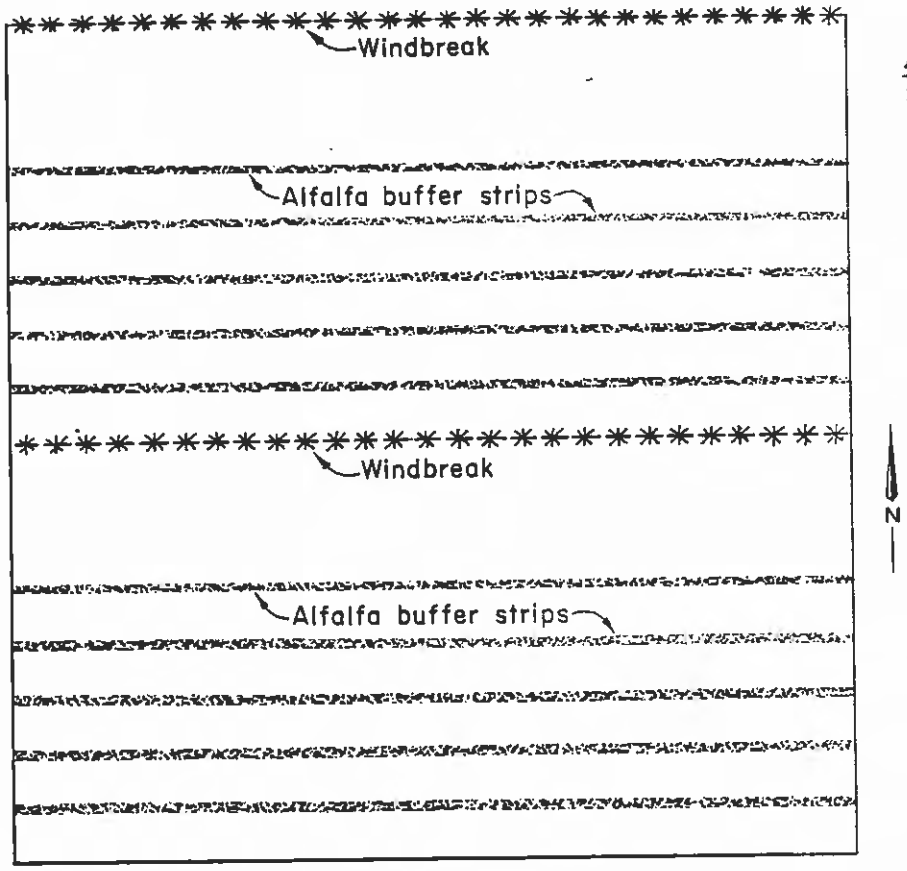
Alternative 5. Entire field is protected by 13 (4 ft. high) annual crop barriers. Spacing interval is approximately 200 ft. (10H + 160). Width of annual crop (corn) barrier is approximately 12 ft. (minimum).



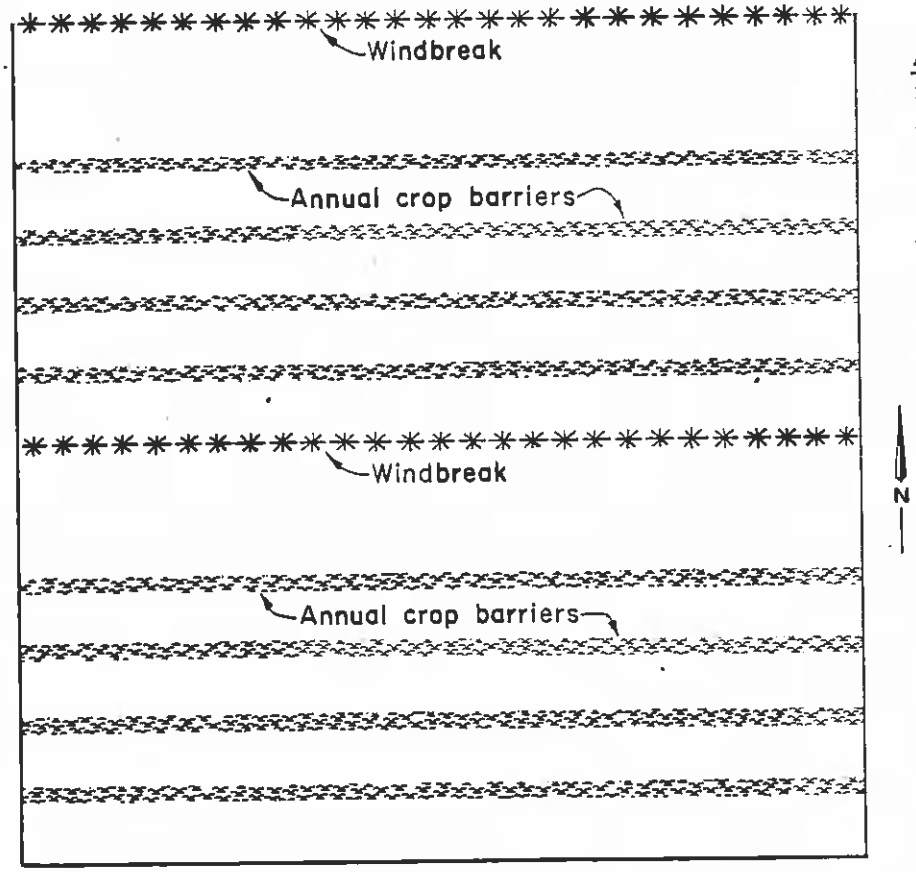
Alternative 6. Entire field is protected (within allowable loss) by two 30 ft. windbreaks and eight 3½ ft. high and 3½ ft. wide perennial grass barriers. Windbreaks are 1,240 ft. apart; grass barriers approximately 195 ft. apart (10H + 160).



Alternative 7. Entire field is protected by two 30 ft. windbreaks and 12 strips (stripcropping). Windbreaks are 1,320 ft. apart and each strip is approximately 143 feet wide.



Alternative 8. Entire field is protected by two 30 ft. windbreaks and ten 12 ft. (minimum) alfalfa buffer strips. Windbreaks are 1,320 feet apart. Buffer strips are approximately 172 feet apart (160 + 12).



Alternative 9. Entire field is protected by two 30 ft. windbreaks and eight 4 ft. high annual crop barriers (12 ft. wide strips of corn). Windbreaks are 1,320 ft. apart. Annual crop barriers are approximately 215 ft. apart (10H + 163 + 12).

Figure 2.

	Land out of Production due to Acres of Field In:						Acres of Field Protected By: 1/					
	Windbreaks (Acres) 2/	Perennial Grass Barriers (Acres)	Strip Cropping	Buffer Strips	Annual Crop Barriers	Total Acres	Windbreaks	Perennial Grass Barriers	Strip Cropping	Buffer Strips	Annual Crop Barriers	Surface Resistance
Existing Situation	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10
Alternatives												
1-Windbreaks only	6	NA 7/	NA	NA	NA	6	102	NA	NA	NA	NA	58
2-Grass barriers only	NA	2.8	NA	NA	NA	2.8	NA	28	NA	NA	NA	132
3-Buffer strips only	NA	NA	NA	0	NA	0	NA	NA	NA	11	NA	149
4-Strip cropping only	NA	NA	0	NA	NA	0	NA	NA	80 3/	NA	NA	80 4/
5-Annual barriers only	NA	NA	NA	NA	0	0	NA	NA	NA	NA	41 6/	119
6-Windbreaks & grass barriers	2	1.7	NA	NA	NA	3.7	36	17	NA	NA	NA	107
7-Windbreaks & strip cropping	2	NA	0	NA	NA	2	36	NA	104	NA	NA	20
8-Windbreaks & buffer strips	2	NA	NA	0	NA	2	36	NA	NA	7	NA	117
9-Windbreaks & annual barriers	2	NA	NA	NA	0	2	36	NA	NA	NA	25 5/	99

1/ All figures rounded except Grass Barriers.
2/ Single Row Field Windbreak 16.5 ft. wide
3/ Growing Crop Strips
4/ Fallow Strips
5/ Includes 6 ac. of land in annual crop.
6/ Includes 9 ac. of land in annual crop.
7/ NA--practice does not apply to situation or alternative

Figure 2 compares the various alternatives. A wide variety of useful information can be obtained from this table. For instance, perennial grass barriers can take as much land out of production as windbreaks, annual crop barriers can take up to three or more times as much space as windbreaks and perennial grass barriers, and narrow buffer strips composed of alfalfa or another hay crop can be very effective in controlling wind erosion. Small numbers of windbreaks, when used with other practices, can provide landowners with a wide variety of crop options that would not normally be available. Essentially the low residue crops could be grown in the protected zone provided by the windbreaks. Higher residue crops in conjunction with other practices could be grown on the remainder of the field.

It becomes evident, that in situations where adequate crop residues are not available to control wind erosion, it will be necessary to subdivide the field by using a variety of crops and/or wind erosion control practices. Therefore, it is best to use a systems approach to the solving of wind erosion problems. All of the wind erosion control practices that can be used in an area should be considered. Their use as a sole means of soil protection or in possible connection with other practices should be evaluated. If this approach is used, an effective wind erosion control system can be designed to fit any situation.

DAVID L. HINTZ
National Windbreak Forester
Midwest National Technical Center