Prediction A wind erosion equation similar to the USLE summarizes the major factors important to wind erosion:

$$E = f(I, C, K, L, V) \qquad (10)$$

Equation 10 is solved both numerically and graphically, though its complete solution is not considered here. Briefly, the equation states that the potential average annual soil erosion, E, is a function of I, soil erodibility; C, local wind erosion climatic factor; K, soil surface roughness; L, unprotected width of field; and V, equivalent quantity of vegetative cover.

Soil erodibility (I) depends on the percentage of soil greater than 0.84 mm diameter. The local climatic factor (C) is the product of the average wind velocity and the average moisture of the soil surface. Moist soil moves less easily because it is heavier than dry soil, and soil particles cohere when moist. Soil

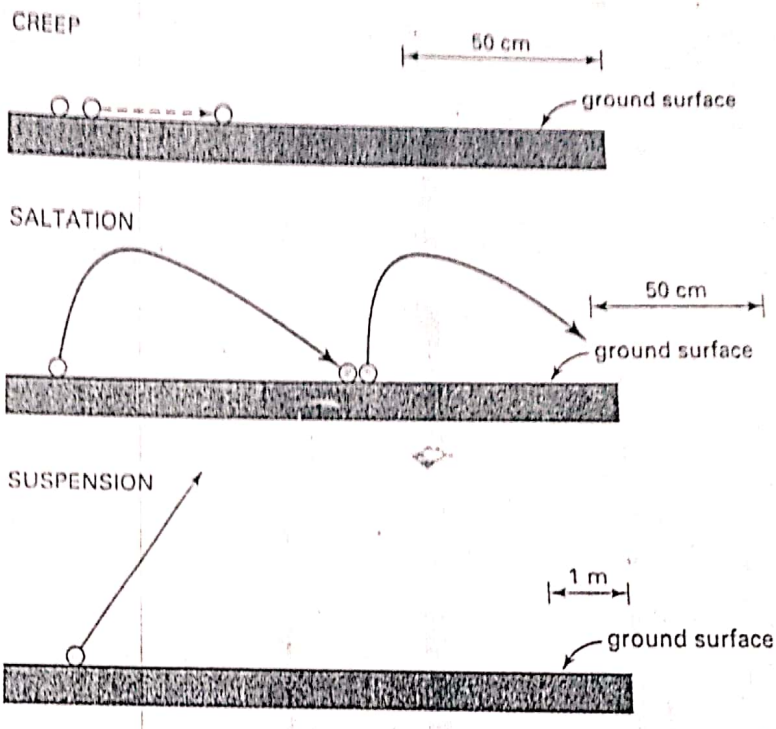

FIGURE 15–6 Wind moves soil particles by creep, saltation, and suspension. Suspension attracts attention because it lifts small particles high into the air and carries them long distances. However, most particles are moved by saltation.

surface roughness (K) is expressed in height of ridges. More roughness (either more or higher ridges) increases the soil's resistance to wind erosion. The unprotected width of the field (L) is the mathematical difference between the total distance along the prevailing wind erosion direction across a field (D_T) and the protected distance along the prevailing wind erosion direction (D_P):

$$L = D_T - D_P \tag{11}$$

Protection is by a wind barrier such as a windbreak. The quantity, kind, and orientation of the vegetative cover are combined into a single vegetative cover factor (V).

Note that Equation 10 states that $E = f$, a function of these parameters. It is not strictly equal to the mathematical product of the factors. The solution of the equation requires graphical methods.

Mass wasting is often spectacular (Figure 15–7), but it moves much less soil than the amount moved annually by wind and water.

Types of mass wasting Various attempts have been made to describe or classify kinds of mass wasting by means of the direction or speed of soil movement. **Falls** occur when gravity pulls a part of a cliff or steep hillside vertically downward. **Rotational slides** or **slumps** actually rotate around a point in the center of the slump (Figure 15–8). A **compound slide** is a combination of a fall and a rotational slide, and a **transitional slide** occurs when a break causes a mass to slide along the face of the supporting mass. **Debris flows** and **avalanches** are instantaneous, whereas creep and **earth flows** are slow. *Slow* is a relative term, because earth flows may move rapidly once they get started. But usually they move a short distance and stop before moving again.

Wind Erosion Equation :-

A wind erosion prediction equation (WEQ) has been in use since the late 1960s.

$$E = f(ICKLV)$$

The predicted wind erosion E is a function f of :-

I = Soil erodibility factor
C = climate factor
K = Soil ridge - roughness factor
L = width of field factor
V = vegetative cover factor
E = the estimated average annual soil loss (Mg/ha - year)

The WEQ involves the major factors that determine the severity of the erosion, but it also considers how these factors interact with each other.

Soil Erodibility factor or index I :-

The above factors are not independent, but must be combined to estimate wind erosion. The wind erodibility I is a function of the soil aggregates greater than 0.84 mm in diameter.

Surface crusting caused by melting & drying will reduce erosion for most soils but should not be considered when making annual estimates.

Erodibility can be decreased by increasing the amount of clods on the soil surface. This can be accomplished on some soils by timely tillage. Soil erodibility factor I relates to the properties

of the soil & the degree of slope of the site.
Soil ridge roughness factor:- K takes into consideration the cloddiness of the soil surface, vegetative cover V, & ridges on the soil surface. The roughness factor K is a measure of the effect of ridge made by tillage & planting implements ~~on erosion rate~~. Ridges absorb & deflect wind energy, & trap moving soil particles. Too much roughness, however, causes turbulance which may accelerate particle movement.

Climatic factor C:- It involves wind velocity, soil temperature, & percipitation. The climatic factor is an index of climatic erosivity, which includes the wind speed & the soil surface moisture. ~~It is expressed as a percentage of the C factor for Garden city, Kansas.~~

width of field factor or Unsheltered distance L:-
L is the width of field in downwaed direction. Naturally, the width changes as the direction of the wind changes, so the prevailing wind direction is generally used. The L factor represents the unsheltered distance in meters along the prevailing wind erosion direction for the field or area to be evaluated. This distance is the length from a sheltered edge of a field, parallel to the direction of prevailing wind, to the end of the unsheltered field.

vegetative Cover factor V:- V relates not only to the degree of the soil surface covered with residues but to the nature of the cover — whether it is living or dead, still standing or flat on the ground. The effect of vegetative cover in the wind erosion equation is expressed by relating the kind, amount & orientation of vegetative material to its equivalent of small grain residue

Revised wind Erosion Equation (RWEQ):-

A revised, more complex, & more accurate computer-based prediction model has been developed. It is still an imprical model based on many years of research to characterize the relationship between observable conditions & resulting wind erosion severity

~~Model factor~~

~~Model factor~~

Soil loss Estimation:- Soil loss due to wind erosion can be predicted by a numerical equation combining the factors influencing wind erosion. As in the case of water erosion, the soil loss due to wind erosion can be estimated with the equation

$$E = I \times R \times K \times F \times C \times W \times D \times B$$

where E = Soil loss per unit area

I = Soil clodiness factor

R = Surface cover factor

K = Surface roughness factor

F = Soil textural class factor

C = Local wind factor
W = Field width factor
D = wind direction factor &
B = wind barrier factor

Studies using wind tunnel is useful in studying wind erosion phenomenon & to establish required relations for use in the equation for estimating soil loss by wind.

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3) Schwab, G. O., Delmar D. F., William J. E., and Richard K. F., 2002. Soil & water conservation engineering. John Wiley & sons, Inc., chapter # 6, page # 114-121

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Erodibility can be led by Tiny amount of clods on the soil surface (by tillage)

Wind Erosion Equation:-

A wind erosion ~~eq~~ prediction equation (WEQ) has been in use since the late 1960s.

$$E = f(ICKLV)$$

The predicted wind erosion E is function (f) of

I = Soil erodibility factor
C = climate factor
K = Soil - ridge - roughness factor
L = width of field factor
V = vegetative cover factor
E = the estimated average annual soil loss in Mg/ha/year.

"The ~~WQE~~ WEQ involves the major factors that determines the severity of erosion, but it also considers how these factors interact with each other.

I :- The above factors are not independent but must be combined to estimate wind erosion. The ~~word~~ I is a function of the soil aggregates greater than 0.84 mm in diameter. - I relates to property of soil & degree of slope of site.

K :- It takes into consideration the cloddiness of the soil surface, vegetative cover V & ridge on the soil surface.

K is measure of effect of ridge, made by tillage & planting implements, on erosion rate.

C :- It involves wind velocity, soil temperature & precipitation. The climate factor is an index of climatic erosivity, which includes the wind speed & soil surface moisture.

L :- L is width of field in downward direction.

The L factor represents the unsheltered distance in meters along the prevailing wind erosion direction for the field.

V :- V relates not only to degree of soil surface covered with residues but to the nature of cover - whether it is living or dead, still standing or flat on ground.