Particle Detachment

- Soil texture and aggregate size have a very important influence on particle detachment.
- Grains that protrude higher above the surface are struck by stronger wind.
- Any grain from 0.05 to 0.5 mm can protrude high enough to be detached by wind.
- **Grains that are 0.1 to 0.15 mm (very fine sand) are the easiest.**
  - Soils dominated by particles of this size are often referred to as sugar sand

Particle detachment

- Silt and clay cannot be detached without being struck by saltating particles
  - They don’t stick up above the Zo layer
  - They are often bound together in aggregates
- Particles >1.0mm are too heavy to be separated from the surface without being hit by saltating particles.

Transport Capacity of Wind

- The capacity of a wind to carry soil is related to velocity but **not grain size**
- A greater number of small particles can be transported, but the total weight of material that a specific wind can carry is relatively constant.
- Aggregate and particle size dictate the proportion of material in suspension, saltation, and creep.

Transport Capacity of Wind

- Suspension of fine particles is minor over very coarse material and creep dominate.
- On dusty, silty and fine sandy soils suspension is greater and creep is minimal

Soil Deposition

- Suspended materials represent a small but important fraction of eroded material
  - Important because suspended material can contain organic matter, and clay (AKA, nutruents and water holding capacity)
- Saltating material represent the larges mass of material but usually remains in the field in tillage depressions, small dunes behind vegetation, or in fence rows or downwind vegetation

Soil Characteristics that Affect Wind Erosion

- The size (mass) of individual particle or aggregates (Grains).
  - Grains larger than 1 mm (very coarse sand and gravel) in diameter are nonerodible
  - Those between 1 and 0.5 mm (coarse sand) are erodible only in very high wind
  - Those less than 0.5 mm are highly erodible

Soil Characteristics that Affect Wind Erosion

- The amount of nonerodible grains present on the surface affects the ease with which erosion is initiated and how long it occurs.
- Nonerodible grains may be coarse sand and gravel or large stable aggregates
  - Therefore aggregate stability has an important impact on wind erosion

Soil Characteristics that Affect Wind Erosion

- High levels of organic matter promote stable aggregates therefore reduce erosion
- Clay serves to bind sand and silt particles therefore clay content is important
  - Soils containing 27% or more clay produce large stable clods therefore have low erodibility by wind

Soil Characteristics that Affect Wind Erosion

- Crusts formed during rainfall are more dense, stable and resistant to wind erosion, therefore can temporarily reduce erosion.
- However, they present a smooth surface with very little surface roughness.
- This allows for high wind velocity at the surface.
- When saltation is initiated the smooth surface can be rapidly eroded especially in soils containing less than 15 % clay

Tillage Ridges Affect on Wind Erosion

- Effectiveness of tillage ridges depend on:
  - Height, frequency, shape and orientation relative to the prevailing wind direction.
- Ridge heights of 2-4 inches decrease wind erosion by decreasing wind velocity at the surface and trapping grains
- Shorter ridges do not decrease wind velocity
- Taller ridges increase erosion at high wind speeds because of increased friction velocity on the crest of the ridges

Length of Exposed Area

- Wind start to pick up particles on the windward side of a field.
- Wind continues to pick up particles until it can carry no more
- The transport capacity of a wind is similar for all soil types
- However, the more erodible the soils that shorter the distance needed to reach a winds carrying capacity

Length of Exposed Area

- Distance needed to reach a winds carrying capacity can be less than 180 ft for structureless find sands
- A cloddy medium texture soil may require more than 5000 ft to reach a winds carrying capacity.

Impact of Vegetative Cover on Wind Erosion

- Maintenance of surface residue or permanent vegetation is the most effective way to reduce wind erosion.
- Row orientation is important and should be perpendicular to the prevailing wind direction, particularly for row crops