DEFINITION OF EROSION

Soil erosion is a form of soil degradation

Erosion refers to the removal of a field’s topsoil due to natural forces of water and wind or through human activities such as tillage.

STEPS:
• Soil detachment
• Movement
• Deposition
TYPES OF EROSION BY WATER

Direct movement of soil by the impact of water droplets

Uniform removal of soil in thin layers from a large area due to impact from raindrops

Small channels (<1 ft) carved out on a slope by running water

Large channels (>1 ft) carved out by running water
TYPES OF EROSION BY WIND

SUSPENSION
The movement of fine particles into the atmosphere over long distances due to strong winds.

SALTATION
The movement of soil particles through short bounces along the surface, displacing additional particles with each impact. Primary source of wind erosion.

SOIL CREEP
The rolling of larger soil particles across the surface, aided by the bouncing movements of saltating particles.
Triggering factors

CLIMATIC FACTORS

• Rainfall (amount, intensity and frequency)
  A greater percentage of rainfall will become runoff during periods of frequent runoff, due to high soil moisture or saturated conditions.

• Temperature
  It affects organic matter.

VEGETATION

• It binds the soil together and makes it more resistant to runoff. A dense and robust soil vegetation is one of the best protections against soil erosion.

<table>
<thead>
<tr>
<th>Vegetation Cover</th>
<th>Runoff</th>
<th>Eroded Soil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>2%</td>
<td>2 lb/yd</td>
</tr>
<tr>
<td>Average</td>
<td>14%</td>
<td>246 lb/yd</td>
</tr>
<tr>
<td>Poor</td>
<td>73%</td>
<td>2718 lb/yd</td>
</tr>
</tbody>
</table>

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CHARACTERISTICS OF SOIL

• Texture
  The size of soil particles can impact soil erosion. Silt particles are most susceptible to erosion while clay and sand particles are less prone to erosion.

• Structure
  It influences the ability to absorb water and its resistance to erosion. Soil particles bond together to form larger clumps and pore spaces.

TOPOGRAFY

• Slope Length and Gradient
  The steeper the slope the greater the erosion, due to the increased velocity of water flow and a greater degree of scouring.
Human Activities

**OVERGRAZING**

- It occurs when plants are exposed to intense grazing: animals can damage the soil surface by eating the vegetation and compacting dry soil.
- Soil with less vegetation are exposed and more subjected to erosion effects.

**OVERCROPPING**

- It occurs when the land is continuously cultivated with no breaks in between the crops.
- Soil dries out and is more subjected to erosion effects.

**DEFORESTATION**

- Cutting down large areas of forests leaves an open and exposed landscape.
- All the nutrients and minerals are removed from the soil.
- Soil is more subjected to erosion effects.

**CONSTRUCTION**

- Clearing the area of any vegetation is usually the first phase of construction.
- Altering gradients/drainage patterns, and compacting soils are also phases of construction.
Erosion Control

AVAILABLE SOLUTIONS:

- Biomats
- Geomats
- Reinforced Geomats
- DT wire mesh products

**Soft Armor**
Re-vegetation using RECP and HECP

**Hard Armor**
Vegetated Riprap, Vegetated Mattresses

**Earth Retaining Structures with Vegetative Fascia**
GEOSYNTHETICS FOR EROSION CONTROL

• Create a physical barrier which absorb water and wind impact on soil;

• Are effective in preventing or limiting the soil loss;

• Enhance vegetation growth;

• Increase shear strength.
Chapter 16  Streambank and Shoreline Protection
SOLUTIONS FOR EROSION CONTROL
ECO-SOLUTION

GREEN REVETMENTS

RENO MATTRESS or GABION MATS filled with stones and soil
Pont Jacques Cartier, Montreal, Canada

Erosion Control + Soil Nailing
Pont Jacques Cartier, Montreal, Canada

Vegetation completely established
SR-85 Landfill, Buckeye, AZ
SR-85 Landfill, Buckeye, AZ

Series of Gabion Weirs
CH: SR 85 LANDFILL STORMWATER CONTROL SYSTEM

BUCKEYE, AZ
27th Ave Landfill, Phoenix, AZ

Erosion Problems
27th Ave Landfill, Phoenix, AZ
27th Ave Landfill, Phoenix, AZ
27th Ave Landfill, Phoenix, AZ

Stepped Gabion Weirs
Dodson Wash, Taylor, AZ

Eroded Bank 3 ft. away of Ranchers Property
Dodson Wash, Taylor, AZ

Objective: Realign wash – Recover bank by sediment deposition

Gabion Groynes
Dodson Wash, Taylor, AZ

Objective: Realign wash – Recover bank by sediment deposition

Gabion Groynes
Dodson Wash, Taylor, AZ

Objective: Realign wash – Recover bank by sediment deposition

Gabion Groynes
Erosion Control Blanket with Live Stakes

- Live Stakes
- Green Terramesh (MSE System)
- Soil Filling Behind Facing (Above W.L.)
- Stone Filling Behind Facing (Below W.L.)
- Max W.L.
- RENO Mattress

BANK STABILIZATION - VRSS
VEGETATED REINFORCED SOIL SLOPE
Bay Bridge, CA

Erosion
Proposed Earth Confinement System
Bay Bridge, CA

ECS (Earth Confinement System)
Bay Bridge, CA

ECS (Earth Confinement System)
In Conclusion, Vegetative and Structural BMPs

- Mitigate the erosion and control sediment
- Increase surface roughness
- Shelter the sediment
- Promote vegetation growth

- Reduce water velocity
- Ground recharge
- Filter pollutants
- Improve water quality and
- Support aquatic life
THANK YOU!

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