Soil Quality Information Sheet

Soil Quality Resource Concerns: Soil Erosion

USDA Natural Resources Conservation Service **April 1996**

What is erosion?

Wind or water erosion is the physical wearing of the earth's surface. Surface soil material is removed in the process.

Why should we be concerned?

Erosion removes topsoil, reduces levels of soil organic matter, and contributes to the breakdown of soil structure. This creates a less favorable environment for plant growth.

In soils that have restrictions to root growth, erosion decreases rooting depth, which decreases the amount of water, air, and nutrients available to plants.

Erosion removes surface soil, which often has the highest biological activity and greatest amount of soil organic matter. This causes a loss in nutrients and often creates a less favorable environment for plant growth.

Nutrients removed by erosion are no longer available to support plant growth onsite, but can accumulate in water where such problems as algal blooms and lake eutrophication may occur.

Deposition of eroded materials can obstruct roadways and fill drainage channels. Sediment can damage fish habitat and degrade water quality in streams, rivers, and lakes.

Blowing dust can affect human health and create public safety hazards.

What are some signs of erosion?

Wind erosion:

- dust clouds,
- soil accumulation along fencelines or snowbanks,
- a drifted appearance of the soil surface.

Water erosion:

- small rills and channels on the soil surface,
- soil deposited at the base of slopes,
- sediment in streams, lakes, and reservoirs,
- pedestals of soil supporting pebbles and plant material.

Water erosion is most obvious on steep, convex landscape positions. However, erosion is not always readily visible on cropland because farming operations may cover up its signs. Loss of only 1/32 of an inch can represent a 5 ton per acre soil loss.

Long-term soil erosion results in:

- persistent and large gullies,
- exposure of lighter colored subsoil at the surface,
- poorer plant growth.

How can soil erosion be measured?

Visual, physical, chemical, and biological indicators can be used to estimate soil surface stability or loss.

Visual indicators

- comparisons of aerial photographs taken over time,
- presence of moss and algae (crypotogams) crusts in desert or arid soils,
- changes in soil horizon thickness,
- deposition of soil at field boundaries.

Physical indicators

- measurements of aggregate stability,
- increasing depth of channels and gullies.

Chemical indicators

- decreases in soil organic matter content,
- increases in calcium carbonate content at the surface, provided greater content exists in subsurface layers,
- changes in cation-exchange capacity (CEC).

Biological indicators

- decreased microbial biomass,
- lower rate of respiration,
- slower decomposition of plant residues.

What causes the problem?

Water erosion

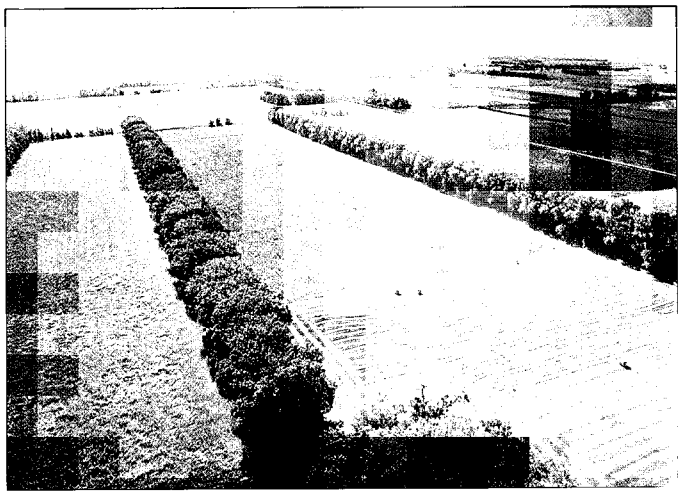
- lack of protection against raindrop impact,
- decreased aggregate stability,
- long and steep slopes,
- intense rainfall or irrigation events when plant or residue cover is at a minimum,
- decreased infiltration by compaction or other means.

Mechanical erosion

- removal by harvest of root crops,
- tillage and cultivation practices that move soil downslope.

Wind erosion

- exposed surface soil during critical periods of the year,
- occurrence of wind velocities that are sufficient to lift individual soil particles,
- long, unsheltered, smooth soil surfaces.



How can soil erosion be avoided?

Soil erosion can be avoided by:

- maintaining a protective cover on the soil,
- creating a barrier to the erosive agent,
- modifying the landscape to control runoff amounts and rates.

Specific practices to avoid water erosion:

- growing forage crops in rotation or as permanent cover,
- growing winter cover crops
- interseeding,
- protecting the surface with crop residue,
- shortening the length and steepness of slopes,
- increasing water infiltration rates,
- improving aggregate stability.

Specific practices to avoid wind erosion:

- maintaining a cover of plants or residue,
- planting shelterbelts,
- stripcropping,
- increase surface roughness,
- cultivating on the contour,
- maintaining soil aggregates at a size less likely to be carried by wind.

(Prepared by the National Soil Survey Center in cooperation with the Soil Quality Institute, NRCS, USDA, and the National Soil Tilth Laboratory, Agricultural Research Service, USDA)

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