FACTSHEET

Soil Quality Management:

What is soil?

Soil is a dynamic resource that supports plant life. It is made up of different sized mineral particles (sand, silt, and clay), organic matter, and numerous species of living organisms. Thus, soil has biological, chemical, and physical properties, some of which are dynamic and can change in response to how the soil is managed.

What does soil do for us?

Soil provides several essential services or functions:

Soil supports the growth and diversity of plants and animals by providing a physical, chemical, and biological environment for the exchange of water, nutrients, energy and air.

Soil regulates the distribution of rain or irrigation water between infiltration and runoff and regulates the flow and storage of water and solutes, including nitrogen, phosphorus, pesticides, and other nutrients and compounds dissolved in the water.

Soil stores, moderates the release of, and cycles plant nutrients and other elements.

Soil acts as a filter to protect the quality of water, air, and other resources.

Soil supports structures and protects archeological treasures.

What is soil quality?

Soil quality is the capacity of a specific kind of soil to function within natural or managed ecosystem boundaries to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation. Changes in the capacity of soil to function are reflected in soil properties that change in response to management or climate.

Why is soil quality important?

Management that enhances soil quality will benefit cropland, rangeland, and woodland productivity. Enhanced soil quality can help to reduce the onsite and offsite costs of soil erosion, improve water and nutrient use efficiencies, and ensure that the resource is sustained for future use. It also benefits water quality, air quality, and wildlife habitat.

How is soil quality evaluated?

Soil quality is evaluated separately for each individual soil using soil quality indicators that reflect changes in the capacity of the soil to function. Useful indicators are those that are sensitive to change, and change in response to management. The type and number of indicators used depends on the scale of the evaluation (i.e., field, farm, watershed, or region) and the soil functions of interest. For example, infiltration rate and aggregate stability help indicate the capacity of the soil to intake water and resist runoff and erosion. Changes in soil organic matter, including active organic carbon or particulate soil organic matter, may indicate changes in productivity. Increased bulk density may reflect limits to root growth, seedling emergence, and water infiltration. Measurements of indicators can be made with simple to somewhat complex field tests or sophisticated laboratory analyses.

To evaluate soil quality, indicators can be assessed at one point in time or monitored over time to establish trends.

An **assessment** provides information about the current functional status or quality of the soil. The assessment must start with an understanding of the standard, baseline value or reference value to be used for comparison. Assessments can be made to help identify areas where problems occur, to identify areas of special interest, or to compare fields under different management systems. Land managers can use this information, along with data from soil surveys, fertility tests, and other resource inventory and monitoring data, to make management decisions.

Monitoring of soil quality indicators over time identifies changes or trends in the functional status or quality of the soil. Monitoring can be used to determine the success of management practices or the need for additional management changes or adjustments.

What concerns relate to soil quality?

Evaluating soil quality can improve the response to many resource concerns, including:

- Loss of soil by erosion
- Deposition of sediment by wind or floodwaters
- Compaction of layers near the surface
- Degradation of soil aggregates or soil structure
- Reduced infiltration and increased runoff
- Crusting of the soil surface
- Nutrient loss or imbalance
- Pesticide carryover
- Buildup of salts
- An unfavorable change in pH
- Loss of organic matter
- Reduced biological activity
- Poor residue breakdown
- Infestation by weeds or pathogens
- Excessive wetness
- Increased water-repellency of soils due to fire
- Reduced water quality
- Greenhouse gas emissions

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