Introduction

Simply stated, soil quality can be defined as the capacity of a particular soil to perform a specific soil function. Soil quality is comprised of three interdependent components – the biological, the chemical, and the physical. Several indicators of soil quality have been identified within each component. Practical field tools and approaches have been developed to measure these indicators to assess the quality of a soil. Data and observations made will aid in making better decisions to sustain and improve the soil resource for future generations.

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Biological Indicators

Biological soil indicators increase awareness of the soil as a dynamic and living system. The soil food web is a complex system consisting of earthworms, fungi, bacteria, mites, ants, beetles, and numerous other organisms. Measurements of organic matter, earthworm populations, soil respiration, decomposition rates, crop yields, and also the smell of the soil have been used as biological indicators.

Chemical Indicators

The chemical component of the soil has an effect on the available plant nutrients, soil and plant relationships, soil's buffering capacity, water quality, and mobility of soil nutrients and contaminants. Cation-exchange capacity, soil pH, electrical conductivity, and nitrate-nitrogen are among the chemical indicators that help determine the capacity of the soil to store and release nutrients, and can also be indicators of potential soil, plant, and ground water toxicity.

Physical Indicators

Physical characteristics of the soil refer to the arrangement of solid particles and pores. Physical indicators such as texture, infiltration rate, bulk density, soil compaction, aggregate stability, and soil crusting can help determine how well water and roots are able to move through the soil and how stable the soil resource is to the effects of climate. Top soil thickness, soil color, subsoil exposure, sediment fans, and soil structure are visual examples of physical indicators.

A pocket electrical conductivity meter is a quick method to measure salts in the soil solution.

Soil salinity can influence biological, chemical, and physical properties and processes in soils.

Soil pH can be measured with a pocket pH meter.

In arid regions, depth to calcium carbonate can be used as a soil quality indicator.

A nitrate test strip can be used to determine nitrate-nitrogen levels in the soil.

Granular structure indicates a stronger aggregate stability than massive structure.

Higher bulk densities can indicate less pore space, less oxygen, and increased resistance to root penetration.

Soil compaction has restricted root development on the wheel track.

Water infiltration can be easily measured by a coffee can infiltrometer.

Wind and water erosion degrade soil quality.

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Summary

Enhanced soil quality can help to reduce the cost of soil erosion, improve nutrient efficiencies, and ensure that the soil resource is sustained for future use. The information that is gathered can be used in different ways: (1) as benchmarks to compare with future soil quality measurements; (2) to determine the present condition of the soil resource as compared to its inherent potential; and (3) to determine which management practices could be applied to enhance the soil resource.