Part 624 – Soil Quality

Subpart A – General Information

624.0 Definition and Purpose

A. Definition.—“Soil quality” is the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans.

B. Purpose.—Considering that soil quality is the capacity of a soil to function, specific functions of concern should be clear when applying the concept. Common examples of specific soil functions are—

1. Sustaining biological activity, diversity, and productivity.
2. Regulating and partitioning water and solute flow.
3. Filtering, buffering, degrading, immobilizing, and detoxifying organic and inorganic materials, including industrial and municipal byproducts and atmospheric deposition.
4. Storing and cycling nutrients and other elements within the earth’s biosphere.
5. Providing support of socioeconomic structures (i.e., buildings and roads) and protection for archeological treasures associated with human habitation.

C. Components.—Soil quality integrates the biological, chemical, and physical components and processes of a soil with its surroundings. Whether a research plot, field, watershed, or the earth; the concept that soil functions within a larger system remains a key consideration in assessment of soil quality.

D. Views and Concepts.—Views differ on soil quality depending on the background of individuals and their relationship to the land.

1. Some of these views and concepts include—
   (i) Inherent properties of soil as determined by the soil forming factors.
   (ii) Highly productive land, sustaining or enhancing productivity, maximizing profits, or maintaining the soil resource for future generations.
   (iii) Plentiful, healthful, and inexpensive food for present and future generations.
   (iv) Soil in harmony with the landscape and its surroundings.
   (v) Soil functioning at its potential in an ecosystem.
2. The concept of soil quality is also viewed from various scales of concern:
   (i) For the land manager, productivity and sustainability are important.
   (ii) For members of a community, the health or the ability of the watershed to maintain a healthy neighborhood and environment is important.
   (iii) For national policy makers, an assessment of the overall quality and trends of the Nation’s soil resources are important for sustaining and ensuring food and water supply and national security.

624.1 Quality Concepts

Soils naturally vary in their capacity to function; therefore, an important part of the definition is the concept that quality is specific to each kind of soil (soil map unit component). The quality of a soil has two distinct but related parts, inherent and dynamic qualities.

1. Inherent Quality.—Inherent quality represents intrinsic properties (qualities) of soils as determined by the factors of soil formation—climate, topography, biota, parent material, and time. The inherent quality of soils is often used to compare the capabilities of one soil against another and to evaluate the worth or suitability of soils for specific uses. For example, given all other determining properties being equal, a loam soil will have a higher water holding capacity.
than a sandy soil. Thus, the loam soil will have a higher inherent quality for storing water and lower inherent quality for producing a freely drained condition.

(3) Use-Invariant Properties.—Many properties that have traditionally been recorded in the interpretive and taxonomic databases of the National Cooperative Soil Survey Program are not subject to change by commonly practiced soil use. They are use-invariant. Particle size distribution (texture) is an example of a use-invariant property. Since common land practices only disturb the soil to a depth of about 30 centimeters, the properties below this depth are normally use-invariant.

(4) Dynamic Quality.—Dynamic quality is determined by soil properties that are influenced by human use and management decisions. These properties are use-dependent properties and may be temporal (dynamic) of the soil. Bulk density near the surface and organic matter content are two such properties.

(5) Use-Dependent Properties.—Use-dependent properties most often manifest in surface and subsurface layers. These properties include physical, chemical, and biological properties. Certain management practices and uses of the land have a positive effect on specific soil properties such as increasing organic matter content. Other management practices may negatively impact the soil by causing compaction, erosion, or acidification. Collectively, management will either improve or reduce health of the soil. This dynamic aspect of soil quality is the focal point of the concern for assessing the state (or quality) of the soil resource.

(6) Reference Condition.—The reference condition is defined by a range of values for key soil properties (indicators) that represent conditions of the soil functioning at full capacity such as soil conditions under management systems that use best management practices. Values for the reference condition can eventually be used as criteria in the Field Office Technical Guide for evaluating the soil condition (quality).

(7) Soil Health Evaluation.—Soil health can be evaluated relative to a standard or reference condition that represents the full capacity of a soil to function for a specific use. The reference condition is often based on use-invariant properties in conjunction with the dynamic properties. Soil properties are used to group soils that function similarly. Reference values are developed for the key properties of soils that reflect the capacity of the soil to function. Evaluation of soil quality or health must be tied to soil functions and the specific use of the soil.

Soil health can also be evaluated by establishing a baseline condition for the use-dependent properties (indicators). After a period of years, the use-dependent properties are measured again and compared to the baseline.