Soil Quality Information Sheet

Rangeland Soil Quality—**Introduction**

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What is rangeland?

Rangeland is land on which the native vegetation is predominantly grasses, grasslike plants, forbs, or shrubs. This land includes natural grasslands, savannas, shrub lands, most deserts, tundras, areas of alpine communities, coastal marshes, and wet meadows.

What is rangeland health?

Rangeland health is the degree to which the integrity of the soil, the vegetation, the water, and the air as well as the ecological processes of the rangeland ecosystem are balanced and sustained.

What is soil?

Soil is a dynamic resource that supports plants. It consists of mineral particles of different sizes (sand, silt, and clay), organic matter, and numerous species of living organisms. Soil has biological, chemical, and physical properties, some of which change in response to how the soil is managed.

What is soil quality?

Soil quality is the capacity of a specific kind of soil to function within natural or managed ecosystem boundaries, sustain plant and animal productivity, maintain or enhance the quality of water and air, 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.

What does soil quality affect on rangeland?

- Plant production, reproduction, and mortality
- Erosion
- Water yields and water quality
- Wildlife habitat
- Carbon sequestration
- Vegetation changes
- Establishment and growth of invasive plants
- Rangeland health

How are soil quality and rangeland health related?

Rangeland health and soil quality are interdependent. Rangeland health is characterized by the functioning of both the soil and the plant communities. The capacity of the soil to function affects ecological processes, including the capture, storage, and redistribution of water; the growth of plants; and the cycling of plant nutrients. For example, increased physical crusting decreases the infiltration capacity of the soil and thus the amount of water available to plants. As the availability of water decreases, plant production declines, some plant species may disappear, and the less desirable species may increase in abundance. Changes in vegetation may precede or follow changes in soil properties and processes. Significant shifts in vegetation generally are associated with changes in soil properties and processes and/or the redistribution of soil resources across the landscape. In some cases, such as accelerated erosion resulting in a change in the soil profile, this shift may be irreversible, while in others, recovery is possible.

Why is soil quality important?

Changes in soil quality that occur as a result of management affect:

- the amount of water from rainfall and snowmelt that is available for plant growth;
- runoff, water infiltration, and the potential for erosion;
- the availability of nutrients for plant growth;

- the conditions needed for germination, seedling establishment, vegetative reproduction, and root growth; and
- the ability of the soil to act as a filter and protect water and air quality.

How are soil quality indicators integrated into rangeland assessments and monitoring?

Ecological processes on rangeland are evaluated with soil and vegetation indicators. Evaluations made through assessment and monitoring provide information about the functional status of soil and rangeland. Soil quality indicators are properties that change in response to management, climate, or both and reflect the current functional status. Functions include maintaining soil and site stability; distributing, storing, and supplying water and plant nutrients; and maintaining a healthy plant community.

How are soil quality indicators used on rangeland?

Assessment.—Soil quality indicators are used to increase the value and accuracy of rangeland assessments and trend analysis. Assessments help to identify areas where problems occur and areas of special interest. Land managers can use this information and other inventory and monitoring data to make management decisions, which, in turn, affect soil quality. When assessments or comparisons are made, the rangeland ecological site description is used as the standard. For the soils associated with a given ecological site, the properties that change in response to management or climate are used as indicators of change.

Monitoring.—Tracking trends in the functional status of the soil and the plant community helps to determine the success of the management practices or the need for additional management changes or adjustments. Regular measurement of soil quality indictors at the same location can detect changes over seasons or years and provide early warning of future vegetation changes.

How do I get more information?

For additional information, refer to rangeland information sheet 2, “Indicators for Assessment and Monitoring.” For soil quality information related to rangeland health indicators, refer to the rangeland soil quality information sheets listed in the following table. Download the sheets from:

http://www.statlab.iastate.edu/survey/SQI

Rangeland health indicator [1]	Related rangeland soil quality information sheets
1. Rills	Water Erosion
2. Waterflow patterns	Infiltration
3. Pedestals and/or terracettes	Water Erosion, Wind Erosion
4. Bare ground	Water Erosion, Wind Erosion
5. Gullies	Water Erosion
6. Wind-scoured areas	Wind Erosion
7. Litter movement	Water Erosion, Wind Erosion
8. Soil surface resistance to erosion	Physical and Biological Soil Crusts, Aggregate Stability
9. Soil surface loss or degradation	Water Erosion, Wind Erosion
10. Plant community composition and distribution relative to infiltration and runoff	Infiltration
11. Compaction layer	Compaction
12. Functional/structural groups	Soil Biota
13. Plant mortality/ decadence	
14. Litter amount	Organic Matter
15. Annual production	
16. Invasive plants	
17. Reproductive capability of perennial plants	

[1] These qualitative assessment indicators are from *Interpreting Indicators of Rangeland Health,* Version 3, 2000, TR 1734-6, BLM (http://www.ftw.nrcs.usda.gov/glti).

(Prepared by the Soil Quality Institute, Grazing Lands Technology Institute, and National Soil Survey Center, Natural Resources Conservation Service, USDA; the Jornada Experimental Range, Agricultural Research Service, USDA; and Bureau of Land Management, USDI)

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