



United States Department of Agriculture

Natural Resources Conservation Service

# Rangeland Soil Quality—Introduction

## What is rangeland?

Rangeland is land on which the native vegetation is predominantly grasses, grass like 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, vegetation, water, and air as well as the ecological processes of the rangeland ecosystem are balanced and sustained. The attributes evaluated during rangeland health assessments are 1) Soil and Site Stability 2) Hydrologic Function 3) Biotic Integrity.

## What is soil?

Soil is the unconsolidated mineral or organic material on the immediate surface of the Earth that serves as a natural medium for the growth of land plants. It consists of mineral particles of different sizes (sand, silt, and clay), organic matter, and numerous species of living organisms. Many biological, chemical, and physical properties of soil are highly dynamic, and thereby change in response to management.

## What is soil quality?

Soil quality is the capacity of a specific kind of soil to function

within natural or managed ecosystem boundaries. Functions include sustaining plant and animal productivity, maintaining or enhancing the quality of water and air, and supporting 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 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; 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 available for plant growth;
- Runoff, water infiltration, and the potential for erosion;
- The availability of nutrients for plant growth; and
- The conditions needed for germination, seedling establishment, vegetative reproduction, and root growth.

## What indicators are used to assess soil quality on rangeland?

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 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 (See Figure 1\*).

Assessment – Soil quality indicators are used to increase the value and accuracy of rangeland assessments over time. Assessments help to identify areas of special interest or where problems may occur. 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 (ESD) is used as the standard. The ESD provides reference condition

for the soil properties associated with a given ecological site. Soil properties change in response to management and are used to assess the degree of departure from the standard.

Monitoring – Tracking trends of the functional status within the soil and the plant community helps determine the success of the management practices or the need for additional management changes or adjustments. Regular measurement of soil quality indicators 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 more information related to rangeland health indicators and their relationship to soil quality functions and processes, refer to the *Rangeland Soil Quality - Indicators for Assessment and Monitoring* information sheet available at: [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/n\\_d/soils/?cid=stelprdb1167168](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/n_d/soils/?cid=stelprdb1167168) or Version 4 of *Interpreting Indicators of Rangeland Health* available at [www.blm.gov/nstc/library/pdf/1734-6rev05.pdf](http://www.blm.gov/nstc/library/pdf/1734-6rev05.pdf)
- For additional information regarding soil quality on other land uses, refer to: <http://soils.usda.gov/sqi>
- \* MacKinnon, W.C., J.W. Karl, G.R. Toevs, J.J. Taylor, M.Karl, C.S. Spurrier, and J.E. Herrick. 2011. BLM core terrestrial indicators and methods. Tech Note 440. USDI-Bureau of Land Management, National Operations Center, Denver, CO.

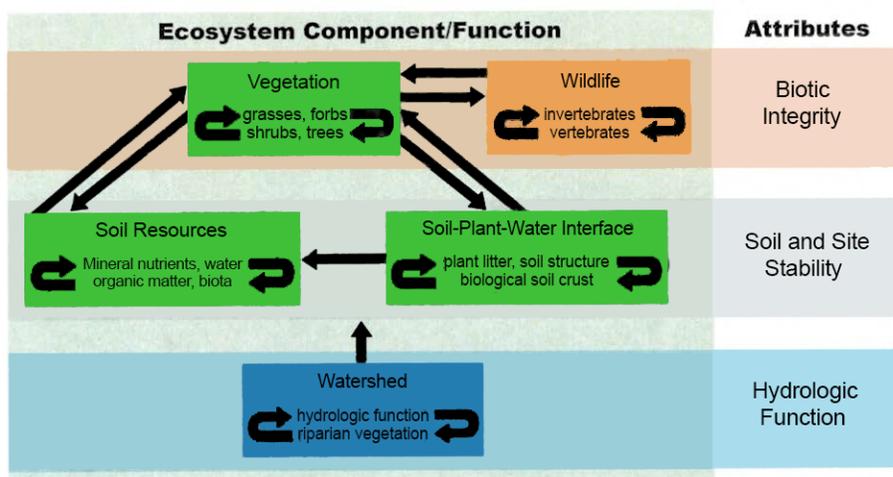


Figure 1. Assessing and monitoring natural systems requires consideration of the major structural components of ecosystems (boxes) and their relationships (solid arrows). Biotic integrity, soil and site stability, and hydrologic function have been identified as the three key attributes that can be evaluated to determine site integrity and the functional status of ecological processes.

For more information, check the following: <http://soils.usda.gov/sqi> and <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/soils/health/> (Adapted from Rangeland Sheet #1, May 2001, developed 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)