



# WORKSHEET

## FOREST HEALTH INDICATOR: SOIL QUALITY

The quality of the soil in a forest is an important indicator of forest health. How well the soil functions directly influences the health of the trees and other forest organisms. An evaluation of soil quality usually involves measuring the soil's physical, chemical, and biological makeup at different depths.

### MATERIALS

Spade or trowel, three paper cups or plastic bags, tablespoon, distilled water, eyedropper, three Petri dishes or plastic containers, pH paper, white paper

### METHOD

Choose a soil sample site that represents the overall forest plot. On the ground, measure a square approximately 30 cm on each side, marking the corners with sticks or rocks. Within the plot, first remove the leaf litter layer with a spade or trowel. Next, collect soil samples from depths of approximately 7.5 cm, 15 cm, and 30 cm. Use paper cups or plastic bags to store the samples, labelling each sample.

Conduct the following assessments for each sample, recording your results in the *Soil Quality Results and Rating* chart that follows.

### RESULTS

#### Soil Type

Most soils are a mixture of sand, silt, and clay. The specific content of a given soil influences how well it holds nutrients and water. To find out your soil type, take a small amount of soil (about the size of a marble), and moisten it with a few drops of water. Squeeze it between your thumb and fingers. Record your results in the *Soil Quality Results and Rating* chart that follows on page 63.

Soil Type	Squeezed Moist Soil	Rating
Sand	Feels gritty and cannot hold ball shape	Poor – Has few nutrients, holds little water, and is prone to drought
Sandy Loam	Can be molded into a ball, but ball breaks up easily	Good – Has good balance of nutrients and moisture retention
Silt	Can be molded into a ball that is easily deformed; does not feel gritty and has silkiness like flour	Fair – Has more nutrients and holds more water than sand, but washes away (erodes) easily
Loam	Can be molded into a ball that can be handled quite freely without breaking	Good – Has good balance of nutrients and moisture retention
Clay Loam	Can be formed into a long thin rod or “ribbon” that will break readily, barely sustaining its own weight	Good – Has good balance of nutrients and moisture retention
Clay	Sticky and can easily be formed into long thin rod or “ribbon”	Fair – Holds water very well, but does not allow movement of air or water, so doesn't drain well

## Soil pH

Soil pH is a measure of how acidic or alkaline the soil is, and it is an indicator of soil quality. Measure 1 tablespoon of soil from each depth, place this amount onto individual Petri dishes or plastic containers, and label the soil samples. Wet each soil sample with 5 drops of distilled water, and allow it to sit for 3 to 5 minutes. Place one piece of pH paper on each soil sample. Determine the approximate pH of your soil.

### RATING

Good	pH of 5.51–7.2, which is optimum for many plant species	3 Points
Fair	pH of 7.2–8.5 (moderately alkaline) or 4.0–5.5 (moderately acid)	2 Points
Poor	pH of 4.0 and less (acid), or greater than 8.5 (alkaline)	1 Point

Record your results in the Soil Quality Results and Rating chart that follows on page 64.

## Soil Organisms

The presence of living organisms in the soil is an important indicator of productive soils. Soil organisms aid in nutrient cycling, soil creation, and decomposition of organic matter and dead organisms. Pour the remaining soil sample onto a white piece of paper, and look for the presence of the following organisms. For each type, circle whether it is present or not. (Soil fungi are microscopic cells that grow as long threads or strands in the soil.)

Soil Depth	Ants/Termites	Centipedes/ Millipedes	Earthworms	Fungi	Other:	Other:
7.5 cm (3 in)	Y / N	Y / N	Y / N	Y / N	_____	_____
15 cm (6 in)	Y / N	Y / N	Y / N	Y / N	_____	_____
30 cm (12 in)	Y / N	Y / N	Y / N	Y / N	_____	_____

### RATING

Good	3 or more types of soil organisms present in soil sample	3 Points
Fair	1 or 2 types of organisms present in soil sample	2 Points
Poor	no soil organisms present in soil sample	1 Point

Record your results in the Soil Quality Results and Rating chart that follows on page 64.



## RATINGS

Circle the ratings that apply for each depth and each assessment. Determine the average score for each depth by adding up the points shown for each rating and dividing the total by 3. Find the average of the three “Average Soil Quality at Each Depth” ratings to get the overall soil quality.

### Soil Quality Results and Rating

	7.5 cm deep				15 cm deep				30 cm deep		
Soil Type											
Soil Type Rating	Good 3 Points	Fair 2 Points	Poor 1 Point		Good 3 Points	Fair 2 Points	Poor 1 Point		Good 3 Points	Fair 2 Points	Poor 1 Point
Soil PH Rating	Good 3 Points	Fair 2 Points	Poor 1 Point		Good 3 Points	Fair 2 Points	Poor 1 Point		Good 3 Points	Fair 2 Points	Poor 1 Point
Soil Organism Rating	Good 3 Points	Fair 2 Points	Poor 1 Point		Good 3 Points	Fair 2 Points	Poor 1 Point		Good 3 Points	Fair 2 Points	Poor 1 Point
Total Points											
Average Soil Quality at Each Depth (rounded to nearest whole number)											
Overall Soil Quality (rounded to nearest whole number)											

### OVERALL RATING

Good Average point value of 3

Fair Average point value of 2

Poor Average point value of 1

Overall Soil Quality rating for plot: \_\_\_\_\_

Source: USDA Forest Service. 2007. “Soil Vital Signs: Soil Quality Index (SQI) for Assessing Forest Soil Health.” [www.fs.fed.us/rm/pubs/rmrs\\_rp065.pdf](http://www.fs.fed.us/rm/pubs/rmrs_rp065.pdf)

