



# Soils and Land Use Study Guide

The following key points, learning objectives, and suggested activities will help you and your students prepare for the Soils and Land Use component of the Oregon Envirothon competition. See also the [Oregon Envirothon Soils and Land Use Manual](#), available at [oregonenvirothon.org](http://oregonenvirothon.org) for additional resources. For study information specific to the North American competition, please see the Resources section on the NCF-Envirothon website at [envirothon.org](http://envirothon.org).

## Key Point 1—Physical Properties of Soil and Soil Formation

### Learning Objectives:

1. Understand the importance of soils and appreciate the relatively small amount of usable soil that exists on Earth.
2. Know the five soil forming factors and understand how they influence soil properties.
3. Identify soil parent materials.
4. Understand the soil forming processes: additions, losses, translocations, and transformations.
5. Identify and describe soil horizon characteristics:
  - a. texture
  - b. structure
  - c. color (using Munsell color charts)
6. Understand how soil profile characteristics can determine basic soil properties and limitations and be used to classify soils.

### Suggested Activities:

1. Generate a list of reasons why soils and the study of soil science are important to sustaining life on Earth. Explore how much soil on Earth is available for human use with a cut up apple as a model (see "[Apple as the Earth's Soil](#)" for an example.)



2. Describe the five factors of soil formation and be able to explain how each factor affects the soil profile.
3. Examine a soil pit. Describe soil characteristics for each horizon and record your data on the “NRCS Soil Description form, SOI-232” provided in the Oregon Envirothon Soils and Land Use Manual.
4. Use [Web Soil Survey](#) or [SoilWeb](#) to look at different soil profiles and Official Series Descriptions in your area. Describe differences between the soil types such as texture, drainage and permeability (or saturated hydraulic conductivity), use and vegetation, and geographic setting.
5. Estimate percent sand, silt, and clay for soil samples and determine texture class using the texture triangle. Explain how texture is important and what other soil characteristics it can affect.

## **Key Point 2—Soil Ecosystems**

### **Learning Objectives:**

1. Recognize that biological diversity is crucial to soil health and hence plant, human, and environmental health.
2. Understand how the hydrologic, carbon, and nutrient cycles relate to soil management.
3. Recognize that ecosystem biodiversity is often a reflection of soil biodiversity.

### **Suggested Activities:**

1. Draw a soil food web and discuss why biodiversity is important to healthy soil. For inspiration, see the “Organisms” section of the *Oregon Envirothon Soils and Land Use Manual*.
2. Diagram the nitrogen, carbon, and phosphorus cycles and identify the types of organisms involved. Identify their roles in organic matter decomposition and nutrient cycling.
3. Discuss how the different soil types described in the Soil Classification and Land Use section of the *Oregon Envirothon Soils and Land Use Manual* support different types of ecosystems. Imagine which kinds of plants can grow in each system and how they affect soil.

## **Key Point 3—Chemical Properties of Soil and Soil Fertility**

### **Learning Objectives:**

1. Understand how to sample a soil for lab analysis.
2. Know that plants receive nutrients from the soil and return organic matter to the soil as they break down.
3. Understand how soil fertility relates to the physical and chemical properties of the soil.

### **Suggested Activities:**

1. Collect a soil sample and measure pH, nitrogen (N), Phosphorus (P), and Potassium (K). Record your data and discuss the results. Refer to the Soil Investigations section of the *Oregon Envirothon Soils and Land Use Manual* to learn about soil sampling tools and to Oregon State University's *A Guide to Collecting Soil Samples for Farms and Gardens* (available online).
2. Explain how soil characteristics like texture and organic matter content may affect nutrient management. Hint: think about leaching and how water and nutrients move in the soil profile.
3. Discuss the risks and benefits of using synthetic fertilizer compared to compost. How might this change for a bare area versus one covered in vegetation?

## **Key Point 4—Soil Conservation and Land Use Management**

### **Learning Objectives:**

1. Name common land uses in Oregon and explain how they affect the soil.
2. Discuss how soils filter water and how slope plays a role. See the Soil Permeability/ $K_{sat}$ , Slope, and Soil Drainage Classes sections of the *Oregon Envirothon Soils and Land Use Manual*.
3. Describe natural resource career opportunities and the role of government in managing land.

### **Suggested Activities:**

1. Identify different land uses on a map of Oregon and discuss what kinds of soils support them. Use [Web Soil Survey](#) or [SoilWeb](#) to look at soil profile descriptions in these areas. Discuss how different management might affect the soil and how the soil characteristics might limit land use.
2. Practice using topographic maps to measure slope and compare this to an elevation map made from LiDAR data. Discuss different areas on your map and where you might expect more or less soil erosion and why.
3. Measure slope outside using a clinometer or slope finder and discuss what might happen during a heavy rain event. Notice the ground cover or lack thereof. If possible, dig a small soil pit or push a piece of wire into the topsoil and determine if compaction is present. Classify the soil's permeability/  $K_{sat}$ , drainage class, and slope class. Discuss whether this area would filter water and why or why not.
4. Browse the Natural Resources Conservation Service's careers website. Identify your local Soil and Water Conservation District and look at the staff page. If possible, invite staff to talk to your class about what they do.