

Soil Monolith Curriculum



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These lessons were created to help participants understand the 12 soil orders, their development and importance, and the traits used to identify each.

Curriculum Structure

The *Soil Monolith Curriculum* is composed of the following lessons. Approximate lesson times are included.

Lesson	Title	Approximate Time
One	Soil Horizons	45 minutes
Two	Soil Orders	105 minutes
	Total	2.5 hours

Lesson Structure

Each lesson begins with a Lesson Overview, Lesson Objectives, and a Lesson at a Glance table that lists lesson activities, materials required, suggested preparation steps, and approximate class time.

Lesson Sections

The actual lesson follows the overview, which contains some of the sections described below.

FOCUS

Every lesson begins with a FOCUS activity intended to capture participants' attention. This may be in the form of a small or large class discussion, a game, a demonstration, or a review of previous lesson information. During this activity, participants are introduced to the topic of the lesson.

LEARN

The LEARN activity in each lesson varies in its presentation mode. It may be a slide presentation, group activity, or demonstration.

REVIEW

The majority of lessons end with a REVIEW activity intended to briefly review the lesson's key messages or main points.

Lesson One – Soil Horizons

Lesson Overview

This lesson will focus on the diagnostic soil horizons found in mineral soils and how they affect plant growth.

Lesson Objectives

After completing this lesson, participants will be able to:

- Identify the various possible diagnostic horizons found in mineral soils
- Distinguish the traits that make each layer unique
- Describe the effect each horizon has on plant growth
- Correctly locate soil horizons when examining a soil monolith

Lesson at a Glance

Activity	Materials	Preparation	Approximate class time
FOCUS	• <i>Soil Horizons</i> worksheet • <i>Soil Horizons – Answer Key</i> • Soil Monolith Models • <i>Soil Horizons</i> slide presentation • <i>Focus Assessment</i> • <i>Focus Assessment – Answer Key</i>	1. Print/photocopy the <i>Soil Horizons</i> worksheet (one per participant) 2. Prepare the <i>Soil Horizons</i> slide presentation for viewing 3. Print/photocopy the <i>Focus Assessment</i> (one per participant) 4. Prepare the Soil Monolith Models	10-15 minutes
LEARN	• <i>Soil Horizons</i> slide presentation • Soil Monolith Models • <i>Soil Monolith Horizons Identification Cards</i>	1. Print/photocopy <i>Soil Monolith Horizons Identification Cards</i> 2. Prepare the <i>Soil Horizons</i> slide presentation for viewing 3. Prepare the Soil Monolith Models	20-30 minutes
REVIEW	• Soil Monolith Models for Mollisol, Alfisol, and Entisol • <i>Soil Profiles</i> worksheet • <i>Soil Profiles – Answer Key</i> • <i>Soil Horizons Quiz</i> • <i>Soil Horizons Quiz – Answer Key</i>	1. Set out Soil Monolith Models 2. Print/photocopy the <i>Soil Profiles</i> worksheet and <i>Soil Horizons Quiz</i> (one of each per participant)	10-15 minutes

Lesson One – Soil Horizons

FOCUS: Introduction to Soil Horizons

10-15 minutes

Purpose:

Participants work to identify the various horizons found in the soil profile.

Materials:

1. *Soil Horizons* worksheet
2. *Soil Horizons* – Answer Key
3. Soil Monolith Models
4. *Focus Assessment*
5. *Focus Assessment* – Answer Key
6. *Soil Horizons* slide presentation

Facilitation Steps:

1. Distribute the *Soil Horizons* worksheet to the participants.
2. Set out the Soil Monolith Models.
3. Give participants five minutes to identify the common horizons found in a soil profile on their own.
4. Show the *Soil Horizons* presentation slides one through nine.
5. Review the answers to the *Soil Horizon* worksheet with participants and see how many questions they answered correctly.
6. Distribute the *Focus Assessment* to participants and give them five minutes to complete it.
7. Review the assessment answer together to see how they did.

Facilitator Notes:

Slide 1: Title slide

Slide 2: What Are Soil Horizons?

Soil profiles can have very different arrangements

The horizons can vary in thickness from less than one inch to several feet

Slide 3: Why Are the Layers Different?

The different combinations of parent material, topography, climate, organism, and the length of time that has passed create different soils.

The best uses for a soil are determined by its features.

Slide 4: O Horizon

The O (organic) horizon is usually only found in forests. It is made of leaf litter and debris.

Slide 5: A Horizon

The A horizon has the most living organisms in a soil profile.

Plants absorb most of their nutrients from the A horizon.

Granular structure is common here.

Slide 6: E Horizon

The E horizon has lost some of its clay and organic matter from leaching.

Platy structure is commonly found in the E horizon, which can slow water movement.

Slide 7: B Horizon

The B horizon strongly affects water movement in the profile.

Clay, organic matter, minerals, and other leached particles end up here.

Slide 8: C Horizon

Loose unconsolidated material called “pre-soil.”

The parent material present helps determine how the mature soil will look.

Slide 9: R Horizon

Available rooting depth of the soil profile is determined by the depth to bedrock.

Name: _____ Class: _____

Soil Horizons Worksheet

Directions: Using the word bank, label the different soil horizons.

C Horizon

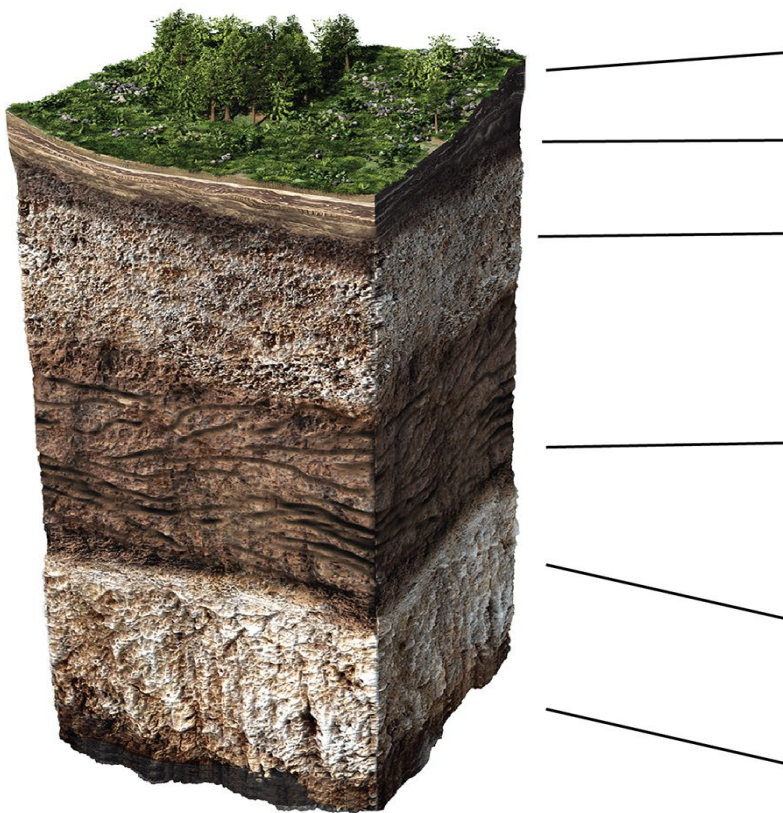
B Horizon

E Horizon

A Horizon

R Horizon

O Horizon



Soil Horizons Worksheet – Answer Key

Directions: Using the word bank, label the different soil horizons.

C Horizon

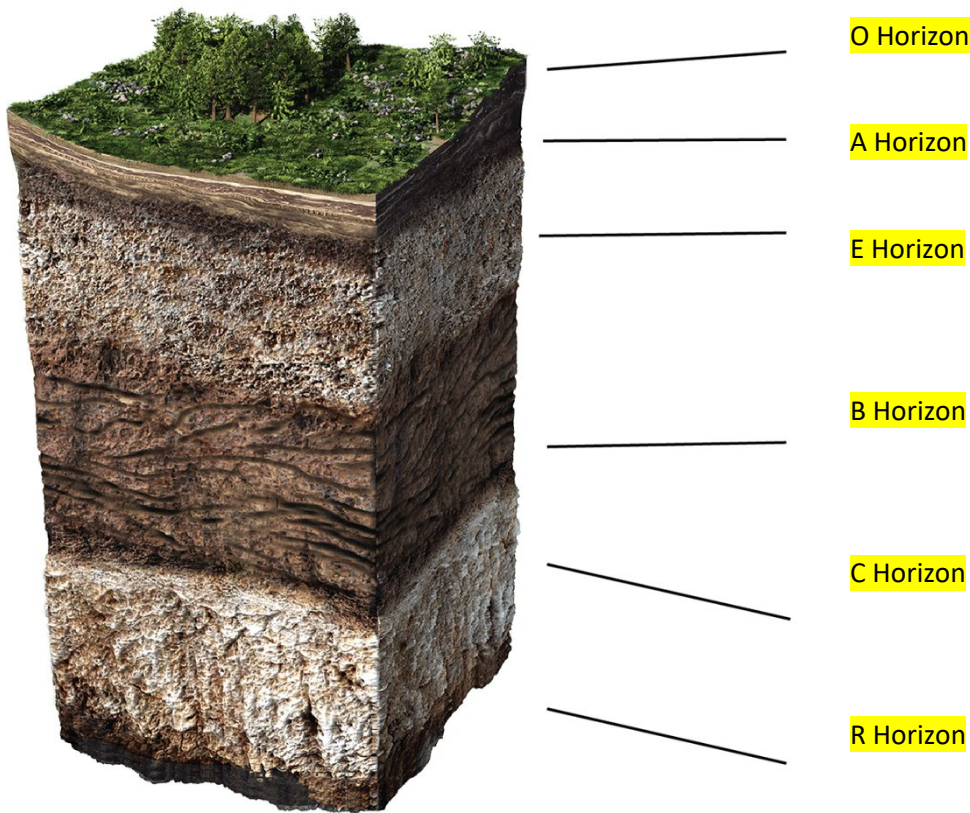
B Horizon

E Horizon

A Horizon

R Horizon

O Horizon



Name: _____ Class: _____

Focus Assessment

Directions: Match the letter designation for each soil horizon at left with its descriptive name at right.

- | | |
|--------------------|--------------------|
| 1. _____ O Horizon | a. Platy structure |
| 2. _____ A Horizon | b. Bedrock |
| 3. _____ E Horizon | c. Parent Material |
| 4. _____ B Horizon | d. Topsoil |
| 5. _____ C Horizon | e. Organic layer |
| 6. _____ R Horizon | f. Subsoil |

Focus Assessment – Answer Key

Directions: Match the letter designation for each soil horizon at left with its descriptive name at right.

1. e O Horizon
2. d A Horizon
3. a E Horizon
4. f B Horizon
5. c C Horizon
6. b R Horizon

- a. Platy structure
- b. Bedrock
- c. Parent Material
- d. Topsoil
- e. Organic layer
- f. Subsoil

Lesson One – Soil Horizons

LEARN: Soil Monoliths

20-30 minutes

Purpose: Participants will work in groups to identify the horizons present in the Soil Monolith Models and the *Soil Horizon Identification Cards*.

Materials:

1. *Soil Horizons* slide presentation
2. Soil Monolith Models
3. *Soil Monolith Horizon Identification Cards*

Facilitation Steps:

1. Display the set of 12 Soil Monolith Models in the classroom.
2. Place the participants in groups and assign them a set of Soil Monolith Models to work with. Each group should have approximately the same number of Soil Monolith Models.
3. Each Soil Monolith has a set of *Horizon Identification cards*.
4. Participants should identify the horizons on each Soil Monolith and place an identification card in the correct location.
5. When all groups are finished, show the *Soil Horizons* slide presentation (slides 10-21). Review the horizons to see how many horizons they correctly identified.

Slide 10: Entisols

Soils haven't had time to develop a B horizon.

There is a wide variety of traits in Entisols.

Slide 11: Inceptisols

Soils often have rocks in all the layers which can affect productivity.

Slide 12: Alfisols

Leaching clays or minerals causes the E horizon.

The E horizon can reduce water movement and rooting in plants.

Slide 13: Mollisols

These are the most common and fertile soils in the U.S.

Slide 14: Gelisols

The layer of ice below the O horizon lasts all year long.

Gelisols can store large amounts of carbon in organic matter.

Slide 15: Andisols

Andisols form in volcanic ash residues.

Slide 16: Histosols

Histosols form in wet, poorly aerated conditions like swamps or bogs.

Slide 17: Aridisols

Aridisols are very old, but lack of moisture has slowed their development.

Unique layers can form on the surface or in the subsoil due to weathering.

Slide 18: Vertisols

Mixing of topsoil in the subsoil often happens during dry seasons.

Crop root systems can be seriously damaged by topsoil cracking.

Vertisols are not suitable for building foundations.

Slide 19: Ultisols

These soils usually form under forests.

These soils can be very productive if properly fertilized.

Slide 20: Oxisols

Oxisols are easily identified by their deep B horizon layer.

They are very infertile due to leaching.

Slide 21: Spodosols

The whitish E horizon is almost entirely quartz sand.

These soils are leached

Soil Monolith Horizon Identification Cards

Directions: Place the horizon cards for each soil monolith in the correct location on each model.

Entisols A Horizon	Entisols C Horizon	Inceptisols A Horizon	Inceptisols B Horizon	Inceptisols C Horizon
Alfisols O Horizon	Alfisols A Horizon	Alfisols E Horizon	Alfisols C Horizon	Mollisols A Horizon
Mollisols B Horizon	Mollisols C Horizon	Gelisols O Horizon	Gelisols C Horizon	Gelisols Permafrost Layer
Andisols A Horizon	Andisols B Horizon	Andisols C Horizon	Histosols O Horizon	Vertisols A Horizon
Vertisols B Horizon	Vertisols C Horizon	Aridisols A Horizon	Aridisols B Horizon	Aridisols C Horizon
Ultisols A Horizon	Ultisols E Horizon	Ultisols B Horizon	Oxisols B Horizon	Spodosols O Horizon
Spodosols C Horizon	Spodosols B Horizon	Spodosols E Horizon	Spodosols A Horizon	

Lesson One – Soil Horizons

REVIEW: Soil Horizons

10-15 minutes

Purpose:

Participants use colored pencils or markers to highlight the different layers in four common soil orders on a worksheet.

Materials:

1. *Soil Profile* worksheet
2. *Soil Profile* – Answer Key
3. *Soil Horizon Quiz*
4. *Soil Horizon Quiz* – Answer Key

Facilitation Steps:

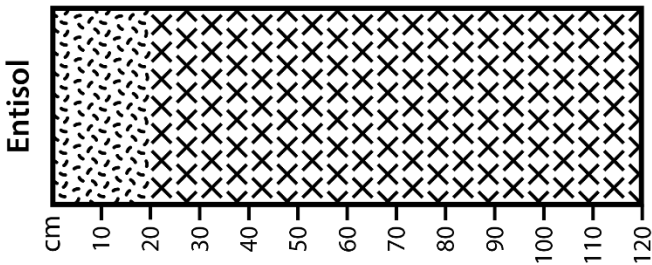
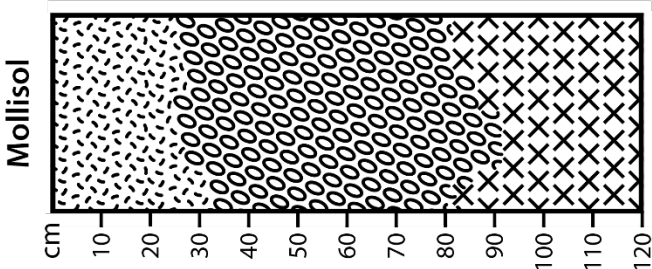
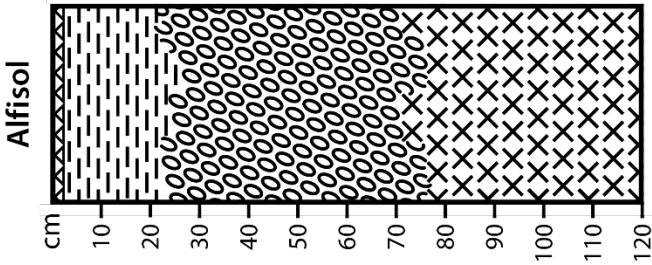
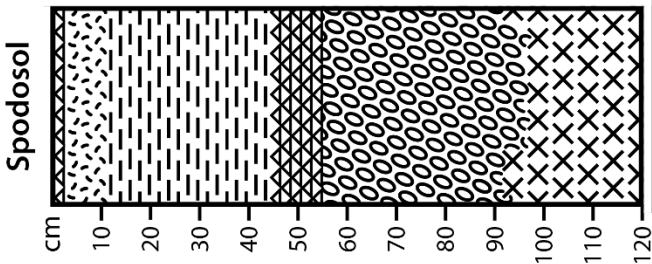
1. Distribute the *Soil Profile* worksheet to each participant, along with colored pencils or markers.
2. Have participants color in the profile horizons, using a different color for each layer.
3. When done, review the horizon names for each order listed.
4. Distribute the *Soil Horizon Quiz*.
5. Have participants complete the quiz on their own. Collect when done.

Soil Profile Worksheet

Name: _____ Class: _____

Directions: For soil profiles in the drawings below, use colored pencils or markers to show the different horizons present. Then label the horizons with the appropriate letter.

/ \ / \ = Topsoil 0000 = Subsoil xxxx = Parent Material
----- = Illuvial zone ^^^^ = Organic Matter



Soil Profile Worksheet – Answer Key

Name: _____ Class: _____

Directions: For soil profiles in the drawings below, use colored pencils or markers to show the different horizons present. Then label the horizons with the appropriate letter. Use the following key to identify the horizons.

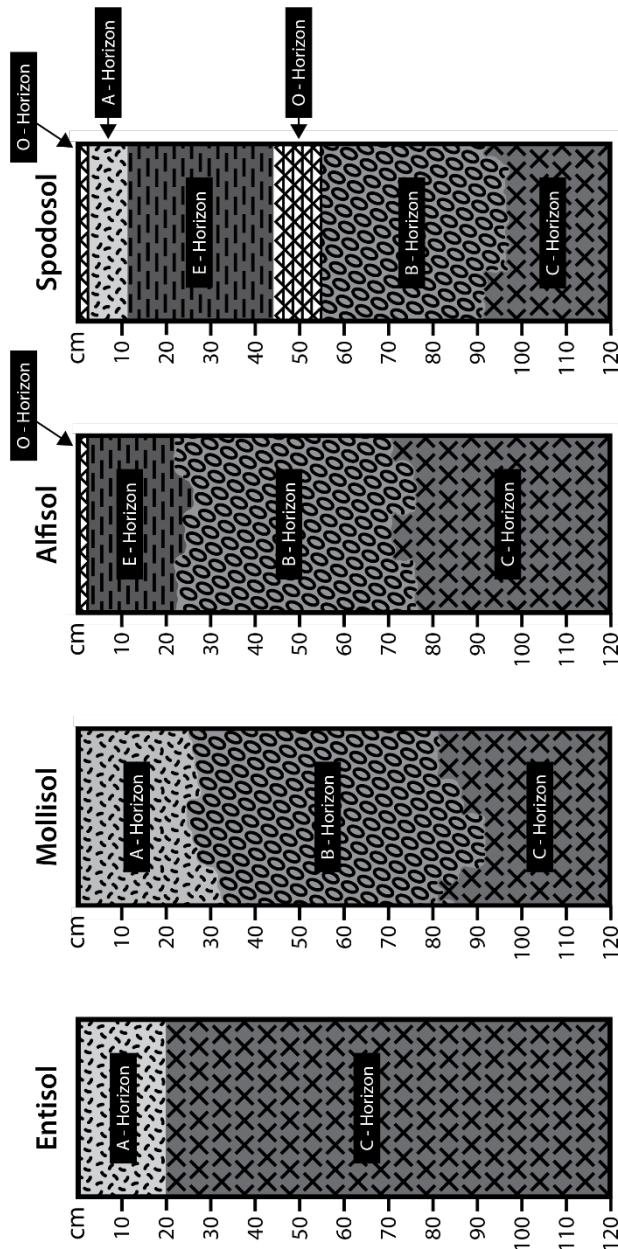
/ \ / \ = Topsoil

0000 = Subsoil

xxxx = Parent Material

----- = Eluviation zone

^^^ = Organic Matter



Name: _____ Class: _____

Soil Horizons Quiz

Directions: Circle the correct answer for each question below.

1. _____ is the dark layer of decomposed plant and animal residues usually found at the soil surface.
a. Topsoil b. Eluviation zone c. Subsoil d. Parent material
2. The _____ are layers of different colors, texture, or structure in a soil profile.
a. horizons b. monoliths c. sections d. peds
3. _____ is the layer that controls drainage in the soil profile.
a. Topsoil b. Eluviation zone c. Subsoil d. Parent material
4. _____ is the layer that soils are created from over time.
a. Topsoil b. Eluviation zone c. Subsoil d. Parent material
5. Older soil profiles will have _____ layers visible than younger soils.
a. more b. less c. the same number as d. makes no difference

Soil Horizons Quiz – Answer Key

1. _____ is the dark layer of decomposed plant and animal residues usually found at the soil surface.
a. **Topsoil** b. Eluviation zone c. Subsoil d. Parent material
2. The _____ are layers of different colors, texture, or structure in a soil profile.
a. **horizons** b. monoliths c. sections d. peds
3. _____ is the layer that controls drainage in the soil profile.
a. Topsoil b. Eluviation zone c. **Subsoil** d. Parent material
4. _____ is the layer that soils are created from over time.
a. Topsoil b. Eluviation zone c. Subsoil d. **Parent material**
5. Older soil profiles will have _____ layers visible than younger soils.
a. **more** b. less c. the same number as d. makes no difference

Sources

1. Brady, Nyle & Weil, Ray. (2010). *Elements of the Nature and Properties of Soils*. Third Edition. Prentice-Hall Publishers.
2. *The Twelve Soil Orders*. Retrieved from [Soil Orders | Soil & Water Systems | University of Idaho \(uidaho.edu\)](#). University of Idaho, Department of Soil and Water Systems
3. *Soil Orders*. Retrieved from [Soil Formation and Classification | NRCS Soils \(usda.gov\)](#). United States Department of Agriculture, Natural Resources and Conservation Service.

Lesson Two – Soil Orders

Lesson Overview

This lesson will focus on what soil monoliths are, how they are made, and how they are used to teach soil science.

Lesson Objectives

After completing this lesson, participants will be able to:

- Identify what a soil order is
- Explain how they are made
- Compare the horizons found in different soil orders
- Identify soils based on the horizons found in a soil order

Lesson at a Glance

Activity	Materials	Preparation	Approximate class time
FOCUS	• <i>Soil Orders and Their Formation</i> slide presentation • <i>Soil Orders in the U.S.</i> worksheet • <i>Soil Orders in the U.S. – Answer Key</i> • Soil Monolith Models	1. Print/photocopy the <i>Soil Orders in the U.S.</i> worksheet (one per participant) 2. Prepare <i>Soil Orders and Their Formation</i> slide presentation	10-15 minutes
LEARN	• <i>Soil Orders in the U.S.</i> slide presentation • <i>Soil Orders in the U.S. Note Sheet</i> • <i>Soil Orders in the U.S. Note Sheet – Answer Key</i>	1. Print/photocopy <i>Soil Orders of the U.S. Note Sheet</i> (one per participant) 2. Prepare the <i>Soil Orders in the U.S.</i> slide presentation.	45 minutes
REVIEW	• Soil Monolith Models • <i>Soil Monolith ID Worksheet</i> • <i>Soil Monolith ID Worksheet – Answer Key</i> • <i>Review Assessment</i> • <i>Review Assessment – Answer Key</i>	1. Print/photocopy the <i>Soil Monolith ID Worksheet</i> (one per participant) 2. Set out the 12 Soil Monolith Models without their identifying names. 3. Have the participants use the Soil Monolith Models and their note sheet from the lesson to identify each soil order. 4. Collect their worksheets when finished. 5. When the participants are finished, review each monolith model one at a time, pointing out the identifying characteristic(s) on each and the correct answer.	20 minutes

Lesson Two – Soil Orders

FOCUS: Introduction to Soil Orders

10-15 minutes

Purpose:

Participants work in pairs to identify different soil orders in their area and how monoliths can be used to learn about them.

Materials:

1. Soil Order map of the United States
2. *Soil Orders and Their Formation* slide presentation
3. *Soil Orders in the U.S.* worksheet
4. *Soil Orders in the U.S. – Answer Key*
5. Soil Monolith Models

Facilitation Steps:

1. Distribute the *Soil Orders in the U.S.* worksheet.
2. Show slide 2 with the map of the Soil Orders of the U.S. You can also do a web search for “Soil Order Maps” and find the different soil orders in the United States or go to the USDA website on soil classifications, located here: https://www.nrcs.usda.gov/Internet/FSE_MEDIA/stelprdb1237749.pdf
3. Ask the participants to find their home state and identify the dominant soil orders found in their area. Highlight that order on the worksheet.
4. Allow five minutes for this part of the lesson.
5. After they identify the soil order in their region, ask the participants to find a different soil order in a state in another part of the country.
6. Select two Soil Monolith Models based on the orders identified by the participants.
7. Ask, “Why do they look so different?”
8. After participants have provided possible answers, show the rest of the presentation on soil order formation.
9. Have participants answer the questions on the worksheet as they watch the presentation.

Facilitator Notes:

Slide 1: Title Slide

Slide 2: Soil Orders of the U S

Slide 3: What are Soil Orders?

The U.S. has a collection of the twelve soil orders.

Putting objects into groups is called “classification.”

Soils in the same category are similar to each other.

Slide 4: What Determines the Order?

The weather and soil conditions vary across the U.S.

Soil orders have one or more traits that make it easier to identify them.

Slide 5: What Are Some of the Traits That Make Them Different?

The parent material, or “pre-soil” varies in texture and age.

The poster graphic shows color images of all the soil orders.

Note the variety of colors and layers present.

Slide 6: Native Vegetation

Most U.S. soils developed underneath either prairie grasses or forests.

The forests would be either deciduous or evergreen trees, depending on the climate and location.

Slide 7: Parent Materials

Parent materials will vary based on how they were created or moved to an area.

The textures will have a great effect on the soils that develop later.

Slide 8: Climate Factors

Climate is a combination of precipitation and temperature for an area.

This affects plant growth rates, organic matter levels, and leaching.

Slide 9: Amount of Weathering and Development

As soils age, they develop stronger horizons, become more weathered, and become more heavily leached.

Name: _____ Class: _____

Soil Orders in the U.S.

Directions: Answer the following questions, based on the *Soil Orders and Their Formation* slide presentation and Soil Order Monolith Models.

1. Your home state: _____
2. Most common soil order in your area from the map:

3. State you chose from a different part of the United States: _____
4. Most common soil order found in that state: _____
5. Differences you see between two Soil Order Monolith Models presented today:

6. Possible reasons for the difference in appearance of the Monolith Models:

7. Soil _____ are the largest and most general group in soil classification.
8. They can often be identified by looking at one particular _____.
9. Deciduous trees, coniferous trees, and prairie grass are some of the _____
_____ that help create different soils.
10. _____ have a great effect on soils that develop later.
11. The amount of _____ or the annual range in _____ affects soil formation.
12. As soils age, they show more distinct _____ as well as increasing amounts of _____ and _____.

Soil Orders in the U.S. – Answer Key

Directions: Answer the following questions, based on the *Soil Orders and Their Formation* slide presentation and Soil Order Monolith Models.

1. Your home state:

Answers vary

2. Most common soil order in your area from map:

Answers vary

3. State you chose from a different part of the United States:

Answers vary

4. Most common soil order found in that state:

Answers vary

5. Differences you see between two Soil Order Monolith Models presented today:

Answers vary. Participants could identify colors, horizons present, thickness of the horizons, and visible structures as differences

6. Possible reasons for the difference in appearance of the Monolith Models:

Soils formed under different conditions. Soils that are older than others and/or created with different ingredients.

7. Soil orders are the largest and most general group in soil classification.

8. They can often be identified by looking at one particular characteristic or trait

9. Deciduous trees, coniferous trees, or prairie grass are some of the native vegetation that help create different soils.

10. Parent materials have a great effect on soils that develop later.

11. The amount of precipitation or the annual range in temperature affects soil formation.

12. As soils age, they show more distinct horizons and increasing amounts of weathering and leaching.

Lesson Two – Soil Orders

LEARN: The 12 Soil Orders in the U.S.

45 minutes

Purpose:

Participants work as individuals to learn the identifying characteristics of the 12 soil orders.

Materials:

- *Soil Orders in the U.S.* slide presentation
- *Soil Orders in the U.S. Note Sheet*
- *Soil Orders in the US Notesheet Answer Key*

Facilitation Steps:

1. Distribute the *Soil Orders in the U.S. Note Sheet* to each participant.
2. Go through the *Soil Orders in the U.S.* slide presentation.
3. Have the participants take notes during the presentation.

Facilitator Notes:

Slide 1: Title slide

Slides 2-4: Entisols

Notice the uniform colors found and the lack of a subsoil development.

Entisols are common in the river valleys of the U.S.

Slides 5-7: Inceptisols

The B horizon is evident, along with lots of rocks from the parent material.

Inceptisols are common in the Appalachian states of the eastern U.S.

Slides 8-10: Andisols

Andisol soils can be very fertile, even though they have a thinner A horizon.

Andisols are found in Hawaii, Alaska, and the Pacific Northwest.

Slides 11-13: Mollisols

The highly productive Mollisols are a product of centuries of grasses growing.

Mollisols are common in the Great Plains and Corn Belt states.

Slides 14-16: Alfisols

Alfisols are found in places that had forests of trees like oaks, ash, or maples.

Alfisols are common in the hills and valleys of the Midwest.

Slides 17-19: Gelisols

The lens of ice under the A horizon is called “permafrost.”

Gelisols are only found in Alaska in the U.S.

Slides 20-22: Histosols

Histosols are very dark and spongy from the organic matter present.

Histosols are commonly found in the upper Midwest, Florida, and Louisiana.

Slides 23-25: Vertisols

Vertisols often develop in areas with a monsoon climate of rainy and dry seasons.

Vertisols are commonly found in Texas and the Mississippi River Valley.

Slides 26-28: Spodosols

The dark gray band under the topsoil is easily visible in Spodosols.

Many states in the Northeastern U.S. have Spodosol soils.

Slides 29-31: Ultisols

Ultisols have a thin topsoil layer, but the B horizon is very weathered and oxidized.

Ultisols are commonly found in the Southern States like Georgia, Alabama, and the Carolinas.

Slides 32-34: Oxisols

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The entire profile of an Oxisol is reddish orange due to weathering.

Oxisols are found in tropical zones like Puerto Rico and Hawaii.

Slide 35-37: Aridisols

Due to the lack of precipitation in desert areas, Aridisols have very little organic matter present.

Aridisols are common in the Western States from Idaho to Texas.

Name: _____ Class: _____

Soil Orders in the U.S. Note Sheet

Directions: Supply the missing information for each soil order as your instructor covers them on the *Soil Orders in the U.S.* slide presentation.

1. _____ can be identified by the lack of a B horizon. They are often found in floodplains, or at the _____ of a slope where erosion has occurred.
2. _____ are a young soil order that doesn't show any evidence of leaching or weathering. One common identifying trait is the presence of _____ in the B horizon.
3. _____ are soils that were formed in volcanic _____. They are common in the Pacific Rim. These soils can be identified by the high amounts of _____.
4. _____ are easily identified by the thick, dark-colored A _____. They were formed underneath _____ in moderate climates.
5. _____ are the soils that formed under timber woodlands. They are developed enough for _____ to start leaching down. They can be identified by the presence of the _____ horizon.
6. _____ are the unique soils that form only in cold climates. They are high in organic matter and can be identified by the presence of a _____ layer.
7. _____ soils are formed in swamps, marshes, and other places with _____ soils. They can be identified by the deep, dark layer of _____ present.

8. _____ are created in high clay soils that experience wet and dry seasons each year. The deep _____ that form in dry periods are easily visible.
9. _____ soils form under evergreen forests in sandy soils. They can be identified by the _____ layer that forms, often with dark _____ below it.
10. _____ are common in the Southeast U.S. They form in _____ and _____ conditions. They can be identified by the _____ topsoil with a _____ subsoil below it.
11. _____ soils are formed in tropical environments. They are characterized by the oxidized, _____ color that is consistent throughout.
12. The _____ are found in desert regions across the world. They are most easily identified by the low levels of _____ and the accumulations of minerals like gypsum, salt, or other minerals.

Soil Orders of the U.S. Note Sheet

– Answer Key

1. **Entisols** can be identified by the lack of a B Horizon. They are often found in floodplains, or at the **base** of a slope where erosion has occurred.
2. **Inceptisols** are a young soil order that doesn't show any evidence of leaching or weathering. One common identifying trait is the presence of **rocks** in the B horizon.
3. **Andisols** are soils that were formed in volcanic **ash**. They are common in the Pacific Rim. These soils can be identified by the high amount of **volcanic glass**.
4. **Mollisols** are easily identified by the thick, dark-colored A **horizon**. They were formed underneath **prairie grasses** in moderate climates.
5. **Alfisols** are the soils that formed under timber woodlands. They are developed enough for **clays** to start leaching down. They can be identified by the presence of the **E** horizon.
6. **Gelisols** are the unique soils that form only in cold climates. They are high in organic matter and can be identified by the presence of a **permafrost** layer.
7. **Histosol** soils are formed in swamps, bogs, marshes, and other places with **saturated** soils. They can be identified by the deep, dark layer of **organic matter** present.
8. **Vertisols** are created in high clay soils that experience wet and dry seasons each year. The deep **cracks** that form in dry periods are easily visible.
9. **Spodosol** soils form under evergreen forests in sandy soils. They can be identified by the **ashy gray** layer that forms, often with reddish brown **streaks** below it.
10. **Ultisols** are common in the Southeast U.S. They form in **humid** and **warm** conditions. They can be identified by the **light brown** topsoil with a **red** subsoil below it.
11. **Oxisol** soils are formed in tropical environments. They are characterized by the oxidized **reddish orange** color that is consistent throughout.
12. The **Aridisols** are found in desert regions across the world. They are most easily identified by the low levels of **organic matter** and the accumulations of minerals like gypsum, salt, or other minerals.

Lesson Two – Soil Orders

REVIEW: Identifying Soil Orders

20 minutes

Purpose:

Participants work in groups to identify the 12 soil orders using the Soil Monolith Models.

Materials:

- Soil Monolith Models
- *Soil Monolith ID* worksheet
- *Soil Monolith ID* – Answer Key
- *Review Assessment*
- *Review Assessment* – Answer Key

Facilitation Steps:

1. Distribute the *Soil Monolith ID* worksheet to each participant, and set out the 12 Soil Monolith Models without their identifying names.
2. Have participants use the Soil Monolith Models and their note sheet from the Learn section to identify each soil order.
3. Collect their worksheets when they're finished, and review each monolith model. Point out the characteristic(s) and identify the orders.
4. Survey the class to see how many soil orders they correctly identified, and display the Soil Monolith Models with the correct names for participants to study on their own.
5. Distribute the review assessment quiz, and give participants five minutes to complete it.
6. Review the answers as a group and collect their sheets.

Name: _____ Class: _____

Soil Monolith ID Worksheet

Directions: Using the Soil Monolith Models and your *Soil Orders in the U.S. Note Sheet*, identify each Soil Monolith Model with its correct soil order.

Soil Order Name	Identifying Characteristic
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____
6. _____	_____
7. _____	_____
8. _____	_____
9. _____	_____
10. _____	_____
11. _____	_____
12. _____	_____

Name: _____ Class: _____

Soil Monolith ID Worksheet – Answer Key

Directions: Using the Soil Monolith Models and your *Soil Orders in the U.S. Note Sheet*, identify each Soil Monolith Model with its correct soil order.

Soil Order Name	Identifying Characteristic
1. Entisol	No B horizon
2. Inceptisol	Evident B horizon with lots of rocks
3. Andisol	Lots of volcanic glass
4. Mollisol	Thick, dark-colored A horizon
5. Alfisol	Presence of E horizon
6. Spodosol	Ashy gray layer with reddish brown streaks
7. Gelisol	Permafrost layer
8. Ultisol	Light brown topsoil and red subsoil
9. Vertisol	Deep cracks
10. Oxisol	Reddish orange color
11. Aridisol	Low levels of organic matter and many minerals
12. Histisol	Deep, dark layer of organic matter

Name: _____ Class: _____

Review Assessment

Directions: Answer the following questions by placing the correct name of soil orders in the space by each description.

1. _____ are the dark, deep, fertile soils that formed underneath the grasses of the prairies.
2. _____ are the oxidized, weathered soils that formed under forests in the Southern U.S.
3. _____ are the light-colored soils with no B horizons that form in the floodplains of the U.S.
4. _____ are the mature soils that have started to show leaching of clays into an E horizon.
5. _____ are the light-colored soils with low organic matter found in the Southwestern U.S.

Aridisol	Mollisol	Alfisol	Entisol	Ultisol
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Assessment/Quiz – Answer Key

1. **Mollisols** are the dark, deep, fertile soils that formed underneath the grasses of the prairies.
2. **Ultisols** are the oxidized, weathered soils that formed under forests in the southern US.
3. **Entisols** are the light colored soils with no B horizons that form in the floodplains of the US.
4. **Alfisols** are the mature soils that have started to show leaching of clays into an E horizon.
5. **Aridisols** are the light-colored soils with low organic matter found in the Southwestern U.S.

Aridisol	Mollisol	Alfisol	Entisol	Ultisol
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Sources

1. [Maps | NRCS Soils \(usda.gov\)](https://www.nrcs.usda.gov). Soil Order Maps of the United States
2. [Soil Orders | Soil & Water Systems | University of Idaho \(uidaho.edu\)](https://uidaho.edu). The Twelve Soil Orders, University of Idaho College of Agriculture and Life Sciences