



The Effects of Soil Erosion on Soil Profiles

Middle School Food and Agricultural Literacy Curriculum

Precepts

- B. Relationships
 - B5. Participate effectively as a team member
- I. Professional Growth
 - I4. Balance personal and professional responsibilities

National Standards

- NL-ENG.K-12.4 – Communication Skills
- NL-ENG.K-12.12 – Applying Language Skills
- NS.5-8.6 – Science in Personal and Social Perspectives
- NSS-GK-12.5 – Environment and Society

Student Learning Objectives

- As a result of this **unit** the students will...
- Explain the importance of maintaining soil quality.
- As a result of this **lesson** the students will ...
- Illustrate the impact of soil erosion using a soil profile.

Content Outline

Objective 1: Illustrate the impact of **soil erosion** using a **soil profile**

I. What is a **soil profile**?

- A. A vertical cross section of the soil.
- B. Shows layers of soil beneath the surface that vary depending on location of profile.
- C. Top layers of a **soil profile** are nutrient rich for plant growth.

II. What is **soil erosion**?

- A. The process by which soil is moved.
- B. The wearing away of the earth's surface by wind, water or ice, or other geological processes.

III. What causes **soil erosion**?

- A. Erosion is often caused by weather, for example, wind or water.

Time

Instruction time for this lesson: 45 minutes.

Resources

United States Department of Agriculture, Natural Resources Conservation Service. A Soil profile. Retrieved August 21, 2009, from United State Department of Agriculture Web Site: http://soils.usda.gov/education/resources/k_12/lessons/profile/ — United States Environmental Protection Agency. (2007). Ag 101: Soil Preparation. Retrieved August 21, 2009, from United States Environmental Protection Agency Web Site: <http://www.epa.gov/oecaagct/ag101/cropsoil.html>

Tools, Equipment, and Supplies

Overhead, writing surface, or LCD/SMART board
Writing utensil
Plain white paper – one piece per two students
MS.NR.4.1.TM.A – one per teacher
MS.NR.4.1.TM.B – Overhead or one per group of four students
MS.NR.4.1.TM.C – Overhead or one per group of four students
MS.NR.4.1.TM.D – Overhead or one per group of four students
MS.NR.4.1.ASSESS.A – one per student

Key Terms

The following terms are presented in this lesson and appear in **bold italics**:

Soil profile

Soil erosion

- B. ***Soil erosion*** can be caused by human activity, such as construction and plowing.

IV. Impact of **soil erosion**.

- A. Top layers of a ***soil profile*** that are rich in nutrients are moved and land becomes poor due to lack of quality soil.
- B. Loss of topsoil. Topsoil provides the best root environment by providing the best structure, the most air and living organisms. Topsoil contains most of the soil's organic matter and plant nutrients

Interest Approach

Prior to class starting, gather together one piece of plain white paper for each pair of students. Each student will need a writing utensil to complete the following activity. As students arrive, greet them and thank them for being on time.



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Today we're going to talk about profiles. When I say SKETCH, take one minute to draw a person's profile. Make sure you include things like the eyes, mouth, nose, and ears. Get all defining features on your paper. It does not have to be perfect, but do your best. Remember, only one minute! Oh, and you will be doing this with partners. Pick one person to do the drawing and the other to do the modeling! What questions are there? Answer any questions students might have. SKETCH.

As students begin to draw their profiles, use your judgment with the time. Do not exceed two minutes maximum on this activity. When time is up, regain the class's attention.

Great job drawing your partner's profile! Each human profile is very unique but has generally the same features. Let's start at the top of the head and work down. Who will walk us through their profile, from top to bottom? Tell us all the distinguishing features.

Have a student talk about their profile, from top to bottom.

Great job! Most profiles should look very similar. Now when I say GO, take one minute and draw a straight, horizontal line to separate each feature. Questions? GO!

Students will separate their profiles with lines to define the forehead, eyes, nose, mouth, and chin. If students have difficulty determining where to separate their profile, guide them, but do not show them what to do. Allow pairs to work on this activity for one minute. When time is up, regain the class's attention.

Great job. Notice, the profile should be separated into several layers, each having a certain job or task. All the way from the top of the head to the neck, each layer is important. Think of the top layer as representing your brain, the think-tank of your whole body. This layer is so important to ensuring that we have a productive and healthy day. If we were to miss any of these layers, especially if we were to not have our top layer, the brain, we would be at a loss.

We may never realize it, but we come in contact with a profile every day that's not our own. When we walk out on a stretch of grass we are actually walking just above the top layer of a **soil profile**. A **soil profile** shows the horizontal layers in the soil; these layers are known as soil horizons. The top layer of the **soil profile**, just like our own profiles, is important to ensure that the plants in contact with

it have a productive and healthy life. But what if that top layer just happened to wash away? Let's take a closer look and see what happens when our **soil profiles** are disrupted and plants do not have access to that all important "top layer."

Summary of Content and Teaching Strategies

Content outline can be found on **MS.NR.4.1.TM.A**. If you would like this to aid in instruction, have an overhead or writing surface available to display information. Information can be written on a large poster board or piece of paper prior to class for easy access and instruction. If technology, similar to an LCD or a SMART board, is available, prepare the following information in presentation software prior to class meeting. This will be lengthy, so ensure enough time is allotted to transfer material. Make sure all students have appropriate writing utensils and paper to collect information discussed during the lesson.

We mentioned several times in the first activity the words "**soil profile**."

Instruct students to write down the following definition.

By definition, a **soil profile** is actually the vertical cross section of the soil. It's like cutting a slice out of a three-layer cake. Take a look at this picture.

Display **MS.NR.4.1.TM.B**.

This picture is an illustration of a **soil profile**. A **soil profile** allows you to see the different types of soil that rest beneath the earth's surface. Depending on the location, the **soil profile** can vary. As we said before, the top layer of the **soil profile** shows the most nutrient rich layer, and it is the most important layer for plant health and productivity.

Objective 1: Illustrate the impact of **soil erosion** using a **soil profile**.

I. What is a **soil profile**?

- A. A vertical cross section of the soil.
- B. Shows layers of soil beneath the surface that vary depending on location of profile.
- C. Top layers of a **soil profile** are nutrient rich for plant growth.



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Unfortunately, not all **soil profiles** look this clear. A lot of times soil is moved due to weather. How many of you have been out and have seen a huge dust cloud? When it is windy, soil is moved from the top layer of the profile and transported to another location.

Instruct students to write down the following definition.

The process by which soil is moved is called **soil erosion**. **Soil erosion** can be caused by wind, water, and other weather-related events. Take a look at the following pictures. Display **MS.NR.4.1.TM.C**.

Who will explain to the class what is happening in the top picture?

Allow a student to discuss what is going on in the top picture. Erosion is happening due to rain.

Great job. Weather is probably the t major cause of erosion that we see. Areas that tend to remain moist throughout the year, like the Pacific Northwest, might encounter more issues with this type of erosion. Look at the bottom picture and explain to the class what is taking place.

Allow a student to discuss what is going on in the bottom picture. Erosion is happening due to dry conditions and strong winds.

Thank you! In this situation we see a much drier climate, similar to one we might see in a desert location; however, the wind has now become a factor. High winds in a dry climate result in frequent situations of wind erosion.

II. What is **soil erosion**?

- A. The process by which soil is moved.
- B. The wearing away of the earth's surface by wind, water or ice, or other geological processes.

III. What **causes soil erosion**?

- A. Erosion is often caused by weather, for example wind or water.

Soil erosion can be caused by human activity, such as construction and plowing.

Utilize the Me-You-Us e-Moment®.

Weather is a factor for **soil erosion**, but humans can also play a factor. How might humans be a factor in **soil erosion**? When I say WRITE, jot down as many ideas as you can think of about this statement in 30 seconds. What is the statement again?

Allow a student to repeat the question.

What questions are there? WRITE.

Students should be completing this by themselves. Allow 30 seconds. When time is up, refocus class.

Great job. When I say PAIR, turn to your neighbor and share the thoughts that you just wrote down. Each person should share their ideas. On your list, write any new ideas that your neighbor thought of that maybe you didn't. As a team, circle your top two ideas from the group. You have 30 seconds to complete this step. What questions are there? PAIR.

Students should be conversing with their neighbors and compiling a list of ways humans affect **soil erosion**. When 30 seconds is up, refocus the class's attention.

This activity should have allowed you to see some other thoughts and ideas that maybe you didn't think of. You circled two ideas that were your top selections from your team. Let's go around the room and share with the class one of your selections on ways humans affect **soil erosion**. Who will be the first to share?

Allow each group to share one selection from their list.

Excellent job! **Soil erosion** is not only an issue due to weather, but it can also be caused by things such as humans' excessive wear and tear to land. Construction sites, plowing fields, and even overwatering your yard can all cause **soil erosion**. It is important to make sure when we are performing simple tasks like watering the yard that we remember that we can play a role in preventing **soil erosion** in our community.

- A. **Soil erosion** can be caused by human activity, such as construction and plowing.

So why is **soil erosion** bad? Think back to the profile we drew. What if we were to try to have a productive and healthy life without our top layer? How does this relate to teamwork?



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Allow for some discussion: If a team member isn't active a team is of poorer quality than when all members are fully functional.

The same goes for a normal **soil profile**. The top layer is so rich in nutrients that if it is moved, the soil that remains is poor in quality. New plant life then has difficulty establishing a healthy, productive life and most of the time does not succeed.

IV. Impact of **soil erosion**.

- A. Top layers of a **soil profile** that are rich in nutrients are moved and land becomes poor due to lack of quality soil.
- B. Loss of topsoil. Topsoil provides the best root environment by providing the best structure, the most air and living organisms. Topsoil contains most of the soil's organic matter and plant nutrients.

Soil erosion has a huge impact on the quality of a **soil profile** in a given area. Erosion caused by weather cannot be prevented; however, we can make sure that our daily practices do not contribute to **soil erosion**. Let's review what we've learned today.

Review/Summary

Utilize the *Bob the Weather Guy* e-Moment.

Have students break into groups of appropriate size for your class. Groups should not exceed four students. Students will be presenting the concepts of the importance of **soil profiles** and how these can be affected by **soil erosion**. In their groups, students will be challenged to create a forecast of what will happen, showing how other people and activities might be affected. They will also give a "radar" report, explaining basic ideas and concepts covered.

To recap today's activities, we are going to summarize and forecast the state of our soil.

Please pause and hear these directions.

Brainstorm the characteristics of a weather forecast. What are some of the terms weather reporters use? Take one minute to write down as many phrases as you can think of. Questions you have? Work in your groups. GO

As students prepare their lists, locate **MS.NR.4.1.TM.D**. This will show you a list of weather reporting terms to complete the list developed by the students. At one minute, regain the class's attention.

Who will share a weather forecasting term with the class? Write students' responses on a writing surface for them to view. Great job.

Help students complete the list with the additional terms located on **MS.NR.4.1.TM.D**.

Today's final challenge is to give a "weather report" about what we learned today regarding the **soil profiles** and how they can be affected by **soil erosion**. When I say GO, groups will have three minutes to write a 30-second report. Include at least two vocabulary words, one major concept, and one prediction about what could happen in the five-day forecast. How long will your report be? Wait for students to say 30 seconds. How many vocabulary words do you need?

Wait for students to say two.

Again, create a 30-second report, including at least two vocabulary words, one major concept, and one prediction about what will happen in the five-day forecast. What questions are there? Wait and answer student questions. GO.

Allow students to work in their groups for three minutes. When students finish, allow at least two or three groups to report the "weather." If time permits, allow more to report. This would also be a great introduction activity the next day as a review of previous content.

Excellent job forecasting our "weather"! Today we learned about the impact of profiles and **soil erosion**. In the next lesson we will take it a step further and look at how the quality of soil not only affects plant life, but also animal life. Remember this information today on **soil erosion** – it will help us be successful tomorrow. Great job today understanding profiles!



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Application

Extended classroom activity:

Allow students to study more in depth the layers of a **soil profile** and learn why each is important.

FFA activity:

Allow a soil scientist to come and speak to members about the greater effects of **soil erosion** on **soil profiles**.

SAE activity:

Students can take actual **soil profiles** and determine if the level of erosion is greater near a waterway.

Evaluation

MS.NR.4.1.ASSESS.A

Answers to Evaluation

1. A vertical cross section of the soil. Show layers of soil beneath the earth's surface that can vary depending on location.
2. **Soil erosion** is the process by which soil is moved.
3. (List one of the following) Weather – wind, water; Human activity
4. Construction, plowing
5. Nutrient-rich layers are moved and soil quality becomes low. (Illustration will show layers being removed by the cause of the erosion.)



Understanding Soil Profiles and Soil Erosion

Objective 1: Illustrate the impact of soil erosion using a soil profile.

I. What is a soil profile?

- A. A vertical cross section of the soil.
- B. Shows layers of soil beneath the surface that vary depending on location of profile.
- C. Top layers of a soil profile are nutrient rich for plant growth.

II. What is soil erosion?

- A. The process by which soil is moved.
- B. The wearing away of the earth's surface by wind, water or ice, or other geological processes.

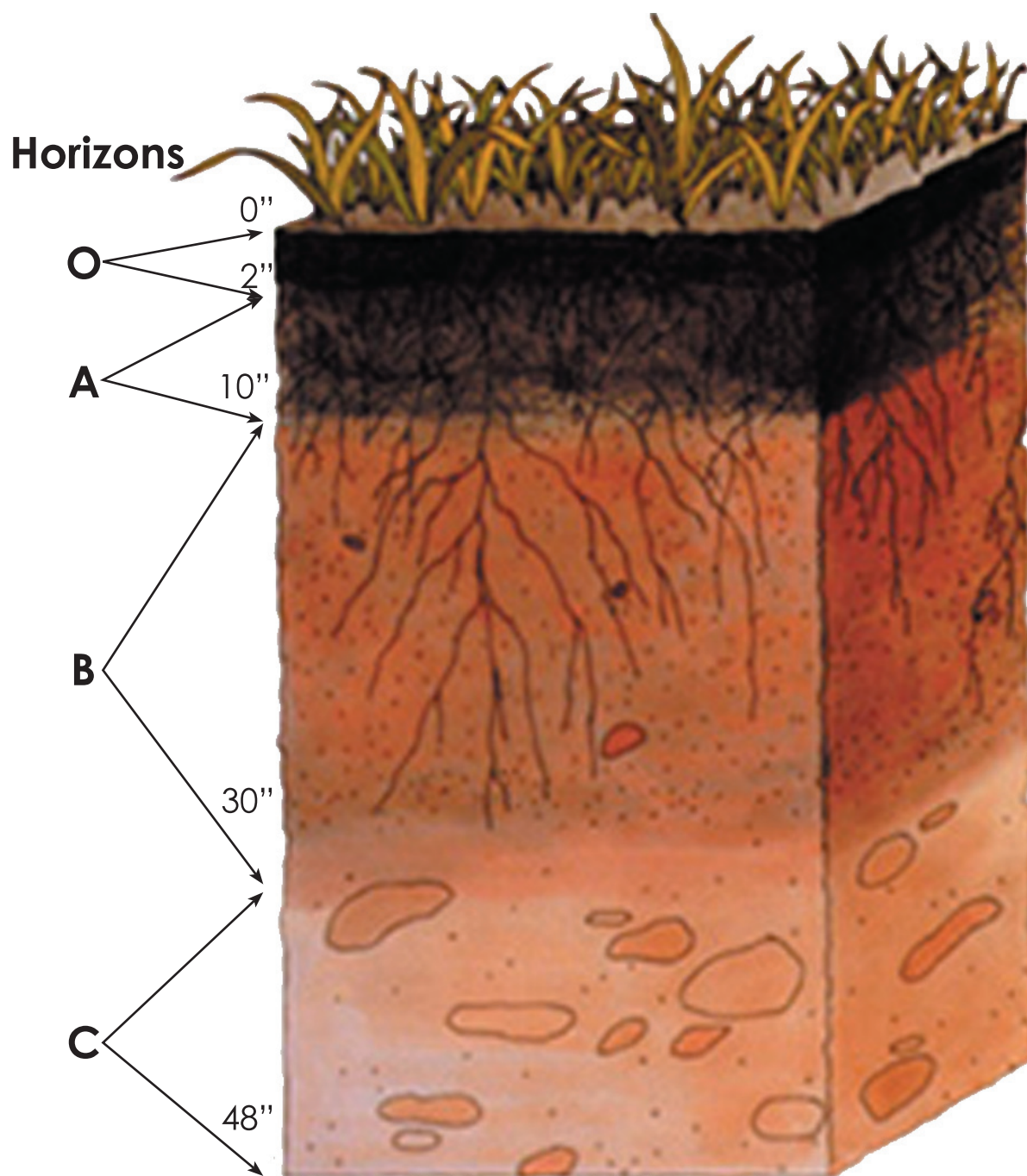
III. What cases soil erosion?

- A. Erosion is often caused by weather, for example, wind or water.
- B. Soil erosion can be caused by human activity, such as construction and plowing

IV. Impact of soil erosion.

- A. Top layers of a soil profile that are rich in nutrients are moved and land becomes poor due to lack of quality soil.
- B. Loss of topsoil. Topsoil provides the best root environment by providing the best structure, the most air and living organisms. Topsoil contains most of the soil's organic matter and plant nutrients

Soil profile Example



Examples of Soil Erosion Caused by Weather





Common Weather Terms and Phrases

Highs	Lows
Fronts	Low Pressure
High Pressure	Winds
Temperature	Humidity
Rain	Snow
Sleet	Regions
Doppler	Radar
“By mid-afternoon we’ll expect.....”	
“We’ll have partly cloudy skies until tomorrow morning, and then the skies will clear.”	



Soil Profiles and Soil Erosion

Name _____

Short Answer

Directions: Answer the following questions correctly.

1. What is a soil profile?

2. What is soil erosion?

3. List one example of something that could cause soil erosion.

4. How can humans contribute to soil erosion?

5. Give one reason why soil erosion is bad and illustrate how erosion changes a soil profile.
