

Lesson 4 Sedimentation as a Source Pollution

Overview

Now that the students are familiar with the essential parts of the ecosystem, we can explain why sedimentation is a source of pollution. Sediment deters photosynthesis by reducing sunlight. Reduced photosynthesis means less food and oxygen for other forms of aquatic life. The gills of aquatic organisms also get clogged with sediment. In Lesson 4 the %Water the Soil Can Hold Activity is completed. The homework is to finish the lab report.

Objectives

- Explain that sediment reduces photosynthesis in plants by blocking the sunlight reaching the plants.
- Recognize that less photosynthesis means less food for the ecosystem and also less oxygen.
- Identify that gills are structures found in many aquatic organisms whose function is to get oxygen from the water.
- Understand that gills are the aquatic structure that functions like lungs in obtaining oxygen for the organism.
- Recognize that sediment comes from bare soil that is eroded from the watershed into the surface water.

TEKS for 6th

(10) Earth and Space (B)

(12) Organisms and environments. (E) (F)

TEKS for 7th

(5) Matter and energy (A) (B) (C)

TEKS for 8th

(11) Organisms and environments. (A) (B) (C)

Recommended Procedure

1. Collect the Ecosystem worksheet from Lesson 3. Possibly return Rock Cycle and go over the rock cycle
2. Show the Power Point/Overhead for Lesson 4
3. Finish the % Water the Soil Can Hold Activity
4. When the students finish the activity have them start on their homework of the Water Cycle. If you have time to gather the class data the students will be expected to turn in the completed lab and the homework at the beginning of the next class period.

Materials needed for this lesson

In addition to the materials listed at the beginning of the % Water the Soil Can Hold Activity in Lesson 3, you will need a computer with a spreadsheet if you are going to do the % using a spreadsheet.

You should have colored pencils, crayons and /or markers for the students to start their water cycle homework.



Soil type assigned _____

Name _____

% Water the Soil Can Hold Activity

Purpose: We will determine the amount of water that soil can hold as a percentage of its mass when the soil is saturated.

Materials for each pair of students: funnel (or cut off plastic bottle) that will hold more than a $\frac{1}{2}$ cup of soil, two pieces of filter paper (coffee filter paper works fine), a plastic spoon, 100 ml of water and a graduated cylinder, container under the funnel to catch the water that runs through, a scale accurate at least to the tenth of a gram, heat lamp or lamp with a big bulb to dry the soils overnight, a rack to support the drying filter paper, a pipette or eye dropper (to aid in getting exactly 100 ml of water), and about a $\frac{1}{2}$ cup of soil, either sand or loam.

Procedure:

1. Write the type of soil you are given at the top of the paper and put the filter paper in the funnel.
2. Place about a $\frac{1}{2}$ cup of soil in the funnel that is lined with filter paper. (This might have already been preparing for you.)
3. Arrange the funnel so that the water that runs through the soil is collected in a container.
4. Carefully pour 100 ml of water onto the soil in the funnel being careful not to make the soil spill over.
5. When the water has nearly stopped dripping out of the funnel, the soil in the funnel is said to be **Saturated**. It is holding as much water as it can possibly hold.
6. While waiting for the water to run through your soil, WRITE YOUR NAME ON A PIECE OF DRY FILTER PAPER AND determine the mass of the clean dry piece of filter paper. Record the mass to the nearest tenth of a gram. Ask for assistance if you don't understand recording to the nearest tenth of a gram. The teacher must initial this mass before you go on.

Mass of dry paper alone: _____g.

7. Determine how much water came *through* the soil into the container and record:

Volume of water that came through the soil: _____ml

8. Place about a tablespoon of saturated soil on the paper you just weighed and weigh again with the saturated soil.

This is the mass of the paper plus **saturated** soil. Record mass here: _____g.

9. Now place your filter paper with the saturated soil (Put your hand under it so the paper will not break) on a rack under a lamp to dry overnight.

NEXT LAB SESSION

10. Determine the mass of the dry paper with the DRY soil and record:

Mass of dry paper with dry soil _____g.

Questions and Calculations

1. How many milliliters of water did you put on the soil in the funnel? _____ (units too)
Hint, you may need to reread your instructions from yesterday.
How much water came through the soil? _____. EXPLAIN why there is a difference:
 2. **When** was the soil saturated?
 3. **WHY** did the soil on the paper weigh less in procedure #10(today) than in procedure #8 (last lab) above?
 4. **EXACTLY** how much less did the paper and soil weigh after the soil dried? **SHOW WORK AND USE UNITS.** I expect to see numbers. This is the mass of the water that adhered to the saturated soil in the tablespoon. This is the mass of the water.
- Turn the page over**
5. **EXACTLY** how much did the saturated soil **ALONE** without the paper weigh? **SHOW WORK AND USE UNITS.** I expect to see numbers.
 6. If you know how to calculate the % of the saturated soil's mass that was due to water, show work here:
 7. Now go to a classroom computer and enter your data. The spreadsheet will calculate the % of your saturated soil's mass that was due to water.

sand or loam	mass of paper #7	paper + sat. soil #8	paper + DRY soil #10	soil alone in	water in g	% mass due to water
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Record the % of the mass that was due to water here:

8. Put your % up on the class data chart and record the other data entered by other groups.

Class data

% water in the saturated soil

sand									
loam									

While you are waiting for all the members of the class to enter their data, work on your homework.

CONCLUSION:

Is the % water in the saturated sand and the saturated loam the same?

EXPLAIN YOUR ANSWER. This means you back up your statement with facts and explanations.

Teacher's Guide Italics are for the teacher and are not found on the version used with the students

This activity is suitable for grades 6 through 12. Older students will be expected to do more on their own and younger students will need more guidance. The students should be familiar with the balance or scale, understand about the importance of recording the mass to the tenth of a gram, know the metric unit for volume and how to read the bottom of the meniscus in the graduated cylinder to determine the volume, before they begin this activity.

Soil type assigned_____ they will put loam or sand here

Name_____

% Water the Soil Can Hold Activity

Purpose:

We will determine the amount of water that soil can hold as a percentage of its mass when the soil is saturated.

Materials for each pair of students: funnel (or cut off plastic bottle) that will hold more than a ½ cup of soil, two pieces of filter paper (coffee filter paper works fine) , a plastic spoon, 100 ml of water and a graduated cylinder, container under the funnel to catch the water that runs through, a scale accurate at least to the tenth of a gram, heat lamp or lamp with a big bulb to dry the soils overnight, a rack to support the drying filter paper, a pipette or eye dropper (to aid in getting exactly 100 ml of water), and about a ½ cup of soil, either sand or loam.

Procedure:

1. **Write** the type of soil you are given at the top of the paper and put the filter paper in the funnel.
2. Place about a ½ cup of soil in the funnel that is lined with filter paper. (This might have already been preparing for you.)
3. Arrange the funnel so that the water that runs through the soil is collected in a container.
4. Carefully pour 100 ml of water onto the soil in the funnel being careful not to make the soil spill over.
5. When the water has nearly stopped dripping out of the funnel, the soil in the funnel is said to be **Saturated**. It is holding as much water as it can possibly hold.
6. While waiting for the water to run through your soil, **WRITE YOUR NAME ON A PIECE OF DRY FILTER PAPER AND** determine the mass of the clean dry piece of filter paper. Record the mass to the nearest tenth of a gram. Ask for assistance if you don't understand recording to the nearest tenth of a gram. The teacher must initial this mass before you go on.
Mass of dry paper alone: _____g.
7. Determine how much water came *through* the soil into the container and record:
Volume of water that came through the soil:_____ml
8. Place about a tablespoon of saturated soil on the paper you just weighed and weigh again with the saturated soil.

This is the mass of the paper plus saturated soil. Record mass here: _____g.

9. Now place your filter paper with the saturated soil (Put your hand under it so the paper will not break) on a rack under a lamp to dry overnight. *If you have a suitable drying oven, this could also be used.*

NEXT LAB SESSION

10. Determine the mass of the dry paper with the DRY soil and record:

Mass of dry paper with dry soil _____g.

Questions and Calculations

1. How many milliliters of water did you put on the soil in the funnel? _____ (units too)
Hint, you may need to reread your instructions from yesterday. *They put 100 ml of water on the soil.*
How much water came through the soil? _____. EXPLAIN why there is a difference:
They should have less than 100 ml of water coming through the soil into the container below the funnel because the soil absorbed some of the water.
2. **When** was the soil saturated? *The soil is saturated when it is holding as much water as it can possibly hold. Because this definition is given above, so there is no excuse for missing this question.*
3. **WHY** did the soil on the paper weigh less in procedure #10 (today) than in procedure #8 (last lab) above?
The soil weighed less today because the water in the soil evaporated overnight.
4. **EXACTLY** how much less did the paper and soil weigh after the soil dried? This is the mass of the water in the soil. SHOW WORK AND USE UNITS. I expect to see numbers. This is the mass of the water that adhered to the saturated soil in the tablespoon.
They will subtract the mass of the filter paper plus saturated soil (#8) from the mass of the paper with dry soil (#10) to get the mass of the water evaporated. The unit of grams should be used.
5. **EXACTLY** how much did the saturated soil ALONE without the paper weigh? SHOW WORK AND USE UNITS. I expect to see numbers. *They will subtract the mass of the paper alone (#6) from the mass of the paper with the saturated soil (#8) to get the mass of the saturated soil alone. Gram units should be used.*
6. If you know how to calculate the % of the saturated soil's mass that was due to water, show work here:
$$\text{Mass of water (\#4)} / \text{mass of the saturated soil alone (\#5)} * 100 = \% \text{ of the saturated soil's mass that was due to water}$$
7. Now go to a classroom computer and enter your data. The spreadsheet will calculate the % of your saturated soil's mass that was due to water.
I set this up on an Excel program, but any spreadsheet program will work. The students are often amazed at how quickly and easily the machine can do the calculations they slaved over.

You can make the point the scientists use spreadsheets so that all they have to do is enter the data and the machine does the repetitive calculations.

sand or loam	mass of paper #7	paper + sat. soil #8	paper + DRY soil #10	soil alone in	water in g	% mass due to water
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Record the % of the mass that was due to water here:

8. Put your % up on the class data chart and record the other data entered by other groups.

Class data

% water in the saturated soil

sand									
loam									

While you are waiting for all the members of the class to enter their data, work on your homework.
The answers will vary depending upon the sand and loam used.

Conclusion:

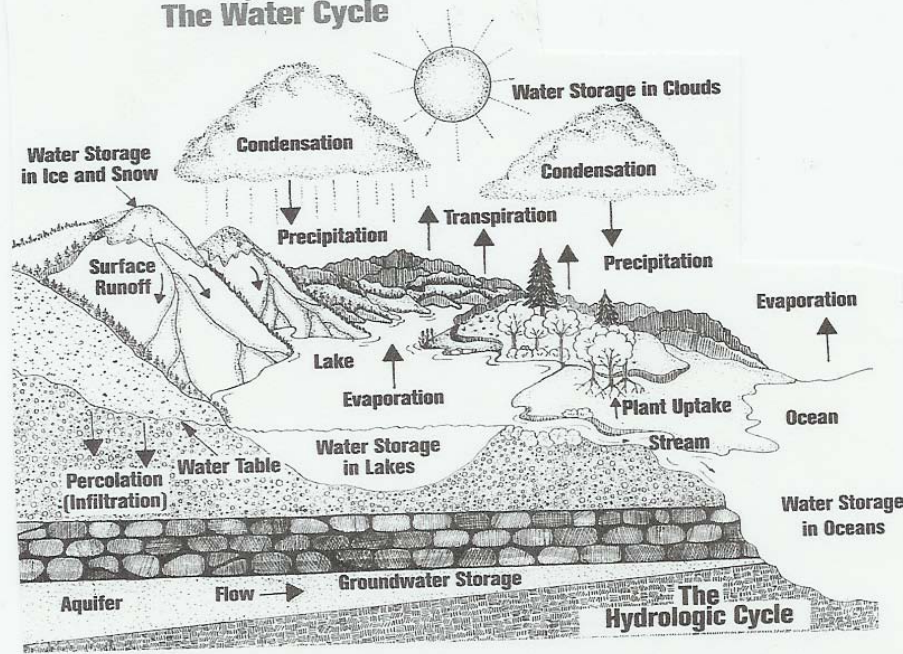
Is the % water in the saturated sand and the saturated loam the same?

Explain your answer. This means you back up your statement with facts and explanations.

The answers will vary depending upon the sand and loam used. The important thing to watch for is the use of numbers and averages to support their statement

Name _____

Figure 2-4
The Water Cycle



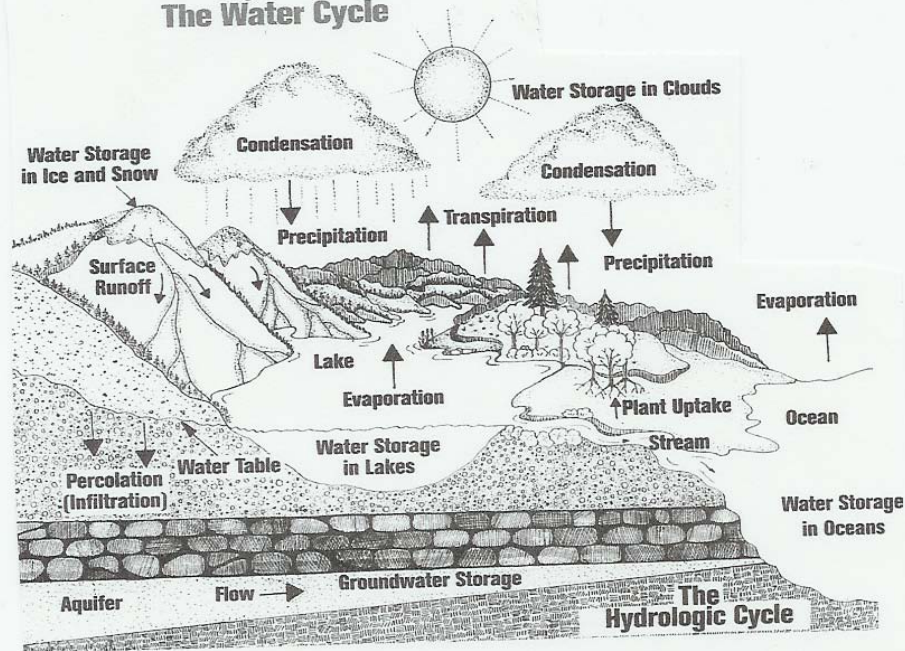
Instructions. You are going to need colored markers (pencils or anything to make colors) and you are also expected to use a **dictionary** along with the picture to answer questions below.

1. What is the source of energy for the water cycle? _____. Color the source yellow
 - a. Is this energy cycled back to the sun? _____
2. Color the aquifer blue. What is an aquifer?
3. Plants release water into the air through _____. The word is above. A dictionary will help you identify words listed above not yet familiar to you. Color the word you put in the blank (line above) green on the picture above.
4. In Condensation the water vapor in the air turns into _____ in the sky.
5. When the rainwater is not absorbed by the soil it becomes _____. Color the word you put in the blank brown.
6. List and circle above the places water can be stored shown in the picture.
7. When water goes from the liquid form into water vapor in the air, we call this _____. Color the word (It appears twice) purple
8. When water from the clouds falls as rain we call it _____. Color this word orange.
9. Put a box around the three surface water examples in the picture above.
10. When runoff is on a slant, what can it carry to the surface water? _____.

This erosion is more pronounced on soils surfaces that are _____.

Name _____

Figure 2-4
The Water Cycle



Instructions. You are going to need colored markers (pencils or anything to make colors) and you are also expected to use a **dictionary** along with the picture to answer questions below.

1. What is the source of energy for the water cycle? the sun Color the source yellow.
 - a. Is this energy cycled back to the sun? no.
 - b.
2. Color the aquifer blue. What is an aquifer? *A water bearing rock. Expect an answer here because the instructions say to use a dictionary to answer the questions.*
3. Plants release water into the air through transpiration. The word is above. A dictionary will help you identify words listed above not yet familiar to you. Color the word you put in the blank (line above) green on the picture above.
4. In Condensation the water vapor in the air turns into clouds in the sky.
5. When the rainwater is not absorbed by the soil it becomes surface runoff. Color the word you put in the blank brown.
6. List and circle above the places water can be stored shown in the picture.
They should circle and list aquifer, clouds, lakes, oceans, ice and snow.
7. When water goes from the liquid form into water vapor in the air, we call this evaporation. Color the word (It appears twice) purple
8. When water from the clouds falls as rain we call it precipitation. Color this word orange.

9. Put a box around the three surface water examples in the picture above.

Box should go around the lake, the stream and ocean. They might choose surface runoff, which is okay.

10. When runoff is on a slant, what can it carry to the surface water?

sediment.

Give an extra point if they get this right. It is not included in the diagram, but they are connecting it with Lesson 4.

This erosion is more pronounced on soils surfaces that are slanted. We cover this more in lesson 5, so I would not take off if they do not understand this yet.