

Join the Erosion Patrol Team



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References

Acknowledgements - Original Creation/Updates of the Erosion Patrol (1990s)

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Credits - Original Creation/Updates of the Erosion Patrol (1990s)

Special recognition is given to Denise Smith and Catherine Martin. This project would not have been possible without their tireless research, talent and creativity.

Amazing Soil Stories

California Association of Resource Conservation Districts

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The North Carolina Department of Environmental Quality
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Land Quality Section

RL.3.4	Determine the meaning of words and phrases as they are used in a text, identifying words that impact the meaning in a text.	Reading Literature				x									
CCR Anchor Standard RL.6	Assess how point of view, perspective, or purpose shapes the content and style of a text.	Reading Literature		x	x										
RL.3.6	Distinguish their own point of view from that of the narrator or those of the characters.	Reading Literature		x	x										
CCR Anchor Standard RL.7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words	Reading Literature		x											
RL.3.7	Explain how specific aspects of a text’s illustrations contribute to what is conveyed by the words in a story.	Reading Literature		x											
CCR Anchor Standard RI.1	Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.	Reading Informational Text				x				x	x	x	x	x	
RI.3.1	Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.	Reading Informational Text				x				x	x	x	x	x	
CCR Anchor Standard RI.2	Determine central ideas (RI) or themes (RL) of a text and analyze their development; summarize the key supporting details and ideas	Reading Informational Text				x				x	x	x	x	x	
RI.3.2	Determine the main idea of a text; recount the key details and explain how they support the main idea .	Reading Informational Text				x				x	x	x	x	x	
CCR Anchor Standard RI.3	Analyze how and why individuals, events, and ideas develop and interact over the course of a text	Reading Informational Text	x	x	x	x									
RI.3.3	Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.	Reading Informational Text	x	x	x	x									
CCR Anchor Standard RI.7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.	Reading Informational Text		x	x		x			x	x	x			
RI.3.7	Use information gained from illustrations and the words in a text to demonstrate understanding of the text.	Reading Informational Text		x	x		x			x	x	x			
RF.3.2	Create readable documents with legible handwriting (manuscript and cursive).	Reading: Foundational Skills (Handwriting)	x										x	x	
RF.3.4	Know and apply grade-level phonics and word analysis skills in decoding words. (d. Read grade-appropriate irregularly spelled words)	Reading: Foundational Skills (Phonics and Word Recognition)				x	x								

EVALUATION FORM

Teacher and Student Guides for Erosion Patrol

Please take a few minutes to fill out this form and send it to the address below. Your constructive criticism will help us improve our educational material and provide you with a better product.

Demographics:	Class/group size:	Grade or age of class/group:	
Activity 1	Did you use it? Yes or No	Circle Rating Poor 1 2 3 4 5 Excellent	Additional Comments:
Activity 2	Did you use it? Yes or No	Circle Rating Poor 1 2 3 4 5 Excellent	Additional Comments:
Activity 3	Did you use it? Yes or No	Circle Rating Poor 1 2 3 4 5 Excellent	Additional Comments:
Activity 4	Did you use it? Yes or No	Circle Rating Poor 1 2 3 4 5 Excellent	Additional Comments:
Activity 5	Did you use it? Yes or No	Circle Rating Poor 1 2 3 4 5 Excellent	Additional Comments:
Activity 6	Did you use it? Yes or No	Circle Rating Poor 1 2 3 4 5 Excellent	Additional Comments:
Activity 7	Did you use it? Yes or No	Circle Rating Poor 1 2 3 4 5 Excellent	Additional Comments:
Activity 8	Did you use it? Yes or No	Circle Rating Poor 1 2 3 4 5 Excellent	Additional Comments:
Activity 9	Did you use it? Yes or No	Circle Rating Poor 1 2 3 4 5 Excellent	Additional Comments:
Activity 10	Did you use it? Yes or No	Circle Rating Poor 1 2 3 4 5 Excellent	Additional Comments:
Activity 11	Did you use it? Yes or No	Circle Rating Poor 1 2 3 4 5 Excellent	Additional Comments:
Activity 12	Did you use it? Yes or No	Circle Rating Poor 1 2 3 4 5 Excellent	Additional Comments:
Overall Evaluation:		Circle Rating	Poor 1 2 3 4 5 Excellent
Overall Comments:			

Email to the current Sediment Education Engineer/Specialist:

[DEQ DEMLR Contact Information](#)

Or mail to: Land Quality Section
1612 Mail Service Center
Raleigh, NC 27699-1612

Introduction

About the Erosion Patrol Kit . . .

This kit is designed for the teacher to meet and expand upon selected objectives outlined in the North Carolina Department of Public Instruction, Standard Course of Study, for language arts, social studies and science.

The Erosion Patrol Kit was produced by a committee of elementary school teachers in cooperation with erosion control specialists and artists with the North Carolina Department of Environmental Quality and the North Carolina Department of Public Instruction. The project was originally funded through fines collected from violations of North Carolina's Sedimentation Pollution Control Act.

Twelve activities are included in this kit for use in the classroom, as field exercises and for student assignment at home. For additional technical assistance, contact the North Carolina Department of Environmental Quality:

Division of Energy, Mineral and Land Resources
Land Quality Section
1612 Mail Service Center
Raleigh, N.C. 27699-1612
(919) 707-9220

Division of Soil & Water Conservation
1614 Mail Services Center
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Introduction

What did you have for breakfast this morning? Was it only a cup of coffee? Maybe you had some cereal or a roll. Did you have cream in your coffee or milk on your cereal? Perhaps you skipped breakfast, dressed and drove your car to work.

Consider the source of all the things that helped you start your day. Broken down to their most basic elements they all came from the soil. That's right! The beans that were ground to make your coffee grew on a tree which needed soil to grow. The wheat that went into your cereal or roll also came from a plant that grew in rich soil. The soil grew grass that fed the cow which produced the milk or cream that went into your coffee. The raw materials which were used to produce your clothing, coffee mug and even your car came from the soil beneath our feet.

As you can see, soil is one of the most basic and important resources we have on earth. As educators, it is of utmost importance to teach soil conservation to our children. Sedimentation is the largest single polluter, by volume, of North Carolina's lakes, rivers and streams. Children need to know how to recognize erosion and what measures can prevent soil erosion and sedimentation. They need to recognize soil as home to many types of life. They also need to recognize the importance of preserving the quality of the land for future generations and that the quality of the land for future generations and that the quality of our lives depends on the quality of our soil.

Why conserve soil?

Soil is a basic resource easily taken for granted. We never really give a thought to the soil under our feet and whether it will always be there for us to use. Therefore, it becomes important for us to ask the question, " Why should we conserve soil"?

Many people just accept that soil exists and never wonder where soil comes from. Well, soil is a natural body that results from the interaction of five soil forming factors. The five soil forming factors are climate, topography, parent material, organisms, and time. Climate involves the temperature and precipitation that influence chemical reactions involved in soil formation from geologic material. Topography is related to the slope position and aspect of the soil. Parent material is the geologic rock that determines the types of minerals found in the soil as well as the type of soil that forms. Organisms include all life such as earthworms, humans, microorganisms, and plants that influence soil formation. Time is needed to form soil from the parent material. Parent material is slowly weathered to form the soil that surrounds us. It takes 500 to 1000 years to form one inch of topsoil. We must conserve the soil because it takes many years to form and only one rain event to wash it away.

There are hundreds of reasons to conserve our soil, but most of these reasons can fit into four categories. The first category is humanitarian. Soil gives life to green plants. High soil productivity in the United States has allowed us to become the largest producer of food in the world. If soil is not protected, we cannot feed ourselves and millions of others who look to our country for nourishment.

Another reason for soil conservation is economics. If soil on farmland becomes poor, a lower yield will result, causing higher prices for us at the supermarket and less profit for farmers. It is very expensive to correct erosion problems on construction and development projects. The cost to do so is usually passed along to the consumer. Soil is also vital to our forests to grow healthy trees for timber. We need to practice responsible land use so we may continue to have clean rivers, lakes and drinking water. Sediment can quickly fill lakes and streams, causing flooding and higher costs for treating water. It also damages property and lowers property values. Sediment suspended in the water also increases the cost of treating drinking water and power production.

Rich productive soil is home to many species of wildlife. Fish and wildlife are dependent upon clean water and rich productive lands to grow plants for food and shelter. Soil that washes into streams can reduce the oxygen in the water, cover fish eggs and their food supply. The water that once was filled with wildlife quickly becomes lifeless.

Finally, we need to preserve our soil for aesthetics. Imagine our lives without beautiful landscapes or well-maintained recreational areas. Losing these treasures could become a reality if we do not take precautions to preserve our soil.

Obviously, our very quality of life can change drastically if we do not use our soils wisely. The answer to the question, "Why conserve soil?" is all the above and more!

How erosion occurs

Erosion is a natural process that moves soil from one location to another by wind, water, ice or gravity. Soil erosion can be accelerated by human actions.

There are five basic types of erosion.

Sheet erosion - Sheet erosion is the gradual wearing away of a thin uniform layer of soil. It occurs where there is not enough vegetation covering the soil to stop erosion completely, but where there is enough to prevent rill erosion. Sheet erosion can be seen as muddywater.

Rill erosion - Rill erosion occurs on gentle slopes which have little protective vegetation. Runoff water gathers into small channels or rills. These channels are only a few inches deep.

Gully erosion - Gully erosion is much like rill erosion, but more dramatic. It also occurs where there is little or no vegetation, but the slope is much steeper. This steepness causes the water that gathers in channels to move more rapidly cutting the channel wider and deeper.

Wind erosion - Wind erosion is common along the North Carolina coast where high prevailing winds, storms and unprotected dunes are common. Soils are also easily transported by the wind.

Land slippage- Land slippage happens when blocks of saturated soil move or "slip" down steep slopes in response to gravity. This can happen along cultivated fields, highway road cuts and banks. In winter, the soil may creep along due to frequent freezing and thawing conditions.

Sources of erosion

Soil erosion can come from many sources. Agriculture is a leading contributor of erosion in North Carolina. When a field is plowed soil becomes susceptible to erosion until a ground cover or crop is reestablished. In addition, pesticides and other chemicals applied to the soil can be transported into lakes, rivers and coastal sounds unless good erosion control is practiced. Farmers are encouraged to follow erosion control practices recommended by local, state and federal agencies.

Homes, commercial buildings and highway construction are other sources of erosion. Construction usually involves disturbing land and destroying the ground cover that prevents erosion. North Carolina law requires erosion control practices on all construction sites and a sediment and erosion control plan for sites one acre or more in size.

Timber harvesting can be a potential source for erosion. Care has to be exercised by the timber harvester to ensure that forestry erosion control practices recommended by the state are followed.

Mining can also be a source of erosion. North Carolina law requires that erosion control practices be applied to mine sites one acre or more in size.

As North Carolina continues to grow, producing food, building homes, constructing shopping centers and highways, harvesting timber and mining, the threat of erosion will increase and require that we practice good erosion control.

How to prevent erosion

Erosion and sedimentation can be prevented or controlled by different types of measures. The measures commonly used include ground cover, silt fence, riprap, diversions, sediment traps, basins and buffers. Erosion and sedimentation can be controlled and reduced if measures are properly installed and maintained.

Examples of ground cover include vegetation, sod, mulch, gravel, and netting and matting that is applied to bare soil. Ground cover stabilizes disturbed areas and controls runoff and erosion. Ground cover protects the soil by reducing raindrop impact and also decreasing the amount and velocity of runoff.

Silt fence is a cloth material that is semi permeable. The fence has small holes that allow water to pass through at a very slow rate. Water ponds behind the fence so that suspended soil particles settle out of runoff water before the water passes through the fence. This allows for sediment to be deposited on site rather than in waterways. Sediment fence is usually found along the perimeter of a site where land-disturbing activity is occurring.

Riprap is stone that is crushed to different sizes and used to protect and stabilize areas subject to erosion. Riprap is best used on steep slopes and the inlets and outlets of pipes. It is typically used in areas where ground cover establishment is not feasible. The riprap slows runoff water so that it flows at a non-erosive velocity. Riprap is often used along streambanks, channels, and on steep slopes.

Diversions are a ridge or excavated channel used to divert sediment laden water into other sediment control measures. Diversions are used to ensure that runoff water empties into a sediment trap or sediment basin where the soil particles will settle out of the runoff water before continuing on to rivers, lakes, streams or any other water body.

Sediment traps and sediment basins are ponding areas used to catch sediment. Runoff water flows into the trap or basin and is slowed so that sediment settles out of the runoff water. A riprap section is used to slowly dewater the trap or basin and the detained sediment fills the bottom of the trap or basin. The traps or basins look like small man-made ponds that only have water in them after a heavy rain. The trap and basin must be cleaned regularly because sediment will eventually fill it.

Buffers are areas of natural or planted vegetation that collect runoff and prevent sedimentation by allowing soil particles to settle out in the buffer before reaching a stream, channel, lake, river or any other water body. Buffers are usually found along waterways and the type of vegetation varies. A buffer can consist of any combination of trees, shrubs and grasses.

TEACHERS SUMMARY

Glossary

Objectives-	To identify terms that are used throughout this lesson on soil erosion and sedimentation. To refer to throughout the lesson.
Materials- Preparation-	Print out of vocabulary list per student or display at the front of the class. Print out materials, or project the list to review as a group, or use NC DEQ's online vocabulary list and flashcards: NC-DEQ –DEMLR's Erosion and Sedimentation Vocabulary List Password: NCDEMLR

Activity #1

Good vs. Bad

Objectives-	To encourage an awareness of and interest in the soil. To understand the effects of nature and man-made products on the soil.
Materials- Preparation-	Activity sheet or projector, white board, and dry erase markers. Print activity, or display/project on white board and write answers with student contribution/discussion.
Answers-	Good = trees, roots, flowers, earthworms, moles, cows, grass, crops, dead animals, mushrooms, leaves. Bad = hard rain, roads (incorrectly constructed), strong wind, rocks, fertilizer, trash, baking sun, cement, all terrain bikes (misused).

Activity #2

If We Lose The Soil, They Lose Their Home

Objectives-	To understand and respect the balance that exists in the soil ecosystem. To recognize the diversity of life that depends on the soil.
Materials- Preparation-	Activity sheet, crayons. Print activity, color the images following a discussion.
Answers-	Creative thought. Example: Squirrels' food and shelter (trees) grow in the soil. Example: Carrots grow in and get their nutrients from the soil.

Activity #3

10 Reasons Why We Need to Stop Soil Erosion

Objectives-	To promote thought and discussion about who and what depend on the soil.
Materials-	Activity sheet. Depending on how the instructor wants the class to complete the boxes, materials could include crayons, magic markers or magazines, scissors and paste.
Preparation-	Class can be divided into small groups in order to promote discussion. This activity is designed to encourage creative thought, and while there are no correct answers, per say the students should be able to give a plausible explanation as to why his or her illustration fits the statement under the box.
Answers-	Creative thought. Example: because I like to swim in clean water: fish, person, or other aquatic creature. Example: because silt makes me muddy: pig, elephant, muddy dog.

Activity #4

Objectives-

Materials-

Preparation-

Answers-

Erosion Patrol Comic and Coloring Book

To encourage a positive group identity with the Erosion Patrol and to reinforce the vocabulary words.

Activity book, crayons.

Print activity, color the images following a discussion. Tip: to save paper either use Adobe's double-sided Booklet print option and assemble along the center seam, or print two pages per paper, double-sided and assemble in the top left corner.

Creative thought/participation during discussion.

Activity #5

Objectives-

Materials-

Preparation-

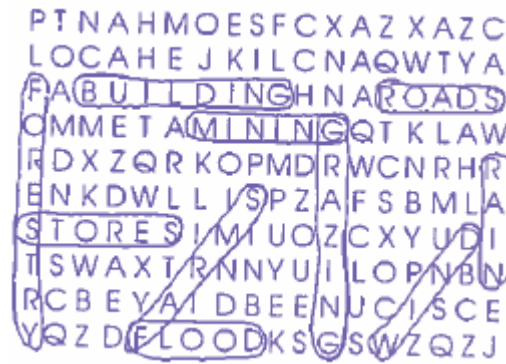
Answers-

Crossword Puzzle

To reinforce the understanding of soil erosion and sediment control terms.

Activity sheet or projector, white board, and dry erase markers.

Print activity, or display/project on white board and have students volunteer to circle answers.



Activity #6

Objectives-

Materials-

Preparation-

Answers-

The Process of Erosion and Sedimentation

To observe how erosion occurs on bare soils that are exposed during land disturbing activities. To observe sedimentation that results from erosion.

Aluminum pans, ruler, cups, soil and water.

Follow instructions (can print or display/project instructions).

Participation during activity & discussion.

Activity #7

Objectives-

Materials-

Preparation-

Construction Site Erosion Control

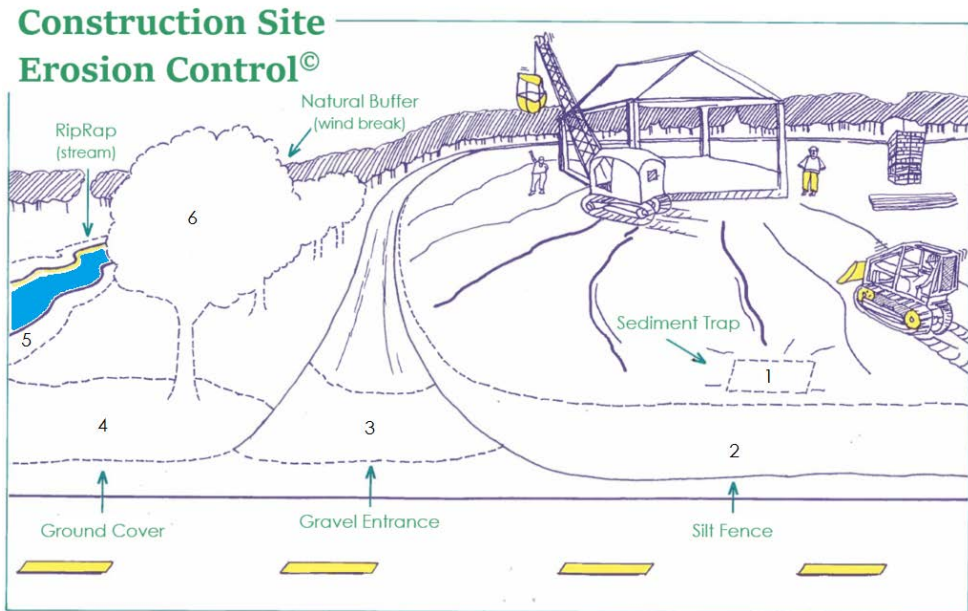
To analyze and interpret the overall construction site.

To introduce the students to the concepts of soil conservation. For the students to physically place soil conservation measures on the construction site.

Activity sheet, scissors, glue.

Cut objects from devices sheet and paste onto construction site/activity sheet.

Answers-



Activity #8

We Must Protect Our Soil!

Objectives-

To demonstrate one cause of soil erosion and one possible prevention measure.

Materials-

2 containers of water, a timer/watch with a second hand, 2 small hills of soil, one bare and the other one with vegetative covering (can substitute craft felt for the vegetation/grass).

Preparation-

Follow instructions (can print or display/project instructions).

Answers-

The bare hill will show more erosion than the covered hill. Encourage discussion as to why this is so.

Activity #9

What's the Right Way To Plow your Garden

Objectives-

To demonstrate one cause of soil erosion and one possible prevention measure.

Materials-

2, 9-inch pie pans, enough soil to fill them, and a sprinkling watering can.

Preparation-

Follow instructions (can print or display/project instructions).

Answers-

The soil with the furrows that follow the natural contour of the soil will have the least amount of soil erosion. Encourage class discussion as to why this is true.

Activity #10

What Do Plants Need?

Objectives-

To demonstrate what is necessary for a plant to grow, and to encourage scientific observation and comparison.

Materials-

Activity sheet, 6 small glass or plastic containers, 12 lima beans, soil, water, and access to sunlight.

Preparation- Print or display/project the instructions, print or electronically record data on activity page 2. Soak the lima beans overnight, fill 5 of the glass containers with soil. Use the activity sheet to chart the progress of the plants, day by day.
Answers- Jar #6 should grow the best, with soil, water, and sunlight needed for plants to grow.

Activity #11 **The Official Erosion Patrol Field Notebook**
Objectives- (Field Notebook) To encourage an awareness of and interest in the soil.
Materials- Activity book, pencil.
Preparation- Print activity, fold along dotted lines, assemble & staple.
Answers- Answers will vary by observation.

Activity #12 **Wheel of Erosion**
Objectives- To incorporate and recall terms and concepts that are used throughout this lesson on soil erosion and sedimentation.
Materials- Activity, poster board/cardboard, scissors, brad/tack or display/projector.
Preparation- Display [electronic version](#), or print activity, cut out, glue to poster board, and attach arrow to the wheel with a brad/tack.
Answers- See wheel of erosion activity answers page.

Activity 12 – Answers Wheel of Erosion

Electronic version:

[NC DEQ Wheel of Erosion](#)

5 Point Questions

- 5.a. What is a riprap channel?
answer: a lining made of broken stones placed together to prevent erosion caused by flowing water.
- 5.b. What are two natural causes of erosion?
answer: wind and rain
- 5.c. Name one type of groundcover?
answer: grass, any vegetation, hay, mulch, sod, gravel, plastic, burlap
- 5.d. What is your environment?
answer: everything that surrounds us
- 5.e. What is productive soil?
answer: soil that can support crops and animals
- 5.f. What is nonpoint source pollution?
answer: pollution that cannot be tracked back to one spot

10 Point Questions

- 10.a. What is a watershed or drainage basin?
answer: area that drains to a single point
- 10.b. What is Erosion?
answer: the loosening and movement of soil by wind, water, and other forces.
- 10.c. What do plants need in order to grow?
answer: soil, sunlight, water, and air
- 10.d. What is a buffer strip?
answer: trees and shrubs used to protect the land and water against sediment pollution
- 10.e. Which soil surface will erode the most when rained on? a grass covered surface or bare soil
answer: bare soil
- 10.f. What is reclamation?
answer: when a worn out surface mine is restored as near as possible to the condition it was in before the mining started
- 10.g. What is involved in reclamation?
answer: It involves filling in holes and replanting grass, trees, and shrubs

- 10.h. Name one cause of accelerated erosion?
answer: agriculture, construction, forestry, and mining

15 Point Questions

- 15.a. Name five things that would lose their homes from erosion.
answer: rabbits, mushrooms, earthworms, fish, birds, flowers, etc.
- 15.b. Name five things we get from the soil.
answer: pencils, carrots, paper, hamburger, chairs, wheat, etc.
- 15.c. How many years does it take to form one inch of topsoil?
answer: 500 years
- 15.d. What is conservation?
answer: the wise use and protection of our natural resources
- 15.e. What is a reservoir?
answer: a body of water, often a lake, in which water is collected or stored

20 Point Questions

- 20.a. What is contour plowing?
answer: to plow, plant, cultivate and harvest on a curve around a slope to reduce soil erosion
- 20.b. Soil is a threatened natural resource? True or False
answer: True
- 20.c. Which is the best way of planting crops? On the contour or down the slope?
answer: on the contour
- 20.d. Why is crop rotation important?
answer: to help keep soil productive
- 20.e. What is runoff?
answer: water that flows off the land into streams, rivers, lakes and other waterways

25 Point Questions

- 25.a. How does ground cover protect the land?
answer: it traps sediment, provides leaf litter, improves soil and attracts wildlife
- 25.b. What is rill erosion?
answer: a form of erosion where surface water forms small, well-defined channels that carry soil away from the sides and bottom of the channel
- 25.c. What are three erosion control devices used on construction sites?
answer: sediment trap, silt fence, riprap, tree buffer
- 25.d. How do you prevent forest erosion?
answer: do not clear cut, leave some trees for vegetative cover, replant with grass, or use erosion and sediment control measures

25.e. Define sedimentation.

answer: solid materials, both mineral and organic, that have been moved from one place and deposited in another place by air, water, gravity, or ice

30 Point Questions

30.a. How might you prevent splash erosion?

answer: plant vegetation or cover the soil with loose leaves or straw

30.b. What is a silt fence and how is it used?

answer: a fence of plastic, burlap or wood, used to keep soil from washing into the water

30.c. What is irrigation?

answer: the practice of watering land and crops using ditches, pipes or streams

35 Point Questions

35.a. Name three ways to prevent erosion.

answer: rotate crops, keep a tree buffer, use a silt fence, contour plowing

35.b. What is advanced rill erosion?

answer: gully erosion

35.c. How do trees and plants protect the soil?

answer: they trap sediment, provide leaf litter, and improve the soil

35.d. Why is a nutrient important?

answer: it provides nourishment for an organism to live

35.e. What is soil made of?

answer: a naturally occurring mixture of minerals, organic matter, water and air

40 Point Questions

40.a. If you were a farmer what would you do to prevent erosion?

answer: rotate crops, contour farm, prevent overgrazing, use a tree buffer

40.b. Why is our soil so important?

answer: most of the food we eat begins its life in the soil. Soil also provides us with most other material things we use in everyday life.

40.c. As an Erosion Patrol Member, what can you do to prevent erosion?

answer: educate others, report problem areas, and plant trees and shrub

40.d. What are four good reasons to practice soil conservation?

answer:

to ensure a good food supply

to improve water quality

to keep the landscape looking beautiful

to help keep a pollution-free environment for future generations

40.e. After strip mining, what can be done to help reclamation occur?

answer: mold the land back in shape, plant trees, plant grass seed

References

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For Additional Information on Erosion and Sedimentation Control,

Visit NC Department of Environmental Quality Website:

[NC DEQ Erosion and Sediment Control](#)

Or contact the current Sediment Education Engineer/Specialist:

[DEQ DEMLR Contact Information](#)

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