PURDUE UNIVERSITY | Extension - 4-H Youth Development

4-H-1027

Level 1 Grades 3–5

SOIL and WATER SCIENCE

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Level 1 • Grades 3-5

NOTE TO 4-H MEMBER

The 4-H Soil and Water Science curriculum is for youth who enjoy learning about science and two important natural resources: soil and water. Level 1 introduces basic terms and concepts. Activities focus on understanding important soil and water processes. Level 2 activities help you put the basic concepts into action to understand more advanced soil and water concepts and interactions with the environment. Level 3 activities are divided into chapters based on how you might use the information you have learned — as a homeowner, resident of a watershed, food and fiber producer (farmer), mayor, teacher, or legislator. Level 3 delves deeper into soil and water science concepts, and can prepare you to be well informed and to study these topics at a college or university.

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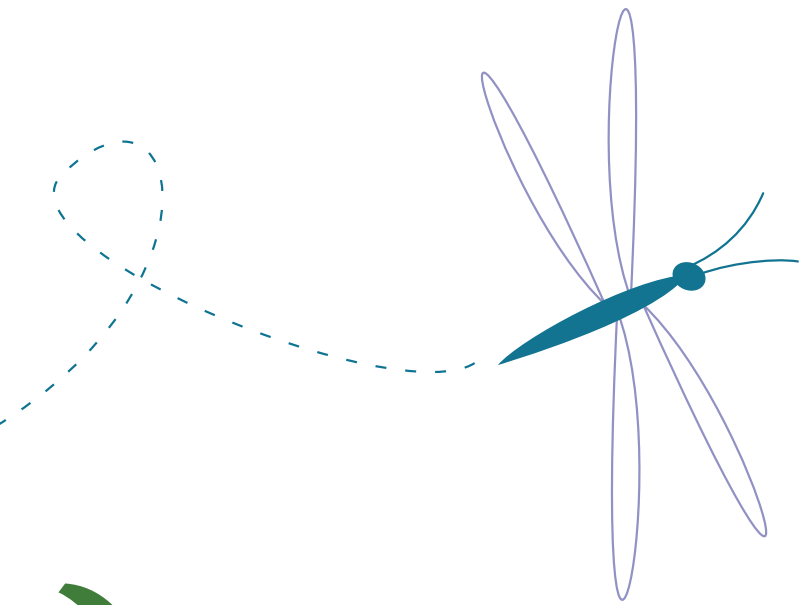
The curriculum development, design, and printing were funded in part by Wal-Mart Stores, Inc.

PROJECT PARTNERS

Purdue University, the Tippecanoe County Partnership for Water Quality, Christopher B. Burke Engineering Limited, and the Wabash River Enhancement Corporation



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* Words that are defined in the glossary are in bold the first time they appear in the text.

SPLASH EROSION

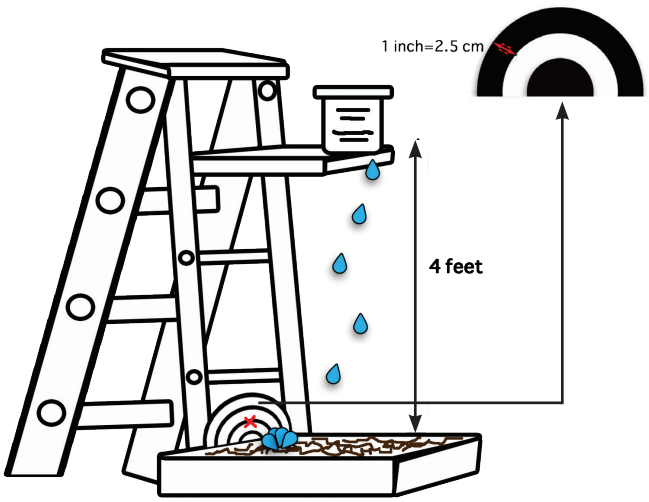
Can soil erosion occur when there is no runoff?

INTRODUCTION

You will explore how soil can be dislodged and might be eroded even when there is no **runoff**.

TOOL KIT

- ☐ Small shallow box lined with plastic
- ☐ Soil from garden or flower bed
- ☐ Small tin can, about 10–12 oz.
- ☐ Cotton balls
- ☐ Cardboard cut into a semicircle, 10-inch diameter
- ☐ Drafting compass
- ☐ Nail, approximately eightpenny or 2-1/2 inch
- ☐ Hammer
- ☐ Stepladder (5 foot is fine)



Drawing by J. Harsh

Make IT

- Fill the box with soil from a garden or flower bed.
- Place the box on a flat surface under the ladder as shown in the picture. Doing this activity in a garage or carport or outside will make cleanup easier.
- Loosen the soil surface so it is fine and crumbly.
- Use your compass to draw concentric circles 1 inch (2.5 cm) apart on the cardboard semicircle.
- Place the semicircle into the soil with the center close to where the water droplets will strike the soil surface.
- Punch a hole in the bottom of the can with the nail.
- Fill the bottom of the can with six or so cotton balls to slow the dripping a bit.
- Place the can about 4 feet above the soil box. (The flip-down paint shelf on a 5-foot stepladder is approximately 4 feet high.)
- Pour a half-inch of water into the can, and set the can on the ladder.
- Watch the water drip onto the soil.
- Mark the places that water splashed on your semicircle before it dries.
- Measure each splash mark on the cardboard semicircle.

ANSWER THE QUESTIONS

- How many splash marks did you observe? ____
- What was the longest splash? _____
- What was the average splash? (Add the total number of measurements and divide by the number of splash marks.) _____

LIFE SKILLS

- Acquiring knowledge
- Following procedures
- Completing a project/task

Chat

Share What Happened: How much **soil erosion** did you observe?

Apply: How might **splash erosion** be reduced?

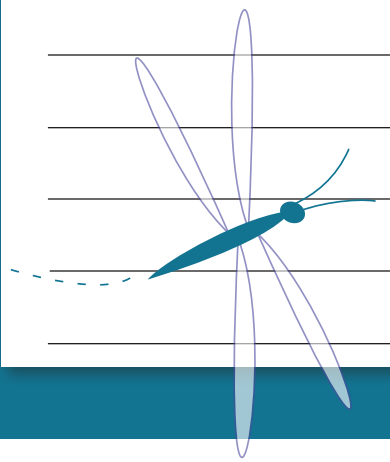
Generalize to Your Life: Why is it important to prevent soil loss?

DIG DEEPER

Compare your results with the results from one or more of the following experiments:

- Make two semicircles, and place the can of water at a height greater than 4 feet, then at a height less than 4 feet.
- Cover the soil with straw, grass clippings, grass sod, or dried leaves, and try the experiment again.
- Try this experiment by putting soil in a bowl and putting the bowl on top of a piece of paper to see the splashes 360 degrees around the bowl.

NOTES:



WATER EROSION

Why are we losing topsoil?

INTRODUCTION

Soil erosion is the wearing away of land surface by water, wind, or ice. Geologic erosion happens *slowly* over time. Accelerated erosion happens much faster, and human activities usually cause it. Water and wind cause most of the erosion in the Midwest. Water erosion occurs when raindrops hit soil particles hard enough to dislodge them and wash them downslope. The splash erosion activity shows how water erosion begins. In this activity you will learn some erosion terms and demonstrate how soil erosion occurs.

TOOL KIT #1

☐ Pencil

DO IT

- Unscramble the letters below to identify types of erosion.
- Indicate the type of erosion shown in Figure 1.

Drawing by J. Harsh

FIGURE 1. Erosion

Scrambled Letters	Type of Erosion	Definition
LYGLU		A channel worn in the ground by running water after it rains. Gullies are deep enough that they are not smoothed over by normal tillage.
LIRL		A very small channel only a few inches deep, caused by runoff water.
STEEH		A thin layer of soil removed by runoff.
HSPLAS		Large raindrops loosen small particles of soil from the surface.
SATMRE AKNB (two words)		A running stream undercuts into stream banks, leaving "shelves" of soil that then collapse into the stream bed.

TOOL KIT #2

- ☐ Small shallow box lined with plastic or a two-liter bottle cut in half
- ☐ Soil from garden or flower bed
- ☐ Heavy-duty aluminum foil to make a spout
- ☐ Sprinkling can, at least 1 quart; half gallon is better
- ☐ Wide-mouth quart canning jar
- ☐ Book or piece of wood, about 1 inch thick

Make IT WATER EROSION IN A BOX

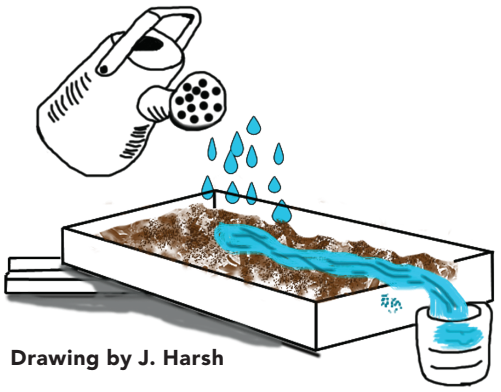
- Line the box with plastic to hold soil.
- Fill the box with soil from a garden or flower bed.
- Construct a foil spout to collect water at one end of the box.
- Set the box on a table with the spout extending over the edge of the table.
- Place the jar under the spout.
- Place the 1-inch book or piece of wood under one end of the box to give it a slope.
- Fill the sprinkling can with water.
- Hold the sprinkling can approximately 1 foot above the box and pour the water steadily onto the soil in the box.
- Continue to pour water until the jar is at least half full of runoff water.

ANSWER THE QUESTIONS

- Did the soil get washed out of the bottom of the box?

  ☐ Yes ☐ No

  If yes, you observed **gully erosion**.
  If no, continue.



Drawing by J. Harsh

- Did the water make small channels in the soil surface?

  ☐ Yes ☐ No

  If yes, you observed **rill erosion**.
  If no, continue.

- Did the water remove a smooth, even portion of the soil without creating small channels?

  ☐ Yes ☐ No

  If yes, you observed **sheet erosion**.
  If no, continue.

  Did you observe more than one type of erosion? If so, what did you see? _____

  _____

  _____

LIFE SKILLS

- Acquiring knowledge
- Following procedures
- Completing a project/task

chat

Share What Happened: What type of soil erosion did you observe?

Apply: How might soil erosion be reduced?

Generalize to Your Life: Why is it important to prevent soil loss?

WIND EROSION

Can soil be eroded by a puff of wind?

INTRODUCTION

Have you heard the term **"wind erosion?"** In this activity, you will explore how wind can dislodge soil.

TOOL KIT

- ☐ Box from Water Erosion in a Box activity
- ☐ Soil from garden or flower bed
- ☐ Electric fan or hair blow dryer
- ☐ Adhesive tape
- ☐ Large cardboard cereal box, at least 12 inches high
- ☐ Scissors
- ☐ Petroleum jelly

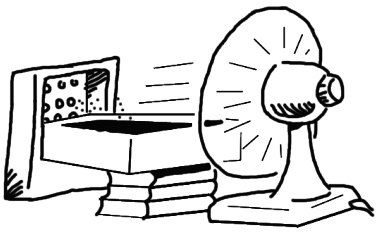
Note: This activity can be messy, so it is recommended for outdoors or a garage.

Make IT

- Fill the box with potting mix or soil from a garden or flower bed. Pinch the soil so that it is fine and powdery. It cannot be damp.
- Construct a soil collector from the cereal box by cutting a window in one side, about 4 inches high and 10 inches wide.

  Punch a dozen holes about a quarter-inch in diameter in the back of the cereal box to let the wind blow through.

  Spread a thin layer of petroleum jelly on the inside of the back of the box around the holes.



Drawing by J. Harsh

  Tape the top and bottom of the box.
- Place the soil box on top of a book or books so the soil is level with the bottom of your window in the cereal box (see figure).
- Place the fan or blow dryer at the opposite end of the box.
- Turn on the fan or blow dryer and let it run for about five minutes.
- Observe the soil inside your cereal box.

ANSWER THE QUESTIONS

- Did you observe any wind erosion?

  ☐ Yes ☐ No
- What do you think would have happened if the soil surface had been protected with growing grass or plant residues?

LIFE SKILLS

- Acquiring knowledge
- Following procedures
- Completing a project/task

Share What Happened: What did you notice about the effect of wind on dry soil?

Apply: How might wind erosion be reduced?

Generalize to Your Life: Why is it important to prevent soil loss?

DIG DEEPER

Compare your results with the results from the following experiment:

- Cover the soil box with straw, grass clippings, grass sod, or dried leaves.

  Are soil particles protected from wind erosion?

CONNECTIONS

- *The Dust Bowl*, a documentary by Ken Burns, tells the story of the devastation that wind erosion can cause, www.pbs.org/kenburns/dustbowl

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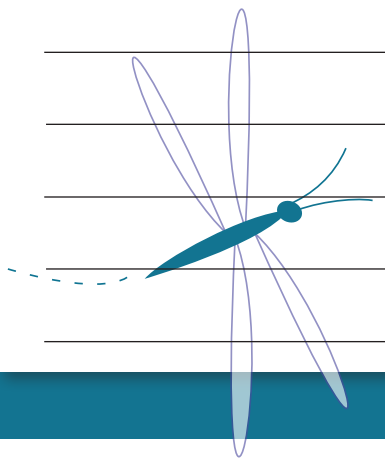

FLOODS!

How do floods damage property?

INTRODUCTION

Floods occur when water rises in rivers and streams and overflows the stream bank. Storms that drop large amounts of rain usually cause floods, but melting snow can also cause them. Flooding can kill grass, trees, and crops when they are underwater too long and even people who get caught in the moving water. Floods can badly damage homes and other structures, and can carry cars away when people try to drive through what seems to be shallow, moving floodwater. Floodwaters move from higher to lower elevations such as basements and floodplains. **Floodplains** are areas that flood regularly, often near rivers and streams.

On a smaller scale, a home can be flooded when a water pipe breaks or someone forgets to turn off a faucet that has no overflow valve. When water floods a home, either because of a broken pipe or a storm, appliances, carpets, furniture, and many other items are often ruined and must be thrown away.

IMPORTANT SAFETY REMINDERS

- Floodwater is deceptive. It doesn't usually look dangerous, but it is!
- Floodwaters pick up many pollutants, so never touch or walk in it!
- It only takes a few inches of water to float a car. No one should drive through flood water.

In this activity you will interview family members or friends to ask them about floods that have occurred where you live.

Courtesy Christopher Burke Engineering

TOOL KIT

- ☐ Paper
- ☐ Pencil

DO IT

- Make a Flood Facts interview sheet that lists the questions below.

  Write your name by "Interviewer."

  Leave room so you can write down the answers you hear.

  Make three copies of your interview sheet.
- Ask three adults the questions on the Flood Facts interview sheet.

  Have you had a flood where you live? If so:

  When was it?

Describe the flood and any damage it caused.

What damage does flooding cause?
You can ask the general question, or ask more specifically about anything you want to know; for example, harm to people or animals, or damage to homes, crops, basements, cars, or trees.

Is there anything I can do to prepare for floods or safety information that I should know?

Can you suggest any flood events that I could research for more information?

- Write a summary of your interviews that lists the floods and damage that people told you about.

LIFE SKILLS

- Acquiring knowledge
- Communicating with others

Share What Happened: What resource did you use in this activity?

Apply: Why is it important to know about floods that have occurred in your area?

Generalize to Your Life: Why is it important to learn about floods that happen in other places?

DIG DEEPER

- Talk to people or look online for information about other flood events that the people you interviewed told you about.

NOTES: