PURDUE UNIVERSITY | Extension - 4-H Youth Development

4-H-1029

Level 3 Grades 9–12

SOIL and WATER SCIENCE

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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. Youth are encouraged to supplement their learning by consulting knowledgeable people and current written materials in Level 3 with references from governmental and/or university sources (online extensions *.gov and *.edu).

AUTHORS

Natalie Carroll, professor, Purdue University

CONTRIBUTORS

Lori Gates, Christopher B. Burke Engineering, LLC; Sara Peel, Wabash River Enhancement Corporation; Gary Steinhardt, professor, Purdue University; Doug Wolf, Indiana Department of Environmental Management; Mark Evans, Extension Educator, Purdue University; Ted Leuenberger, middle school and high school teacher; Kayleen Hart, Steuben County Soil and Water Conservation District; Catherine Maddox, graduate student; and Julia Wickert, graduate student

Graphic Designer: Kathi Brethauer, KB Design
Editor: Nancy Alexander

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

Questions you should be able to answer after studying this 4-H curriculum include:

- Why is soil health important?
- What causes soil erosion?
- Where does eroded soil go?
- Where does soil come from?
- How long does it take to form soil?
- How much fresh water is available?
- Who uses water, and how?
- Why is clean water important?
- How does water affect soil?
- How does soil affect water?
- What can I do to conserve and protect soil and water?

Recommendation:
Get a three-ring binder to keep data and your observations. You will see the book icon when you are expected to record such information.

CONTENTS

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

Additional educational resources for many topics are available from Purdue Extension's Education Store, www.edustore.purdue.edu.

CHAPTER 1: You are a Homeowner

Homeowners and renters should understand basic soil and water science to maintain the health of their lawns and gardens as well as water quality for themselves and others. People who live in the country need to understand how their well and onsite wastewater disposal system work. They also need to know how to check and maintain these critical systems. People who live in urban areas usually pay taxes that cover the costs of a community water supply and sewage treatment. It is still important, however, to understand these systems for the benefit of your family and everyone else in your watershed.

CITY DWELLERS AND COUNTRY DWELLERS

What do people need to know about their drinking water and their wastewater?

INTRODUCTION

What you need to know depends on where you live. If you live in a city or town, you likely have a public water supplier and sewage management facility. These services are paid for through user fees and managed by professionals who are required to follow state and national regulations. Municipal water suppliers must provide information about the source, maintenance, testing, and test results of your drinking water annually.

If you live in the country, you probably have a well and an onsite wastewater disposal system. Wells are the most common source of water for private systems, used by more than 40 million people in the United States, or approximately 15 million households. Wells provide water from water-yielding geologic formations beneath the earth's surface. Wells pump **groundwater** from **aquifers.** Because geologic materials filter groundwater, wells are somewhat protected from direct contamination by activities on the land. They are usually the safest and most reliable source of water. However, poorly constructed or shallow wells (less than 100 feet deep) and springs might be easily contaminated and have the potential to go dry during drought.

People who live in rural areas are responsible for maintaining and testing their well and onsite wastewater system, so it is important to understand how they function. Youth who live in a home that uses a well and onsite wastewater system may have trouble finding the installation and maintenance information needed to complete this activity. If you do not have access to this information, complete the parts of the activity that you can, and enter "na" for "not available" to any questions that you cannot find information to answer.

TOOL KIT #1: Water

City Living	Country Living
☐ Ask your parents if they have a copy of your consumer confidence report. Or visit the EPA's consumer confidence report Web page, http://water.epa.gov/lawsregs/rulesregs/sdwa/ccr/. Click on Where You Live to find out how to get a copy. ☐ Your Right to Know (WQ-33) available at Purdue Extension's Education Store, www.edustore.purdue.edu.	☐ Your well and onsite wastewater disposal system installation information ☐ Appendix A, WSS Instructions ☐ Water test results (see Water Testing in Level 2)

#1 DO IT WATER

Record your data in your record book.

- Gather the information about your current drinking water.
- Determine if there are any problems or concerns.
- Recommend possible solutions to any problems.
- Optional: Find a fellow 4-H member who lives in the city, if you live in the country, or vice versa. Compare your findings.

City Living

- Obtain and read your consumer confidence report.
- Answer the following questions.

  Where does your water come from?

  Does it meet the health and safety standards set by the EPA and the Indiana Department of Environmental Management?

  Does your water supplier treat the water you drink? If so, what does the supplier treat it with?

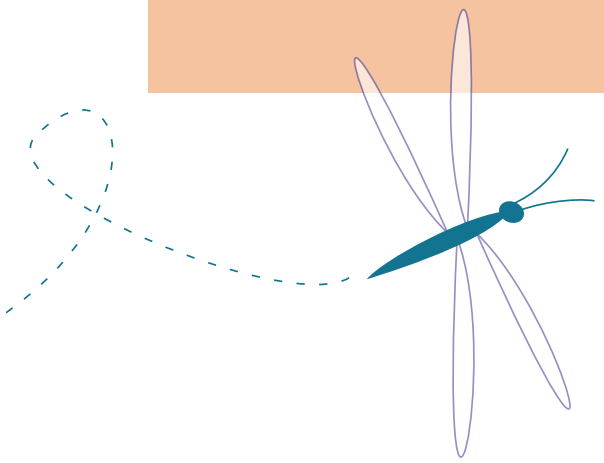
Country Living

- Read your well and onsite wastewater disposal system installation information (if available).
- Answer the following questions.

  Where is your well located?

  How deep is your well?
- Sketch or find an online **plan view** of your property that includes your well. Consider the three areas of protection for a well:

  1. Mark your well.
  2. Draw a circle with a radius of 50 feet around your well. Label this area the "zone of exclusion."
  3. Draw a circle with a radius of 200 feet around your well. Label this area the "zone of management."



TOOL KIT #2: WASTE DISPOSAL

City Living	Country Living
☐ Waste disposal information from your city wastewater treatment plant, which you might be able to find online or by contacting your city administration	☐ Your onsite wastewater disposal system installation information ☐ Appendix A, WSS Instructions ☐ Septic waste pumper/hauler receipt(s)

WASTE DISPOSAL

City Living	Country Living
• Review the Municipal Water Treatment activity in the 4-H Soil and Water Science Level 2 manual. • Tour your waste disposal plant. • Take notes about the wastewater disposal process and any challenges. How is the waste from your home handled? How far does it travel to get to the waste treatment plant? Does it travel in a sanitary combined sewer system? Does your city or town have separate storm sewers? What does this service cost per year?	• Read your onsite wastewater disposal system installation information (if available). • Answer the following questions. Where is your septic tank located? Where is your septic absorption field located? What is above your absorption field? When was your septic tank inspected? When was your septic tank pumped? Do you have an outlet filter? • Sketch or find an online plan view of your property that includes your well. Consider the three areas of protection for an onsite absorption field. 1. Mark your septic tank. 2. Draw a circle with a radius of 50 feet around your well. Label this area the "zone of exclusion." 3. Draw a circle with a radius of 100 feet around your well. Label this area the "zone of management." • Use WSS to view the soil rating at your home with respect to septic tank absorption fields: Click on View Rating. • Scroll down to see the table, Summary by Rating Value, for the rating.

LIFE SKILLS

- Acquiring knowledge
- Managing resources
- Using natural resources wisely

chat

Share What Happened:

- What did you learn about your drinking water?
- What did you learn about your wastewater disposal?

Apply:

- Why is water conservation important?
- Why is proper wastewater disposal important?

Generalize to Your Life: How will the information you learned in this activity help you become a more knowledgeable homeowner and citizen?

DID YOU KNOW?

- What percentage of Indiana's drinking water comes from surface water?

  40 percent of Indiana households drink surface water.

  60 percent of Indiana households use groundwater.

- Public water systems use both groundwater and surface water, depending on where they are located and what is available.

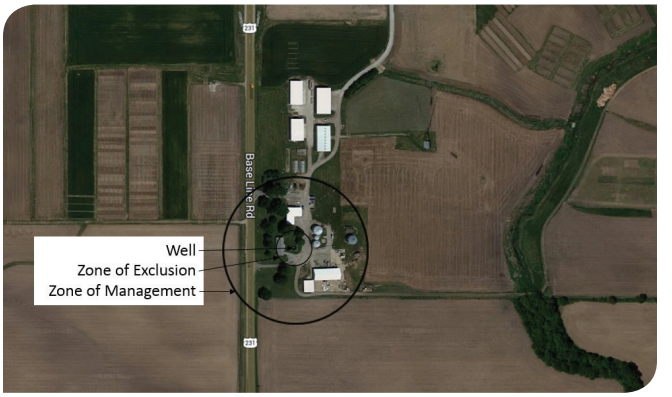
DIG DEEPER

- City dwellers – explore information available on the Web Soil Survey, WSS, http://websoilsurvey.nrcs.usda.gov/app/, using Appendix A, WSS Instructions
- Contact your local Soil and Water Conservation District to find out if anyone is stormwater marking (also called stormwater stenciling) in your area. If they are, offer to help. If not, consider researching this practice and starting a group to do it.
- Learn the difference between confined aquifers and unconfined aquifers.
- Learn more about well and onsite waste disposal system care.

  At Purdue Extension's Education Store, www.edustore.purdue.edu, search HENV-105-W, Cleaning an Onsite Sewage System.

  Visit Home*A*Syst at https://engineering.purdue.edu/SafeWater/farmasyst/IFHhas.htm to learn more about water and waste disposal

- Review the EPA's Primer for municipal wastewater treatment at https://www3.epa.gov/npdes/pubs/primer.pdf



Well protection recommendations plan view.

Have you ever experienced a drought?

- *If so, what effect did it had on you, your family, and community?*
- *If not, can you imagine the effects a drought would have on you, your family, and your community?*

INTRODUCTION

Residents of the United States enjoy one of the biggest and cleanest drinking water supplies in the world. Water seems abundant and endless when it's easily available from the turn of a faucet. However, when no rain falls for an extended period, people quickly come to value our water supplies. Droughts affect the amount and quality of both **groundwater** and **surface water**.

Similarly, productive topsoil is a natural resource that we often take for granted and don't realize the true value of until it's gone. **Soil erosion** is of major concern because topsoil lost from farm fields and homes cannot be replaced. Drought often worsens soil loss, because dry soils are more easily eroded. The 1930–1936 Dust Bowl affected American and Canadian prairielands and caused major health, ecological, and agricultural damage.

It's important to conserve the soil and water that we have and to keep it healthy. You can conserve water by using less and by capturing rainfall to use on your lawn and garden, rather than watering your lawn or garden with water from a well or municipal system. You can enhance your garden soil by recycling kitchen wastes through composting.

TOOL KIT #1: Mini Rain-Collection Station

- ☐ A five-gallon pail or other collection vessel

TOOL KIT #2: Mini Compost Box

- ☐ A cardboard box, like a shoebox
- ☐ Black paint, spray or liquid

MAKE IT #1: Mini Rain-Collection Station

- Consider ways you can collect the water that comes off your roof after a rain.
- Discuss your options with a parent and get permission to use one of your rain-collection methods.
- Construct your water-collection station.
- Collect data after three rains. Include an estimate of the length and intensity of the rain and the amount of water you collected.
- Save the water you collect until your garden flowers or vegetables need it.

MAKE IT #2: Mini Compost Box

- Paint the box black so it absorbs the maximum amount of sun.
- Keep your box where you can easily load it with kitchen vegetable scraps. Do not put meat or eggshells in the box; they'll smell as they age and attract rodents to your compost pile.
- When your box is nearly full, add grass clippings or leaves to fill it.

- Set the box in full sun with a couple of rocks on top and out of reach of curious animals (or humans).
- Check the contents of your box every two weeks and record what you see.

LIFE SKILLS

- Conserving natural resources
- Managing resources
- Using natural resources wisely

Share What Happened: Which activity did you enjoy most? Why?

Apply: How does a rain-collection station and compost box help conserve natural resources?

Generalize to Your Life: How could the concepts you learned with this activity be geared up to better utilize our soil and water resources?

DIG DEEPER

- Research rain gardens to find out how they conserve and utilize water. You might be able to help with a community rain garden effort or build one of your own. The following will help.

  Your local Soil and Water Conservation District

  National Resources Conservation Service, www.nrcs.usda.gov; search water conservation and native plants

  National Plants Database, www.plants.usda.gov
- If you built a rain-collection station, verify your rain duration and intensity estimates using online resources such as www.cocorahs.org.

NOTES: