



## Unit 3: What Impacts the Water Quality in My Watershed?

# The Southern Region 4-H<sub>2</sub>O Ambassador Program



*Educating a new generation of water resource protectors and conservators*





## Southern Region 4-H<sub>2</sub>O Ambassador

### Introduction

The Southern Region 4-H<sub>2</sub>O Ambassador Program addresses key concepts related to watershed education. The program is part of an ongoing effort within the Southern Region to educate and empower youth to conserve and protect our water resources.

A Southern Region 4-H<sub>2</sub>O Ambassador is a 4-Header, 8 to 14 years of age, who has successfully completed units 1 through 3 and has been acknowledged by the Southern Region Water Program as having the skills and knowledge to successfully complete a community-based service project. At the completion of the community-based service project, each 4-H<sub>2</sub>O Ambassador will be recognized on a local, state-wide, and multi-state (regional) basis.

Each unit includes:

- Skimming the Surface** Background information to help instructors prepare for activities
- Wading In** Hands-on activities
- 4-H<sub>2</sub>O Opportunities** Extensions to particular activities (not required to become an ambassador)
- Diving Deeper** Additional activities (not required to become an ambassador)
- Sink or Swim** Evaluation options

### Table of Contents

Unit 3—What Impacts the Water Quality in	
My Watershed? .....	3
Skimming the Surface .....	3
Wading In .....	5
Diving Deeper.....	7
Sink or Swim.....	9
Glossary .....	10
National Education Standards.....	12



## UNIT 3

### What impacts the Water Quality in My Watershed?

#### Overview

In this unit, 4-Hers will learn about land use and its affect on water quality.

#### 4-H<sub>2</sub>Objectives

Upon completion of this unit youth will be able to:

- Identify sources of pollution.
- Identify rural and urban land use practices that may cause water pollution.
- Identify solutions to reduce water pollution.
- Learn how all land use decisions affect water quality.

#### Focus Questions

- How does land use differ in urban versus rural settings?
- How do land use decisions affect water quality?
- How can we reduce water pollution?

#### 4-H Life Skills

- **Head:** Learning to Learn and Critical Thinking
- **Heart:** Communication
- **Hands:** Responsible Citizenship
- **Health:** Self-Responsibility

National Education Standards		
Topic	Section	Grade levels
1. The Nature of Science	B. Scientific Inquiry	3-8
	C. The Scientific Enterprise	3-8
2. The Nature of Mathematics	B. Mathematics, Science, and Technology	6-8
	A. Technology and Science	3-8
3. The Nature of Technology	B. Design and Systems	3-5
	C. Issues in Technology	3-8
	B. The Earth	6-8
4. The Physical Setting	C. Processes the Shape the Earth	3-8
	E. Physical Health	6-8
6. The Human Organism	A. Agriculture	3-5
8. The Designed World	A. Systems	3-8
11. Common Themes		

## Skimming the Surface

### Best Management Practices for Watersheds

We all live in a watershed. Everything we do in our watershed affects the soil, water, air, plants, and animals. Land use in many watersheds can be quite varied. Whether land is used for agricultural, recreational or residential activities, it is important that surface and groundwater within the watershed not be polluted as a result of these activities. Residents within a watershed are often unaware of the potential to pollute water with every day activities.

We all know that the land within a watershed is used for many different purposes including farms, homes, businesses, parking lots, factories, golf courses, and many other uses. All human uses of the land can impact our water quality. We need to be constantly aware of ways to reduce the amounts of sediment, trash, chemicals, fertilizers, sewage, and any other material that may run off or soak into the land and eventually pollute our water.

The installation and use of simple **Best Management Practices** (BMPs) can reduce the pollution of water within and leaving watersheds. A BMP is a method or technique that is recognized to be effective and practical in reducing surface and groundwater contamination while still allowing the productive use of resources (Table 1).



**Table 1. Best management practices.**

<b>BMP</b>	<b>Problem</b>	<b>Simple solution</b>
Planting in the buffer zone	Streambanks with no vegetation in the buffer zone are not as effective in controlling erosion.	One of the easiest methods of stabilizing streambanks is planting native trees, shrubs, and deep-rooted grasses in the buffer zone. Native plants are important in the landscape because they provide natural food and shelter to wildlife and help maintain a balanced ecosystem. Their deep root systems help hold soil in place and reduce erosion.
Establishing a "No Mow Zone"	Mowing right to the edge of a stream can be harmful. Eliminating a buffer zone's natural plants and bushes can result in the loss of important root systems that help hold the soil in place, causing streambanks to erode faster.	Keep your stream buffer zones mower free. If your buffer zones are healthy maintain them. If you buffer zones are degrading, improve them by planting vegetation and by not mowing.
Stenciling storm drains	Dumping of pollutants down storm drains. Automotive fluids, paints, fertilizers, and other chemicals dumped into storm drains go directly to the nearest lake, river, or stream. Most storm drains do not go to the nearest sewage treatment plant.	Stenciling a message next to the street drain, such as "Dump No Waste – Drains to Stream," can help remind local citizens not to dump anything down storm drains.

Buffer zones are strips of vegetation along the banks that separate the body of water from developed areas, such as lawns, driveways, or buildings.





## Wading In

### The Water Guardian Chopper Ride Activity

The primary materials for this lesson were produced through the Cooperative Extension Program at North Carolina A & T State University and provided to the Southern Region Water Program for use in water quality outreach.

**Time:** 45 minutes

This activity focuses on increasing awareness of water quality issues and providing information for actions that protect water quality.

#### 4-H<sub>2</sub>Objectives

- Identify sources of water pollution.
- Explore landuse practices that may cause water pollution.
- Identify ways to reduce water pollution.
- Learn how all land use decisions affect water quality.

#### Materials

- Computer (1–2 students per computer)
- Internet access (to download Chopper Ride activity software)

#### Instructions

1. Download **Chopper Ride** activity software onto each computer prior to lesson. Software is available for download at [http://www.ca.uky.edu/enri/4H2O\\_educator.htm](http://www.ca.uky.edu/enri/4H2O_educator.htm)
2. Open the activity with a discussion of how we use water every day. Ask prompting questions such as:
  - Can you name five ways you used water today?
  - How is your life changed during a drought?
3. Allow participants to work individually or in a small group to experience **Chopper Ride**.

Discuss the topics (below) presented in **Chopper Ride**.

- Watersheds
  - Wetlands
  - Forest management plans
  - Forest fires
  - Water crossings
  - Logging roads
  - Buffer strips
  - Silt fencing and erosion control measures
  - Conservation tillage
  - Composting
  - Contour plowing
  - Mulches
  - Storm sewers and drains
  - Hazardous materials and products, and other harmful liquids
  - Landfills and garbage
  - Pesticides and fertilizers
  - Fuel tanks
  - Above/below ground tanks
  - Animal houses
  - Pet poop
  - Manure
  - Pasture care
  - Animal holding areas
  - Dead animal disposal
  - Abandoned wells
  - Septic systems and drain fields
  - Septic systems/tank cleaning
  - Drinking water location
  - Cooperative Extension Service
5. Close the lesson by identifying ways we can prevent pollution. Discuss best management practices. See **Skimming the Surface** for more information on BMPs.

#### Reflection Questions

- Ask each participant to name one thing they will do as a result of this lesson. Ask them to be specific. Follow up with each participant to see if they have followed through.

#### 4-H Life Skills

- **Head:** Learning to Learn and Critical Thinking
- **Heart:** Communication
- **Hands:** Responsible Citizenship
- **Health:** Self-Responsibility



National Education Standards		
Topic	Section	Grade levels
1. The Nature of Science	B. Scientific Inquiry	3-8
	C. The Scientific Enterprise	3-5
3. The Nature of Technology	A. Technology and Science	5-8
	B. Design and Systems	3-5
	C. Issues in Technology	3-8
4. The Physical Setting	B. The Earth	6-8
	C. Processes the Shape the Earth	6-8
6. The Human Organism	E. Physical Health	6-8
8. The Designed World	A. Agriculture	3-5
11. Common Themes	A. Systems	3-8

### Wading In Streamside Shuffle

Streamside Shuffle was used, with permission, from Martha Yount, University of Kentucky Cooperative Extension Service.

**Time:** 20 minutes

This activity is used to guide youth in understanding how we all contribute to pollution in a watershed.

#### 4-H<sub>2</sub>Objectives:

- Define point source and nonpoint source pollution.
- Define and identify best management practices.
- Understand that we all contribute to and are responsible for the water quality in the watershed(s) we live, work, and play in.

#### Materials

- One index card per student
- Pencils, crayons, or markers

#### Instructions

1. Give each student an index card and a pencil, crayons, or markers.
2. Tell students that the card represents a piece of property that they have been given. Each piece of property has a stream running through it.
3. Give students 5 minutes to draw what they would like on their property (such as buildings, barns, houses, roads, etc.). They may include anything; however, they *must* include a stream.

4. After 5 minutes, collect the cards and stack them up. “Shuffle” the deck, then deal the cards out in a line, so that the stream runs through the line of cards.
5. Have the students look “upstream” from their property.
6. Ask each student if what they see “upstream” from their property impacts their property.
7. Discuss various sources of pollution, including point source and nonpoint source pollution.
8. Discuss best management practices (BMPs). Have each student identify a BMP for their property.

#### Reflection Questions

- Ask students to identify sources of point source and nonpoint source pollution in the watershed they live in. Have students name existing or needed BMPs in the watershed they live in.

#### 4-H<sub>2</sub>O Opportunities

Have students draw the property they live in, whether that is a farm, a house with a backyard, or an apartment building. Have them discuss sources of point source and nonpoint source pollution and existing or needed BMPs.

#### 4-H Life Skills

- **Head:** Learning to Learn and Critical Thinking
- **Heart:** Communication and Sharing
- **Hands:** Responsible Citizenship
- **Health:** Self-Responsibility

National Education Standards		
Topic	Section	Grade levels
1. The Nature of Science	B. Scientific Inquiry	3-5
	C. The Scientific Enterprise	3-5
4. The Physical Setting	B. The Earth	6-8
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## Diving Deeper

### Bird's Eye View: Touring Your Watershed with Google Earth

This activity provides youth the opportunity to tour the watershed they live in using Google Earth. Youth will learn about the land use, population, and potential sources of pollution in their watershed. For younger children, you may consider doing this activity in a large group with adult leaders.

#### 4-H<sub>2</sub> Objectives

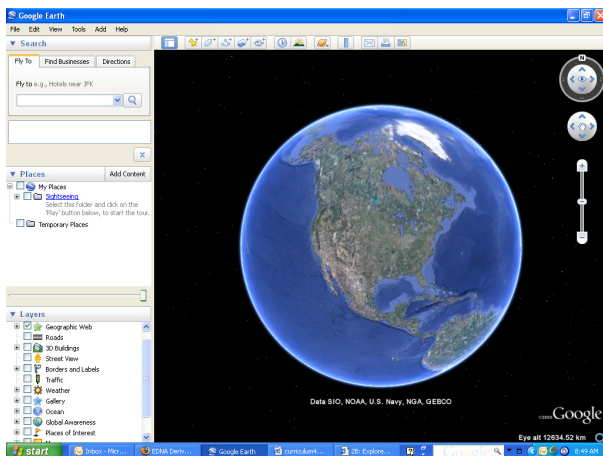
- Identify the major watershed in which you live.
- Understand the types of land use in the major watershed in which you live.
- List the potential sources of pollution in the major watershed in which you live.
- Understand the impacts population may have on a watershed.
- Identify ways to reduce pollution.

#### Materials

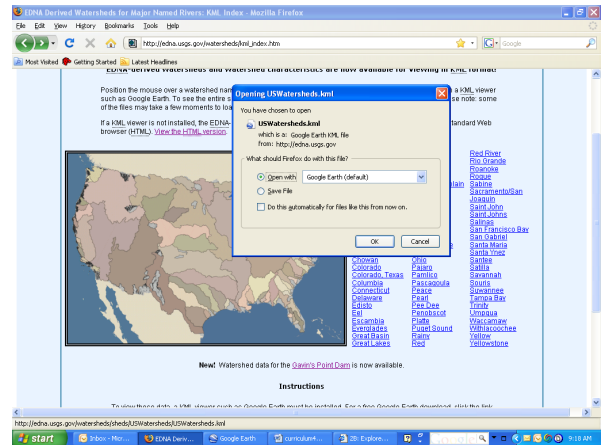
- Internet access
- **Bird's Eye View instruction sheet** (one per participant)

#### Instructions

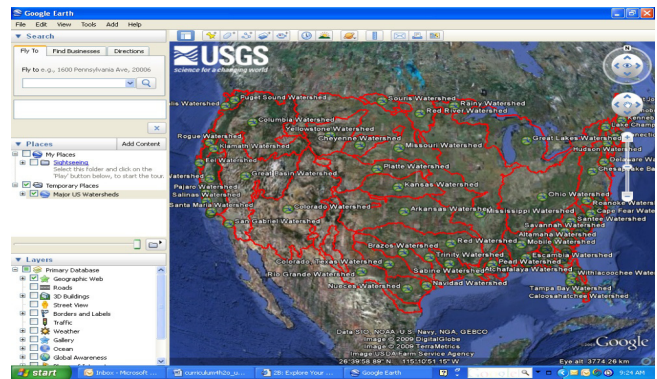
1. Open Google Earth. If you do not already have Google Earth, download it for free at <http://earth.google.com/>.
2. Once Google Earth has opened, note the map of the earth on the right and a *Menu Panel* on the left. Find the *Layers* at the bottom left of the *Menu Panel*. Turn the *Geographic Web Layer* on by clicking the box next to it. See diagram below.



3. Minimize Google Earth (do not close). Go to USGS Elevation Derivatives for National Application (EDNA) Watershed Atlas site at [http://edna.usgs.gov/watersheds/kml\\_index.htm](http://edna.usgs.gov/watersheds/kml_index.htm).
4. Click on the large map of the United States. The pop-up box, *Opening USWatersheds.kml*, will appear. Click ok.



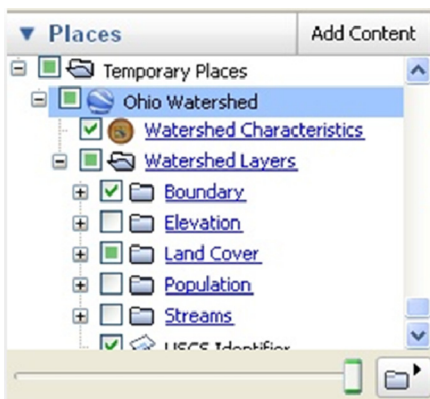
5. Maximize (open) Google Earth. The outline of the major watersheds in the U.S. should appear (as seen below in red).



6. Find your watershed by entering the name of your city and state in the *Fly To* box under *Search* in the *Menu Panel*. Click on the magnifying glass. Google Earth will fly to your city.
7. Use the zoom out tool on the right to zoom out. What is the name of the major watershed you live in?



8. On the map, next to the name of your watershed will be a green circle with blue lines. Click on the green circle. A pop-up box will appear. Click on the *View the <Name of Your Watershed> Watershed* link. This may take two or more minutes to download.
9. The data layers have been downloaded when you see a land cover image overlain on your watershed map. A new folder containing data about your watershed has now been created. Go to the *Menu Panel*, under *Places*, scroll down until you see your watershed name with a blue circle with white lines. This is the new folder for your watershed. Click the + sign next to *Watershed Layers*. Note the different layers (such as boundary, elevation, streams, etc.) available. You can turn these layers on and off by checking the box next to each one.



10. On the map, within the red outline of your watershed find a brown circle next to the text *Watershed Characteristics*. Click on the brown circle. A pop-up box will appear.
11. In the *Watershed Characteristics* pop-up box, to the left, click on the various *Land Cover* links (you may have to open the *Watershed Characteristics* pop-up box more than once to view the various *Land Cover* links). The land cover information will open in a new window. Compare the land use percentages. List the various land uses and their percentages for your major watershed.
12. For each land use listed, list the potential sources of pollution.  
**Note:** The potential sources of pollution are not listed on the chart/table. These sources of pollution are ones YOU think may be affecting the watershed.

**Example:** Land Use – Crop/Pasture Land,  
Source of Pollution – Livestock in Stream

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13. Go back to Google Earth. Click on the *Watershed Characteristics* brown circle again to reopen the pop-up box. Click on the various *Population* links. The population information will open in a new window. Find the area you live in on the *Population Density Map*. What is the population density in the area you live in?

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How do you think the land use may differ in an area that is highly populated versus an area that has a lower population?

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Would the potential sources of pollution in a highly populated area versus an area with lower population differ? Why or why not?

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14. Compare the *Land Cover* information with the *Population* information. What conclusions can you draw from this information?

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**Reflection Questions**

- What do you think are the main sources of pollution in the major watershed you live in based on the Watershed Characteristics Land Use and Population Information?
- How can this pollution be reduced?
- Identify three ways *you* can reduce pollution in the watershed you live. Of the three, choose two that will do in your watershed to reduce pollution.

**4-H<sub>2</sub>Opportunities**

- Take a driving tour of your watershed. Note different land use practices in urban and rural areas. Discuss different sources of pollution, and ways to reduce pollution.
- Interview different land owners in your watershed, such as a local farmer, homeowner, golf course owner, park manager, etc. Ask questions related to land management practices. Examples: Ask a homeowner if he/she uses fertilizers or pesticides on his/her lawn? Discuss best management practices for applying fertilizers and pesticides.

**4-H Life Skills**

- **Head:** Learning to Learn and Critical Thinking
- **Heart:** Communication
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3. The Nature of Technology	A. Technology and Science	3-8
4. The Physical Setting	B. The Earth	6-8
	C. Processes the Shape the Earth	6-8
8. The Designed World	A. Agriculture	3-5
11. Common Themes	A. Systems	3-8

**Sink or Swim**

1. Conduct a pre- and post- questionnaire with youth. Ask them the following questions before and after the activities to determine if youth’s knowledge level changed.
  - a. What is point source and nonpoint source pollution?
  - b. Can you provide examples of point source and nonpoint source pollution?
  - c. What landuse practices may contribute to water pollution?
  - d. What contributes to water pollution in the watershed you live in?
  - e. What are best management practices?
  - f. Identify best management practices existing or needed in the watershed you live in.
2. Develop a K-W-L Chart with youth. This chart demonstrates what students **k**now about the subject before the activity, what students **w**ant to know about the subject during the activity, and what students **l**earned about the subject after the activity. Before starting the activity ask youth as a group what they **k**now about the watershed they live in. Once they have told you what they already know, ask them what they **w**ant to know about the watershed they live in. Record all answers/comments on large poster board or chalk board to refer back to. This section will help the leader know what areas of the activities to emphasis. Depending on these comments the leader may have to adapt the activities to ensure that the youth learn items that have specified in this section. After the activities discuss what the youth **l**earned. Go back to the first and second questions of the chart and discuss what they knew (were their statements correct?, etc.) and make sure items that youth wanted to know were addressed.



## Glossary

**Best management practices (BMP).** Methods that have been determined to be the most effective, practical means of preventing or reducing pollution from nonpoint sources.

**Buffer strips/zones.** Strips of grass or other erosion-resisting vegetation between or below cultivated strips or fields.

**Channelization.** Straightening and deepening streams so water will move faster, a marsh-drainage tactic that can interfere with waste assimilation capacity, disturb fish and wildlife habitats, and aggravate flooding.

**Coliform organism.** Microorganisms found in the intestinal tract of humans and animals. Their presence in water indicates fecal pollution and potentially adverse contamination by pathogens.

**Compost.** A humus or soil-like material created from aerobic, microbial decomposition of organic materials such as food scraps, yard trimmings, and manure

**Composting.** The controlled biological decomposition of organic material in the presence of air to form a humus-like material. Controlled methods of composting include mechanical mixing and aerating, ventilating the materials by dropping them through a vertical series of aerated chambers, or placing the compost in piles out in the open air and mixing it or turning it periodically.

**Conservation.** Preserving and renewing, when possible, human and natural resources. The use, protection, and improvement of natural resources according to principles that will ensure their highest economic or social benefits.

**Contour plowing.** Soil tilling method that follows the shape of the land to discourage erosion.

**Erosion.** The wearing away of land surface by wind or water, intensified by land-clearing practices related to farming, residential or industrial development, road building, or logging.

**Feedlot.** A confined area for the controlled feeding of animals. Tends to concentrate large amounts of animal waste that cannot be absorbed by the soil and, hence, may be carried to nearby streams or lakes by rainfall runoff.

**Fertilizer.** Natural (e.g., manure) or man-made (e.g., urea) substance used to make the soil more fertile and promote plant growth

**Groundwater.** The supply of fresh water found beneath the Earth's surface, usually in aquifers, which supply wells and springs. Because ground water is a major source of drinking water, there is growing concern over contamination from leaching agricultural or industrial pollutants or leaking underground storage tanks.

**Landfills.** 1. Sanitary landfills are disposal sites for non-hazardous solid wastes spread in layers, compacted to the smallest practical volume, and covered by material applied at the end of each operating day. 2. Secure chemical landfills are disposal sites for hazardous waste, selected and designed to minimize the chance of release of hazardous substances into the environment.

**Mulch.** A layer of material (wood chips, straw, leaves, etc.) placed around plants to hold moisture, prevent weed growth, and enrich or sterilize the soil.

**Nonpoint sources.** Diffuse pollution sources (i.e. without a single point of origin or not introduced into a receiving stream from a specific outlet). The pollutants are generally carried off the land by storm water. Common non-point sources are agriculture, forestry, urban, mining, construction, dams, channels, land disposal, saltwater intrusion, and city streets.

**Pesticide.** Substances or mixture thereof intended for preventing, destroying, repelling, or mitigating any pest. Also, any substance or mixture intended for use as a plant regulator, defoliant, or desiccant.

**Point source.** A stationary location or fixed facility from which pollutants are discharged; any single identifiable source of pollution; e.g. a pipe, ditch, ship, ore pit, factory smokestack.

**Pollutant.** Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems.

**Pollution.** Generally, the presence of a substance in the environment that because of its chemical composition or quantity prevents the functioning of natural processes and produces undesirable environmental and health effects. Under the Clean Water Act, for example, the term has been defined as the man-made or man-induced alteration of the physical, biological, chemical, and radiological integrity of water and other media.

**Riparian buffer/zone.** Strip of land that borders a stream, river, or other body of water.



**Run off.** That part of precipitation, snow melt, or irrigation water that runs off the land into streams or other surface-water. It can carry pollutants from the air and land into receiving waters.

**Sanitary sewers.** Underground pipes that carry off only domestic or industrial waste, not storm water.

**Sediment.** Topsoil, sand, and minerals washed from the land into water, usually after rain or snow melt.

**Septic system.** An on-site system designed to treat and dispose of domestic sewage. A typical septic system consists of tank that receives waste from a residence or business and a system of tile lines or a pit for disposal of the liquid effluent (sludge) that remains after decomposition of the solids by bacteria in the tank and must be pumped out periodically.

**Septic tank.** An underground storage tank for wastes from homes not connected to a sewer line. Waste goes directly from the home to the tank.

**Sewage.** The waste and wastewater produced by residential and commercial sources and discharged into sewers.

**Sewer.** A channel or conduit that carries wastewater and storm-water runoff from the source to a treatment plant or receiving stream. “Sanitary” sewers carry household, industrial, and commercial waste. “Storm” sewers carry runoff from rain or snow. “Combined” sewers handle both.

**Silt.** Sedimentary materials composed of fine or intermediate-sized mineral particles.

**Spring.** Groundwater seeping out of the earth where the water table intersects the ground surface.

**Storm sewer.** A system of pipes (separate from sanitary sewers) that carries water runoff from buildings and land surfaces.

**Tillage.** Plowing, seedbed preparation, and cultivation practices.

**Turbidity.** A cloudy condition in water due to suspended silt or organic matter.

**Water quality.** The chemical, physical and biological condition of a body of water

**Water quality criteria.** Levels of water quality expected to render a body of water suitable for its designated use. Criteria are based on specific levels of pollutants that would make the water harmful if used for drinking, swimming, farming, fish production, or industrial processes.

**Watershed.** The land area that drains into a stream; the watershed for a major river may encompass a number of smaller watersheds that ultimately combine at a common point.

**Well.** A bored, drilled, or driven shaft, or a dug hole whose depth is greater than the largest surface dimension and whose purpose is to reach underground water supplies or oil, or to store or bury fluids below ground.

**Wetlands.** An area that is saturated by surface or ground water with vegetation adapted for life under those soil conditions, as swamps, bogs, fens, marshes, and estuaries.



## National Education Standards

### 1. The Nature of Science

#### *B. Scientific Inquiry*

Scientific investigations may take many different forms, including observing what things are like or what is happening somewhere, collecting specimens for analysis, and doing experiments. Investigations can focus on physical, biological, and social questions (Grades 3-5).

Scientists' explanations about what happens in the world come partly from what they observe, partly from what they think. Sometimes scientists have different explanations for the same set of observations. That usually leads to their making more observations to resolve the differences (Grades 3-5).

Scientists differ greatly in what phenomena they study and how they go about their work. Although there is no fixed set of steps that all scientists follow, scientific investigations usually involve the collection of relevant evidence, the use of logical reasoning, and the application of imagination in devising hypotheses and explanations to make sense of the collected evidence (Grades 6-8).

What people expect to observe often affects what they actually do observe. Strong beliefs about what should happen in particular circumstances can prevent them from detecting other results. Scientists know about this danger to objectivity and take steps to try and avoid it when designing investigations and examining data. One safeguard is to have different investigators conduct independent studies of the same questions (Grades 6-8).

#### *C. The Scientific Enterprise*

Clear communication is an essential part of doing science. It enables scientists to inform others about their work, expose their ideas to criticism by other scientists, and stay informed about scientific discoveries around the world (Grades 3-5).

No matter who does science and mathematics or invents things, or when or where they do it, the knowledge and technology that result can eventually become available to everyone in the world (Grades 6-8).

### 2. The Nature of Mathematics

#### *B. Mathematics, Science, and Technology*

Mathematics is helpful in almost every kind of human endeavor – from laying bricks to prescribing medicine or drawing a face. In particular, mathematics has contributed to progress in science and technology for thousands of years and still continues to do so (Grades 6-8).

### 3. The Nature of Technology

#### *A. Technology and Science*

Technology enables scientists and others to observe things that are too small or too far away to be seen without them and to study the motion of objects that are moving very rapidly or are hardly moving at all (Grades 3-5).

Technology extends the ability of people to change the world: to cut, shape, or put together materials; to move things from one place to another; and to reach farther with their hands, voices, senses, and minds. The changes may be for survival needs such as food, shelter, and defense, for communication and transportation, or to gain knowledge and express ideas (Grades 3-5).

Technology is essential to science and for such purposes as access to outer space and other remote locations, sample collection and treatment, measurement, data collection and storage, computation, and communication of information (Grades 6-8).

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#### *B. Design and Systems*

The solution to one problem may create other problems (Grades 3-5).

#### *C. Issues in Technology*

Technologies often have drawbacks as well as benefits. A technology that helps some people or organisms may hurt others – either deliberately (as weapons can) or inadvertently (as pesticides can). When harm occurs or seems likely, choices have to be made or new solutions found (Grades 3-5).

The human ability to shape the future comes from a capacity for generating knowledge and developing new technologies – and for communicating ideas to others (Grades 6-8).





## 4. The Physical Setting

### B. The Earth

The cycling of water in and out of the atmosphere plays an important role in determining climatic patterns. Water evaporates from the surface of the earth, rises and cools, condenses into rain or snow, and falls again to the surface. The water falling on land collects in rivers and lakes, soil, and porous layers of rock, and much of it flows back into the ocean (Grades 6-8).

Fresh water, limited in supply, is essential for life and also for most industrial processes. Rivers, lakes and groundwater can be depleted or polluted, becoming unavailable or unsuitable for life (Grades 6-8).

The benefits of the earth's resources – such as fresh water, air, soil, and trees – can be reduced by using them wastefully or by deliberately or inadvertently destroying them. The atmosphere and the oceans have a limited capacity to absorb wastes and recycle materials naturally. Cleaning up polluted air, water, or soil or restoring depleted soil, forests, or fishing grounds can be very difficult and costly (Grades 6-8).

### C. Processes that Shape the Earth

Waves, wind, water, and ice shape and reshape the earth's land surface by eroding rock and soil in some areas and depositing them in other areas, sometimes in seasonal layers (Grades 3-5).

Although weathered rock is the basic component of soil, the composition and texture of soil and its fertility and resistance to erosion are greatly influenced by plant roots and debris, bacteria, fungi, worms, insects, rodents, and other organisms (Grades 6-8).

Human activities, such as reducing the amount of forest cover, increasing the amount and variety of chemicals released into the atmosphere, and intensive farming, have changed the earth's land, oceans, and atmosphere. Some of these changes have decreased the capacity of the environment to support some life forms (Grades 6-8).

## 6. The Human Organism

### E. Physical Health

The environment may contain dangerous levels of substances that are harmful to human beings. Therefore, the good health of individuals requires monitoring the soil, air, and water and taking steps to keep them safe.

## 8. The Designed World

### A. Agriculture

Some plant varieties and animal breeds have more desirable characteristics than others, but some may be more difficult or costly to grow. The kinds of crops that can grow in an area depend on climate and soil. Irrigation and fertilizers can help crops grow in places where there is too little water or the soil is poor (Grades 3-5).

## 11. Common Themes

### A. Systems

In something that consists of many parts, the parts usually influence one another (Grades 3-5).

In something that consists of many parts, the parts usually influence one another (Grades 3-5).

Thinking about things as systems means looking for how every part relates to others. The output from one part of a system (which can include material, energy, or information) can become the input to other parts. Such feedback can serve to control what goes on in the system as a whole (Grades 6-8).

Any system is usually connected to other systems, both internally and externally. Thus a system may be thought of as containing subsystems and as being a subsystem of a larger system (Grades 6-8).

Source: American Association for the Advancement of Science, *Benchmarks for Science Literacy*, 1993.



## References

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## 4-H<sub>2</sub>O Ambassador Certification

### **Instructor Information**

At the completion of Units 1-3, youth will have earned the title *Southern Region 4-H<sub>2</sub>O Ambassador*. This title indicates that the individual has successfully completed Units 1-3 and has been acknowledged by the Southern Region Water Program as having the skills and knowledge to successfully complete a community-based service project. At the completion of the community-based service project, each 4-H<sub>2</sub>O Ambassador will be recognized on a local, statewide, and multi-state (regional) basis.

A *Southern Region 4-H<sub>2</sub>O Ambassador Certificate* can be downloaded and customized at <http://www.ca.uky.edu/enri/4H2O.htm>.

### **4-H<sub>2</sub>O Opportunities**

- Celebrate! Have an annual 4-H<sub>2</sub>O Festival honoring new and old Southern Region 4-H<sub>2</sub>O Ambassadors. Provide opportunities for ambassadors to present on their community projects. Award new ambassador certificates at an award ceremony. Set up booths featuring water-related information.
- Honor new ambassadors at the county or state fair. Have ambassadors (new and old) showcase their community projects by setting up a display.
- Honor new ambassadors by featuring their accomplishments in a local newspaper. A sample news release is available on the 4-H<sub>2</sub>O Ambassador website or you can create your own.