



4th - 8th Grade
4-H PROJECT
LESSON
PLANS:

4-H Helps
YOUth
into the
21st Century

Series **2**

“H₂O Oh!”

LSU
AgCenter
Research & Extension

Dear Project Helper,

This lesson, “H₂O Oh!,” is a part of an effort by the 4-H Youth Development Department of the LSU AgCenter to provide teaching activities that are fun as well as educational. We are pleased that you have agreed to work with youth as they learn and grow. You will help them learn specific concepts they will use for many years.

These lessons address Louisiana Content Standards Science Benchmarks; therefore what you do with this activity should help strengthen students for LEAP testing. The Benchmarks we have incorporated into this lesson are:

- SE-E-A3: identifying ways in which humans have altered their environment, both in positive and negative ways, either for themselves or for other living things (1, 2, 3, 4, 5)
- SE-M-A1: demonstrating knowledge that an ecosystem includes living and nonliving factors and that humans are an integral part of ecosystems (1, 3, 4, 5)
- SE-M-A3: defining the concept of pollutant and describing the effects of various pollutants on ecosystems (1, 2, 3, 4, 5)
- SE-M-A4: understanding that human actions can create risks and consequences in the environment (1, 2, 3, 4, 5)
- LS-M-C4: explaining the interaction and interdependence of nonliving and living components within ecosystems (1, 2, 3, 4, 5)

At the end of the lesson plan are materials for visual aids, resources for more information and descriptions of additional activities. We have also added information and activities that may be suitable when presenting to more advanced students (7th and 8th graders). We appreciate your being part of this effort.



Learning Activity: “H₂O Oh!”

Key Concepts:

1. Effects of water pollution on an ecosystem.
2. Types and sources of water pollution.

How Can Members Apply this Information?

1. Describe the effects of water pollution on an ecosystem.
2. Identify the types and sources of water pollution.
3. Understand human involvement in pollution and recognize that everyone contributes to and is responsible for water quality.

Getting Ready:

1. Gather all supplies needed.
2. Read lesson and be thoroughly prepared.
3. Make a poster of the five types of water pollution. Attach headings to poster board, leaving space under each for picture cards (to be placed by participants). You can spray poster with spray adhesive so pictures will adhere during activity or you can use tape.
4. Cut pollution pictures apart to make set. (May want to laminate onto cards.)

What You Need for the Lesson:

1. Paper and crayons/markers
2. Drinking straws
3. Tape
4. Poster board to make poster with types of water pollution (headings provided)
5. Pictures of sources of water pollution (provided)

Tracks:

Environment/Science

Life Skills:

Making Decisions,
 Analyzing Information,
 Solving Problems, Critical
 Thinking, Teamwork

Character Focus:

Responsibility and
 Citizenship

Project Skills:

Identifying types and effects
 of water pollution, under-
 standing human involvement
 in pollution

Louisiana

Content Standard

Benchmarks:

LS-M-C4, SE-E-A3,
 SE-M-A1, SE-M-A3,
 SE-M-A4

Delivery Mode:

4-H Club meeting, science
 class, school enrichment,
 after-school program

Time Allotted:

20 minutes:
 Matching activity only
 45 minutes:
 All activities

Minimum Number of Participants:

10

Background:

In Louisiana a large portion of the environment is made up of various aquatic/marine ecosystems including: wetland, freshwater, coastal and saltwater ecosystems. The quality of water is a reflection of land usage and human involvement in the ecosystem. Agriculture, gas and oil exploration and development, and the chemical industry all have important roles in Louisiana's economy, but all are possible contributors of pollution. In addition to industry, private homes and landowners may also contribute to water pollution through everyday activities. For safety and conservation of Louisiana's ecosystems, industry and individuals must stay informed and work together to minimize water pollution.



4th-8th Grade “H₂O Oh!”

What You Say:	What You Show or Do:	What Participants Do:
<p>Today we will begin with an activity. You have been given a piece of riverfront property. You may develop the piece of land any way you wish, such as a home, farm, store or factory. You may even develop your land so that it will make money for you. You will be given a piece of paper to draw your riverfront property. Make sure you draw the river on one side of your paper. You have 10 minutes to develop your property.</p>	<p>Divide participants into teams if necessary. Distribute paper and crayons or markers. Monitor progress and give ideas to students. Make sure there is an assortment of different types of developments (ex: animal farm, crop farm, factories, shopping centers, recreational areas, housing, fishing/hunting camp, golf course, gardens, etc.). You may have to assign different types of development to get a variation. After 10 minutes, pick up sheets and place the sheets side by side along river (on floor or table).</p>	<p>Work individually or in groups to develop property.</p>
<p>Today we will talk about water pollution. First let's review some terms. Can anyone define an ecosystem? (An ecosystem is a group of plants and animals and the environment they live in.) Can someone explain the difference between biotic and abiotic parts of the ecosystem? (They are the living and non-living parts of an ecosystem.) Give me some examples of each. (Biotic = plants, animals, microorganisms, insects, humans, etc.; Abiotic = water, wind, temperature, soil, etc.)</p>	<p>Encourage answers from participants.</p>	<p>Define terms and give examples.</p>

4th-8th Grade “H₂O Oh!”

What You Say:	What You Show or Do:	What Participants Do:
<p>Water is an abiotic component of an ecosystem on which biotic components depend. If water is polluted, it can have several effects on an ecosystem. Can anyone give me some examples of these effects? (disrupting food chain, killing plants and animals, making people sick)</p>	<p>Encourage answers from participants.</p>	<p>Give examples of effects of water pollution.</p>
<p>The five different types of water pollution are: thermal (heat), chemical, erosion (loss of soil), nutrient (fertilizers or decomposing organic matter) and bacterial. To help you understand the different types, we will play a matching game. We will match the type of pollution with its possible source.</p> <p>(Share) What happened? Were you aware of all five types of pollution? Which sources were the easiest to match? The hardest?</p> <p>(Process) Why is it important for both private citizens and industry to understand water pollution? NOTE: If using only this activity, now go directly to the questions near the end of the lesson, which help to generalize and apply the concepts of water pollution.</p>	<p>Show poster with the names of five types of pollution and have the participants match pictures of the possible sources with the types of pollution:</p> <p>Thermal = factory (Factories use water to produce steam for energy. Condensed steam, which is still very hot, is released into surface water. Heat can affect microorganisms, fish, etc.)</p> <p>Chemical = factory, pesticide containers (Waste products from industry, agriculture and domestic use often contain substances toxic to humans and animals This may be the result of overapplication of chemicals like pesticides, fertilizers, disinfectants and cleansers.)</p> <p>Erosion = Logging scene, construction scene (Erosion occurs when trees and plant life are removed. It changes the structure of the ecosystem and increases the solid particles in water. It often alters the feeding and spawning habitats of fish.)</p> <p>Nutrient = Cow, farmer, golf course. (Runoff associated with human or animal waste, run-off from farms or golf courses caused by fertilizer application and decomposing plant materials all can add nutrients to the water that cause unwanted plant matter to grow and take up oxygen that aquatic organisms need for life.)</p> <p>Bacterial = Cow, wildlife scene, fish camp with exposed pipe and/or leaking septic tank. (It's associated with human or animal waste that may cause disease or illness in plants, animals or people. Recreational rivers and lakes have been closed for years when bacterial counts are too high.)</p> <p>Discuss how each source causes its respective type of water pollution.</p>	<p>Place pictures near the type of water pollution. Discuss and respond.</p>



4th-8th Grade “H₂O Oh!”

What You Say:	What You Show or Do:	What Participants Do:
<p>We will now continue with our riverfront activity. You have developed your piece of property. Now we will see what sources and types of pollution you have created. As you know water, flows downstream, so we will start with the property upstream. For each pollutant you have created, you will receive a straw. As we move downstream, we will observe how pollution concentrates and affects others downstream.</p> <p>(Share) When you were initially told to develop riverfront property, what factors did you consider? Did you consider pollution of the river? How do you feel about your pollution affecting others' development and others' pollution affecting your development?</p>	<p>Have participants come up (in order of upstream to downstream) and discuss their development. Hand out straws accordingly, and then have participants pass them to the next group downstream.</p>	<p>Explain development and list types and sources of pollution. Collect straws and pass them downstream. Discuss how their pollutants are affecting others downstream.</p>
<p>(Process) Now let's look at all the pollutants in our river. How are they affecting our ecosystem? How are they affecting the food chain? How could they affect human health?</p>	<p>Encourage discussion. Demonstrate chain reaction. (Ex: water gets polluted — microorganisms die — the fish die — birds die, etc.). Discuss possible health problems. (Ex.: cancer from cancer-causing chemicals, illnesses caused by bacterial contamination.)</p>	<p>Discuss possible effects the pollutants have on the ecosystem, food chain and human health.</p>

4th-8th Grade “H₂O Oh!”

What You Say:	What You Show or Do:	What Participants Do:
<p>(Generalize) What are some ways that landowners in your community are polluting the waterways? What are some ways your community could help prevent pollution of the waterways? Have you had similar experiences where something you did had a negative effect on others? How did you feel and what did you do about it? Can you have a negative effect on people without realizing it? How can you make yourself more aware of the consequences of your actions?</p>	<p>Encourage participation. (Examples of prevention practices: <u>Construction sites and forest clearings</u> – Have vegetation strips (grass, trees, plants) around perimeter or silt fencing to hold the soil in place and prevent erosion. <u>Stream banks</u> – Vegetation strips. <u>Plowed fields</u> – Form rows parallel to the river so that runoff does not drain straight into the river. Have vegetation strips or wetlands between the fields and the river. <u>Crops, lawns and golf courses</u> – Take soil samples to ensure fertilizer is necessary. Use only the correct amount, and follow label directions on both fertilizer and pesticides. <u>Highways, roads and parking lots</u> – Dispose of oil and antifreeze from vehicles at authorized collection points. Maintain condition of vehicles. Do not litter. <u>Sewage and gray water</u> – Be sure to get a permit from DHH Environmental Health Office and maintain wastewater treatment systems properly.</p>	<p>Give possible answers.</p>
<p>(Apply) How can we use the information we have learned today? What are some things we can do to prevent pollution? (Don't litter, learn about the effects of pollution, read pesticide and fertilizer labels, follow laws, etc.) Now that we have discussed water pollution, what changes would you make to your development?</p>	<p>Encourage participation.</p>	<p>Give possible answers.</p>

4th-8th Grade “H₂O Oh!”

What You Say:	What You Show or Do:	What Participants Do:
<p>Doing things to prevent pollution involves taking responsibility for your actions and being a good citizen. We can practice being a good citizen by understanding the effects humans have on the ecosystem and their contribution to water pollution. We can share what we know about pollution with family, friends and neighbors in the community and encourage people to make responsible decisions when it comes to the environment. What are some ways you could educate those around you?</p>	<p>Show the “Responsibility” poster from the Character Counts lessons available from the LSU AgCenter.</p>	<p>Discuss ways to share information about water pollution.</p>



Ways to Help Members Learn More:

1. Dilution is NOT the Solution

Purpose: To show that pollutants take a very long time to dilute and that dilution may not be the best solution.

Materials: Various sizes of clear containers ranging from small/medium/large glass jars to a large fishbowl or aquarium, tap water, red food coloring

Procedure: Add a couple drops of red food coloring to a small glass jar. Fill with water. The food coloring represents pollution. Gradually add it to the next larger container. Fill with clear tap water. Continue until all containers are filled. Notice how long it takes for the red to disappear, or if it ever does.

2. Not All Pollution Can Be Seen Taste Test

Purpose: To help students understand that clear water is not necessarily free of pollutants.

Materials: 5 clear cups with drinking water, 4 clear non-harmful substances with tastes students would recognize (ex: salt, vinegar, sugar, citric acid, carbonated water), cotton swabs.

Procedure: Add clear substances to 4 of the cups of water and allow students to taste each cup using a cotton swab. Have students record and discuss their reactions to each cup.

3. Take participants on fieldtrips to various aquatic ecosystems and have them discuss the types of water pollution evident. Have participants help clean up local waterways.



Resources:

http://ericir.syr.edu/cgi-bin/lessons.cgi/Science/Environmental_Education

http://www.ec.gc.ca/envpriorities/cleanwater_e.htm

<http://school.discovery.com/lessonplans/programs/finiteoceans/>

<http://ofcn.org/cyber.serv/academy/ace/>

<http://www.epa.gov/ORD/WebPubs/fresh/fresh.pdf>

<http://www.lsuagcenter.com/Subjects/bmp/index.asp>

Available from library or LSU AgCenter:

America's Vanishing Treasure. Barataria-Terrebonne National Estuary Program.

Gulf of Mexico Repair Kit: Rx For a Healthy Gulf. Texas A&M University Sea Grant College Program & Gulf of Mexico Program Office.

Haunted Waters, Fragile Lands: Oh, What Tales To Tell! Barataria-Terrebonne National Estuary Program.

Knee Deep In Louisiana Wetlands. Barataria-Terrebonne National Estuary Program.

Lessons on the Lake: An Educator's guide to the Lake Pontchartrain Basin. Second edition. 2002. Lake Pontchartrain Basin Foundation.

100 Years of Oil and Gas in Louisiana Centennial CD Set. Louisiana Independent Oil and Gas Association.

Vanishing Wetlands... Vanishing Future. Produced by Nicholls State University.

Wings Over the Wetlands. Barataria-Terrebonne National Estuary Program

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Career Options:

ecologist,
 environmental scientist,
 marine biologist,
 water conservation agent,
 engineer (biological and
 agricultural, chemical,
 civil, environmental)

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This lesson was adapted from Project WET: Curriculum & Activity Guide. 1995. The Watercourse and the Council for Environmental Education. To be trained in and receive the Project WET Curriculum, contact Joey Breaux, LDAF at (225) 922-1269.

WOW! The Wonders of Wetlands: An Educator's Guide. 1995. Environmental Concern Inc. and The Watercourse.

Louisiana Content Standards, published by Louisiana State Department of Education.



Tips for More Advanced Participants:

1. Bioaccumulation-

process by which pollutants build up in the environment through the food web. Activity suggestion: have students trace how a chemical accumulates as it goes through the food chain. For instance, algae absorb three units of pesticide chemicals. Each microorganism eats two algae. Therefore they each now have six units of pesticide chemicals. A fish eats 10 microorganisms, so now they each have 60 units of pesticide chemicals. A person eats three fish and consumes 180 units of pesticide chemicals. Explain that the described process may not be exact, since the pesticide units may degrade or may not be completely digested. Then the total amount is less.

2. Point-source pollution-

pollutants that come from an identifiable source such as pipes, ditches and sewers, and require a point-source discharge permit from the Louisiana Department of Environmental Quality.

3. Non-point source pollution-

widespread pollutants that do not come from a specific source, such as pollutants from runoff, residential areas or agricultural fields.

4. Best management practices (BMPs) -

methods used by manufacturers, farmers and other resource users to decrease harm done to the environment. The LSU AgCenter has developed a set of BMPs targeted toward agricultural producers in Louisiana. These can be found on the LSU AgCenter Web site, <http://www.lsuagcenter.com/Subjects/bmp/index.asp>

For more information and activities on bioaccumulation and BMPs, refer to WOW! The Wonders of Wetlands.



Thermal

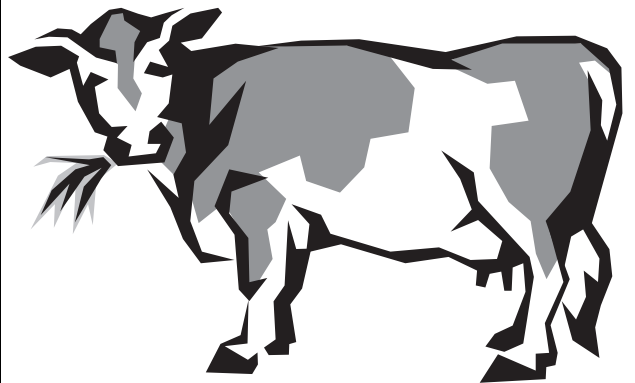
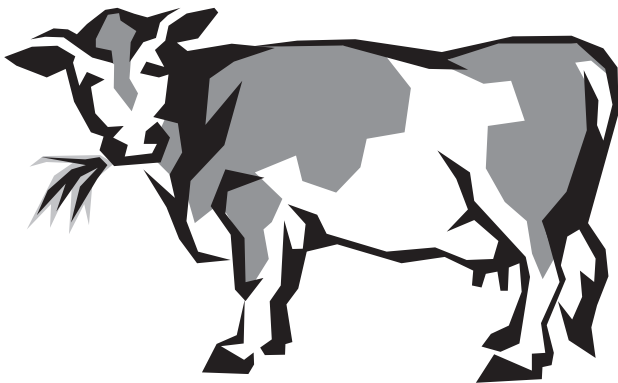
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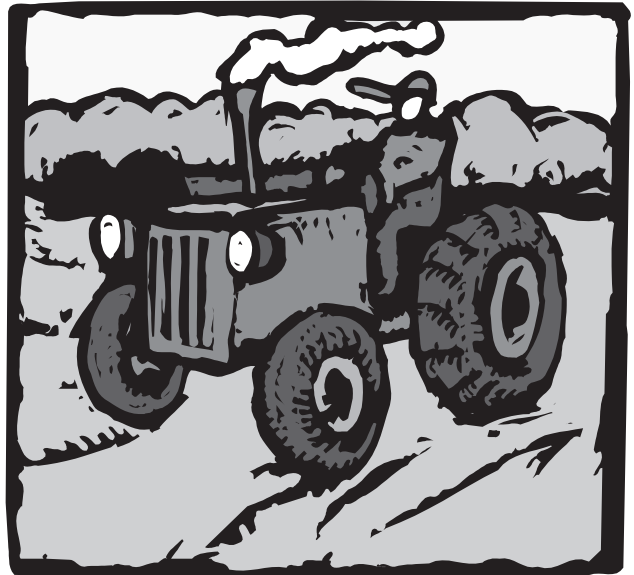
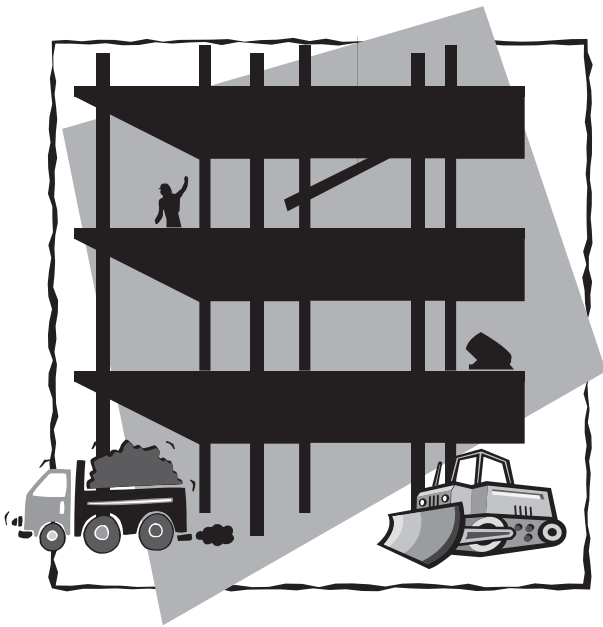
Bacterial

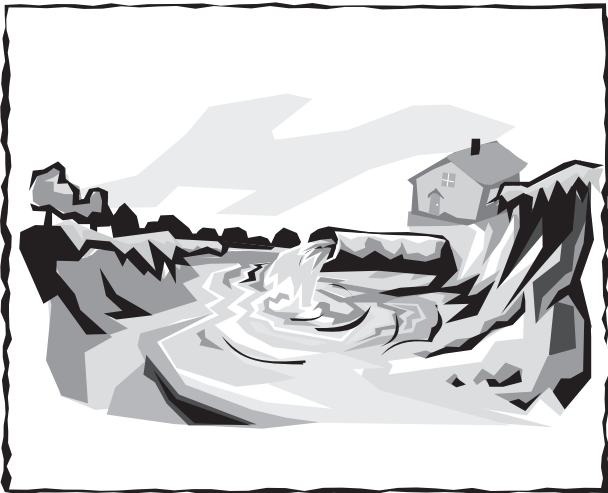
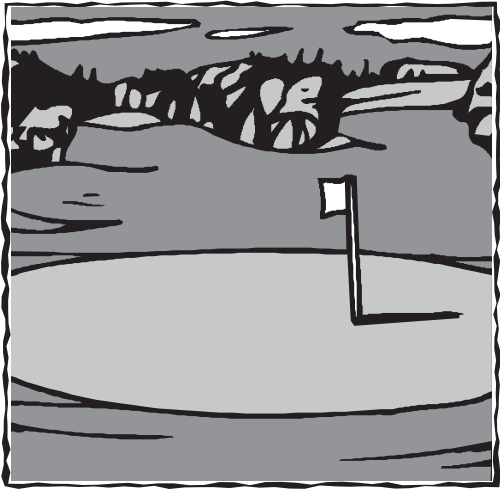
Nutrient

Erosion









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