

Water

About the 4-H Science Toolkit Series: Water

In this series of activities, children investigate the many ways humans interact with water and how they impact the health and safety of this important natural resource. Using games, experiments, outdoor learning experiences and creativity, students will explore the water cycle, the effects of water pollution on the food chains in water bodies, water conservation, the importance of biological diversity and native and invasive plants and animals in New York's waterways.

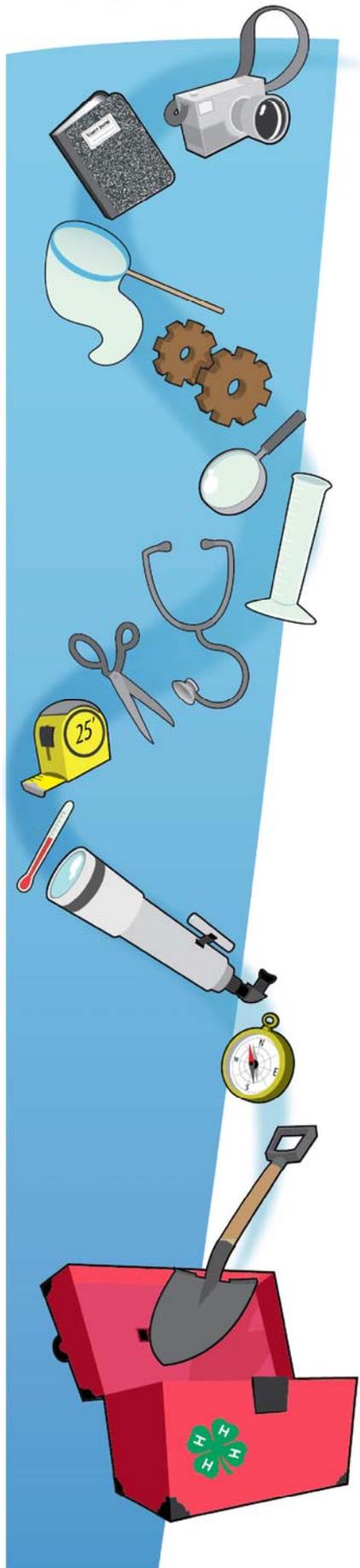
All of these adventures call on students to predict what will happen, test their theories and share their results.

Some of the lessons in this unit were developed by Margo Bauer, a 4-H Extension Educator from Cornell Cooperative Extension of Monroe County and others were adapted from 4-H water science activities.

To find numerous resources related to water, check out the National Directory of 4-H Materials at <http://www.4-hdirectory.org>.

Water Table of Contents

- Watery World:** Understand how water moves across the Earth.
- Won't You be my Neighbor?:** Learn about non-point source pollution and how to prevent it.
- Water Safari:** Discover the interesting creatures that live in ponds and streams. Find out what they can tell us about the health of their aquatic ecosystem.
- Fishy Food Chains:** Learn how pollutants are concentrated as they move through the food chain.
- Alien Invaders:** Discover some of New York's native and invasive plants and animals and learn how to take action against the spread of invasives.
- Using Water at Home:** Understand how water is used in a household and learn to practice water conservation methods.



Water: Watery World

Activity Series:
Water
Grade: 3-6
Time: 60 min.



Main Idea

Youth will create a visual representation of all the water in the world, and discover the relative quantity of water in various locations on the planet. Then, students will simulate the motion of a water drop through the water cycle to learn about the way water moves across the Earth.

Motivator

Hold up a glass of water. Tell the students that the water in the glass has traveled all over the world, and might have been a thirsty dinosaur's drink. Then drink the water.

Pre-Activity Questions

Before you start the activity, ask the students:

- Where does water come from?
- Where on Earth can you find water?
- What forms does water come in?
- Is it possible to destroy water?

Supplies

Activity 1: Water, water everywhere

- Large bucket or aquarium
- Measuring cup with ounce measurements
- Ice cube tray
- Clear jar full of sand
- Tiny clear container, big enough for one ounce of liquid

1. Pour 5 gallons of water into a bucket or an aquarium, if available. Imagine that this represents all the water in the world.
2. Ask the youth to guess how much of this water would be found in the oceans, rivers, glaciers, and atmosphere. As water is removed in the next steps, have the youth guess what each amount represents.
3. Remove 18 ounces of water from the bucket or aquarium. The water remaining in the bucket is all the water in the world's oceans. The smaller amount is not ocean water.
4. Pour 13 ounces from the measuring cup into an ice cube tray. The tray now holds the water found in glaciers and ice caps. Five ounces remain. This is liquid fresh water.
5. Pour 4 ounces into a clear jar full of sand. This water is ground water. Some is available to us through a well.
6. Pour the remaining water into a tiny clear container. This remaining 1 ounce is surface water, found in rivers and lakes.

Discussion: Our demonstration left out one place where water is found. Do you know where that is? (the atmosphere) Water does not stay in a river or ice cap, it moves around the earth. The next activity will help us understand how water travels.

Objectives

- To simulate the motion of a water drop through the water cycle
- To gain an understanding of the way water moves across the Earth

Learning Standards

(See Matrix)

Common SET Abilities 4-H projects address:

- Predict
- Hypothesize
- Evaluate
- State a Problem
- Research Problem
- Test
- Problem Solve
- Design Solutions
- Develop Solutions
- Measure
- Collect Data
- Draw/Design
- Build/Construct
- Use tools
- Observe
- Communicate
- Organize
- Infer
- Question
- Plan Investigation
- Summarize
- Invent
- Interpret
- Categorize
- Model/Graph
- Troubleshoot
- Redesign
- Optimize
- Collaborate
- Compare

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Water: Watery world

Science Checkup - Questions to ask to evaluate what was learned

- What three phases does water have on Earth? (Solid, liquid, vapor or gas)
- Explain the water cycle and the three parts.
- Can water leave the water cycle? (no)
- Why doesn't the ocean dry up like puddles do?

Supplies

Activity 2: Take a Water Vacation

- A sign for each of the seven water stations
- Seven empty wide-mouth plastic jars or large envelopes, one for each station
- Copies of water station cards

For each Team:

- Clipboard
- Paper
- Pencil

1. Create a poster or sign for each of the seven water stations: cloud, glacier, groundwater, ocean, animal, plant and river.
2. Cut the station cards into strips and place them in a jar or envelope at each of the stations set up around the area.
3. Divide the students into groups of two. Explain that during the following activity they will become a water drop and travel around the earth on a vacation. Every water drop will take a different trip.
4. Students need to record the places they visit on their papers, using one line for each place they visit. Groups can start at any place they would like and draw a slip of paper from the container at the first station. Record that information on their clipboard then return the strip to the container. The strip will tell them which station to visit next. Move to that station.
5. Students should visit 10-12 stations before ending the activity.
6. When the activity is finished, compare the stations the students visited. How many students went to the cloud station? How many went there more than once? Who visited plants or animals? Have the students draw conclusions as to where most of the water on the Earth is located. Did the water ever stop traveling? You may want to make a chart keeping a tally of each time any student visited a particular station.

Science Checkup - Questions to ask to evaluate what was learned

- Where is water found on Earth?
- Is there a difference between the types of water found there?
- Water on the earth exists in three forms — solid (ice), liquid (liquid water) and gas (water vapor). Where do we find each form?
- How does water move from place to place?
- Give examples of the types of precipitation.
- How does water leave plants and animals? (Plants transpire water through their leaves as vapor. Animals exhale water vapor and perspire liquid water, as well as the most well known way animals get rid of water!)

Find this activity and more at: <http://nys4h.cce.cornell.edu>

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Water: Watery World

Extensions

- Have the students write a water story that follows their journey through the water cycle. Use the first-person narrative from the point of view of a water drop. For example “There I was, just bobbing in the ocean when I began to feel funny. I evaporated up into the sky and then joined thousands of other drops in a huge cloud...” The students can each read their stories and others can identify the ways water has moved through their story. (evaporation, precipitation, etc.)
- Using a detailed map of your community, ask the youth to locate all the water bodies within 10 miles of their homes. What forms do the water bodies take? (Rivers, creeks, lakes, ponds, etc.) See if you can follow the movement of the water bodies and how they connect. Creeks into rivers or lakes; ponds filled by ground water, etc.
- Have the students complete the interactive diagram at the Jefferson Lab website: http://education.jlab.org/reading/water_cycle.html

Vocabulary

Condensation: The phase change of water from vapor to liquid.

Evaporation: The phase change from liquid to gas.

Liquid: The phase of water when its temperature is between 32°F (0°C) and 212°F (100°C).

Precipitation: The condensing of water from a cloud. Rain, snow, hail.

Solid: The phase of water when its temperature is below 32°F (0°C).

Sublimation: The phase change from solid to vapor, without becoming liquid.

Transpiration: The evaporation of water from the surfaces of plants or animals.

Vapor: The phase of water when its temperature is above 212°F (100°C).

Water Cycle: The pathway of water through its environment.

Water Phases: The form of water based upon its temperature — liquid, solid or vapor.

Background Resources

- *Water Wise, Lessons in Water Resources*, Elizabeth C. Moran and Marianne Krasny, Illus. Steve Sierigk, Cornell Cooperative Extension, 1989.
- *Water Project Unit 2: Incredible Water*, Joy R. Drohan, William E. Sharpe, Sanford S. Smith, Penn State University, 2002.
- *Jefferson Lab Reading Comprehension Passages*, Thomas Jefferson National Accelerator Facility, 10/01/08, http://education.jlab.org/reading/water_cycle.html
- *Project Learning Tree Environmental Education Activity Guide* “Water Wonders,” American Forest Foundation, 1995.
- <http://ga.water.usgs.gov/edu/earthwherewater.html> This website has really good graphs and charts about where Earth’s water is located.
- *Project WET Curriculum and Activity Guide*, “The Incredible Journey,” The Watercourse and the Council for Environmental Education, 1995
- Our Watery World is adapted from *Water: The Resource That Gets Used and Used for Everything*. Poster: Middle School Version. US Geological Survey, Reston, Virginia, 1993.

Background Information

- Although about 75 percent of the surface of the Earth is covered with water, we can drink very little of that water. This is part of the reason why it is so important to learn about water and how we can keep it clean and safe. This Science Toolkit will help you do just that!

Find this activity and more at: <http://nys4h.cce.cornell.edu>

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Water vacation station cards

Cut apart, fold in half and place in each station's container.

Station 1- Glacier

Go to Groundwater

Go to Ocean

Go to Ocean

Go to Cloud

Go to River

Stay at Glacier

Stay at Glacier

Station 2- Ocean

Go to Cloud

Go to Cloud

Go to Cloud

Stay at Ocean

Stay at Ocean

Stay at Ocean

Station 3- River

Go to Ocean

Go to Groundwater

Go to Animal

Go to Cloud

Go to Ocean

Stay at River

Station 4- Cloud

Go to Ocean

Go to Ocean

Stay at Cloud

Stay at Cloud

Go to River

Go to Groundwater

Water vacation station cards

Cut apart, fold in half and place in each station's container.

Station 5- Groundwater

Go to River

Go to Plant

Go to Plant

Go to Ocean

Go to Ocean

Stay at Groundwater

Station 6- Plant

Go to Cloud

Go to Cloud

Go to Cloud

Go to Animal

Go to Animal

Stay at Plant

Station 7- Animal

Go to Cloud

Go to Cloud

Go to Groundwater

Go to Groundwater

Go to River

Go to River

Water: Won't you be my Neighbor?

Activity Series:
Water
Grade: 3-6
Time: 45 min.

Main Idea

During this activity, youth will help to clean up a water supply contaminated with a variety of non-point source pollutants. They will experience the many steps, challenges and expenses involved in the purification of water, then discuss pollution prevention and alternatives to pollutants.

Motivator

Drink a glass of clean water and talk about how refreshing it is. (Ahhhh!) Then introduce yourself as Iggy, their new next-door neighbor.

Pre-Activity Questions

Before you start the activity, ask the students:

- What is the difference between point and non-point source pollution? Give examples.
- What substances can pollute our surface and ground water?
- How is the water that we drink purified?
- What does a water treatment device do?
- How many of you have water treatment devices at home?

Activity

- A five-gallon bucket for every four-five students

Pollutants:

- ½ cup vegetable oil
- 1-5 drops food coloring
- 2 teaspoons sand/gravel
- 5 drops dish detergent
- One handful of leaf litter
- 1 teaspoon salt
- Trash (bottle caps, Styrofoam, etc.)

Clean-up Apparatus:

- One piece of screen (15cm square)
- Cotton facial pads
- Funnel
- Eye dropper/turkey baster
- Paper towels
- Empty plastic or metal pan

1. Divide youth into groups of four or five.
2. Provide each group with a 5-gallon bucket about half full of water and explain that the bucket contains their drinking water supply.
3. Introduce yourself as a new neighbor who is just moving into town and act out the following scenarios.
4. "My house is still under construction. I notice that there seems to be a lot of soil in the street around it." (Walk around and dump a load of sand or gravel in each bucket.)

Supplies

Objectives

- Learn about non-point source pollution and how to prevent it
- Learn how different materials can help remove water contaminants

Learning Standards

(See Matrix)

Common SET Abilities 4-H projects address:

- Predict
- Hypothesize
- Evaluate
- State a Problem
- Research Problem
- Test
- Problem Solve
- Design Solutions
- Develop Solutions
- Measure
- Collect Data
- Draw/Design
- Build/Construct
- Use tools
- Observe
- Communicate
- Organize
- Infer
- Question
- Plan Investigation
- Summarize
- Invent
- Interpret
- Categorize
- Model/Graph
- Troubleshoot
- Redesign
- Optimize
- Collaborate

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Water: Won't you be my Neighbor?

5. "Now that my house is finished, I am putting in my lawn. I am using extra fertilizer so that my grass grows very fast and is very green." (Walk around and squirt green food coloring into each bucket.)
6. "When I do my yard work I simply blow my grass and leaves into the street." (Walk around and dump leaves and organic debris into each bucket.)
7. "My lawn mower is in need of an oil change. I am not sure what to do with the used oil. I usually just pour it in the gutter." (Walk around and squirt some oil into each bucket.)
8. "My car needs to be washed. This soap produces so many bubbles. I am glad that they just run down the driveway." (Walk around and squirt dish detergent into each bucket.)
9. "In the wintertime, I like to salt my sidewalks and the driveway so that I don't slip and fall." (Walk around and dump some salt into each bucket.)
10. "I lost the lid for my garbage can. On windy days garbage tends to blow away." (Walk around and drop small pieces of trash in the buckets.)
11. "It looks like rain today. I am glad because my yard sure could use the water." (Walk around and stir each bucket with a spoon.)
12. Ask each individual how they feel about their new neighbor and what they think about their water.
13. Ask each group to begin the clean-up process. Here are some hints:
 - Use the screen as a filter for the large objects.
 - Put the facial pads or paper towel in the funnel and pour the water through to filter out the smaller particles and some of the non-soluble liquid contaminants.
 - Dab the surface of the water with the cotton or paper towels to absorb some contaminants.
 - Dump the contaminants into the empty jar or pan.
 - Suck out oil particles and small bits with the eye dropper.
 - The pint of water is to illustrate/demonstrate dilution, and can also be used as a control.
14. Bring all of the groups back together and ask how clean they think their water is. Discuss how there are still pollutants in it that you cannot see. Ask them if they would want to drink, swim in or fill their fish aquariums with this water.

Science Checkup - Questions to ask to evaluate what was learned

- How clean is the water?
- Which pollutants were the easiest to remove? (Solids)
- Which were the most difficult to remove? (The substances that dissolved in the water — food coloring, salt, soap — pose the greatest problems for clean-up).
- How long did it take to pollute the water?
- How long did it take to clean it up?
- What could Iggy do to prevent his pollution problems?

Extensions

- Keep track of the materials each group needs to clean their water. Use play money to charge groups for materials. Judge the cleanliness of the water and factor in how costly the clean-up was for each group.
- Try the activity "Soil as a Filter" on page 49 of "Water Wise: Lessons in Water Resources" listed in the Background Resources section.
- Demonstrate the use of charcoal as a filter. Place two coffee filters in a funnel and fill it with well-rinsed charcoal (available where aquarium supplies are sold). Take one of the group's "purified" water supplies and slowly pour the water through the charcoal filter. The charcoal will absorb some of the dissolved pollutants.

Find this activity and more at: <http://nys4h.cce.cornell.edu>

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Water: Won't you be my Neighbor?

Vocabulary

Dissolve: Mixing particles into a liquid to the point that no individual particles are left.

Non-point source: Large or widespread areas such as parking lots and neighborhoods that discharge pollutants into the environment.

Purification: The process of removing impurities.

Background Resources

- <http://ga.water.usgs.gov/edu/runoff.html> Learn more about run-off and how it causes water pollution.
- <http://www.h2ohero.org/> Play an interactive game about how to keep your lawn and landscape happy and not become like Iggy!
- Want to try other filtering experiments? Try "Dissolving or Not," an activity in "In-Touch-Science Chemistry and the Environment," a Cornell Cooperative Extension 4-H Project. Download the curriculum here: <http://hdl.handle.net/1813/11459>

Background Information

- Water can easily become polluted by human activities. Unfortunately, it is not as easy to purify the water. Care must be taken to protect water quality. Some pollutants enter water from a localized, identifiable source, or **point source**, such as discharge from a factory. **Non-point sources** of pollution are those that come from large, dispersed land areas such as parking lots or lawns.
- The science of treating water to remove pollutants is continually evolving with the invention of new methods and technologies. Today's processes are costly, complicated and imperfect, yet necessary as humans continue to rely on pollution clean-up instead of pollution prevention.

Water: Water Safari

Activity Series:
Water
Grade: 3-6
Time: 20-60 min.

Main Idea

Youth will explore ponds and/or streams to collect and identify the various species living there. The diversity of organisms found in an aquatic environment is an indicator of habitat quality and overall environmental quality. The presence or absence of certain macroinvertebrates (large organisms that don't have backbones, such as insects) tells us something about the health of the aquatic ecosystem.

Motivator

Because canaries are more sensitive than humans to dangerous gases in the air, coal miners used to take them into mines to measure air quality. If the canary died, it gave a warning to the miners that the air was not safe to breathe. Aquatic organisms can play a similar role because the absence or presence of certain species can indicate water quality.

Pre-Activity Questions

Before you start the activity, ask the students:

- What is biological diversity?
- What might a high or low diversity of life suggest about a habitat?
- What environmental conditions are important for organisms to survive in an aquatic environment?
- How can you minimize your impact on the environment (stream banks, spawning sites, vegetation) when collecting?

Activity

For Each Team:

- Ice-cube trays or shallow white-bottomed pans
- D-nets
- Plastic spoons
- Magnifying glasses or bug boxes
- Identification charts

1. Head to a pond or stream. Divide your group into pairs and provide each pair with some collection gear and identification books or charts.
2. Demonstrate collection techniques with the D-net or scoop nets.
2. Allow pairs to collect their own samples and observe collected specimens. How many different kinds of specimens did each group collect?
3. Record findings and discuss what everyone found.
4. Combine everyone's observations and decide how you would rate the quality of the ecosystem.
5. Demonstrate how to return the contents of a pan to the pond or stream and have everyone do the same with their collections.
6. Travel to another location and collect again. Compare results.

Supplies

Objectives

- Learn how to safely observe and collect aquatic macroinvertebrates
- Use diversity indexes to classify the health of aquatic ecosystems

Learning Standards

(See Matrix)

Common SET Abilities 4-H projects address:

- Predict
- Hypothesize
- Evaluate
- State a Problem
- Research Problem
- Test
- Problem Solve
- Design Solutions
- Develop Solutions
- Measure
- Collect Data
- Draw/Design
- Build/Construct
- Use tools
- Observe
- Communicate
- Organize
- Infer
- Question
- Plan Investigation
- Summarize
- Invent
- Interpret
- Categorize
- Model/Graph
- Troubleshoot
- Redesign
- Optimize
- Collaborate
- Compare

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Water: Water Safari

Science Checkup - Questions to ask to evaluate what was learned

- What does biodiversity mean?
- How does biodiversity relate to the health of the water?
- Explain how water quality can be good for one creature and bad for another.

Extensions

- Conduct some chemical or physical tests to measure water quality (pH, dissolved oxygen, speed, temperature, depth, etc.).
- Visit your pond or stream several times throughout the year to discover changes in the stream. Be sure to use physical and biological tests in your investigations. What changes do you notice?
- Keep written records of your work so that your group (or a different one) can compare results in the future.

Vocabulary

Aquatic: Pertaining to water.

Biological Diversity: Variety of different species that live in a particular habitat. More different species means better biological diversity.

Biomonitoring: Determining the health of an aquatic ecosystem by taking a count of the number of different types of living organisms and their tolerance to pollutants.

Macroinvertebrates: Organisms, without a backbone, large enough to be seen without a microscope.

Water Quality: A measure of the health of a water body. This can be measured with chemical, biological or physical parameters.

Background Resources

- Water Project Unit 3: Water Quality Matters, Joy R. Drohan, William E. Sharpe, Sanford S. Smith, Penn State University, 2004
- Water Worlds, Experience 4-H Natural Resources Series, Janet E. Hawkes, Kurt Jirka, Marianne Krasny, Diane Held Phillips, Cornell Cooperative Extension, 1988
- Pond and Stream Safari, Experience 4-H Natural Resources Series, Karen Edelstein, Cornell Cooperative Extension, 1993
- The Stream Study, <http://people.virginia.edu/~sos-iwla/Stream-Study/Key/MacroKeyIntro.HTML>, A very nice key to identifying macroinvertebrates can be found on this Web site. Very useful if you can take pictures of your organisms or if you can bring a laptop into the field, Website Manager Rick Webb, Department of Environmental Sciences, University of Virginia, Charlottesville, Va.
- See the attached Macroinvertebrate identification keys, as well as the river and pond keys that can be downloaded from the Science Toolkit website.

Background Information

Much like the canary in the coal mine, water insects can be indicators of water health. Macroinvertebrates include clams and crustaceans, not just insects. They are organized into groups according to their tolerance level for pollution. Macros that are sensitive to pollution live in the cleanest water. Many of the group 1 macros are found in highly oxygenated water in streams and rivers. You most likely will not find many of these animals in a pond. This does not mean the pond is polluted. The water in a pond does not flow like a stream does, so the oxygen levels are not as high. Finding many group 2 macros in a pond is a good indication of health.

No matter where you look, in a pond or in a stream, finding lots of different kinds of animals is the best indicator of a healthy habitat. More food choices, more places to hide, more space to live and grow, all contribute toward many species being able to find what they need. You will always find animals from the lowest quality group. These animals, like worms, snails and leeches, can live in muddy, poorly oxygenat-

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Water: Water Safari

ed warm water. Of course that doesn't mean that they don't also live in healthy water. Every creature likes healthy water!

To use a net, bounce the net along the bottom and along the sides of the plants while moving the net forward. Don't scoop. If you are in a stream, place the net on the bottom and let the water flow through and expand the net material. Have a friend walk upstream a few feet and shuffle around to make the water cloudy. After the water clears, lift the net. Did you capture anything that was washed in by the water?

Look for pond creatures in shallow water near plants and weeds. These are food sources. Shallow water protects tiny macros from predation by larger fish.

Mud and muck are not the best habitat. Guess what you are likely to find there? Yes, group 3 critters. After you are finished looking through your net of weeds and goo, be sure to put it back in the pond. Do not leave it on the bank. It's messy and the tiny creatures will dry out and die.

In a stream, gently turn over small rocks and look underneath. You'll find tiny creatures on the rocks and in the sand on the bottom. Be sure to put the rocks back where you found them. They are someone's home!

Use a plastic spoon or your fingers to gently place creatures in your collection pan to observe. Do not put leaves and twigs in with them. The creatures will immediately hide in the twigs and you will not be able to watch them. Keep the pans cool in the shade and if the water gets warm, put them all back and collect new ones.

Keep track of how many different creatures you find and in what groups they belong. How diverse is the population? Did you find a lot of one kind of creature, or some of a whole bunch? Try coming back in a month or two.

Macroinvertebrate Identification Key

GROUP 1 – Very Intolerant of Pollution

Stonefly Nymph: 2 tails long antennae

Mayfly Nymph: 3 tails fluttering gills

Riffle Beetle Adult & Larva: very small & hard shell

Caddisfly Larva: makes a case from twigs, rocks, leaves

Dobsonfly Larva: large head & 2 pinchers

Water Penny Larva: top, bottom, looks like a suction cup

Right-Handed Snail: must be alive to count

GROUP 2 – Moderately Intolerant of Pollution

Damselfly Nymph: 3 paddle-like (feathery) tails

Dragonfly Nymph: no tails large eyes

Scud: flattened side-ways & swims on side

Crayfish: looks like a mini-lobster

Sowbug: flattened top to bottom (looks like a pill bug)

Cranefly: caterpillar-shaped, ringed

Clam/Mussel: must be alive to count

GROUP 3 – Fairly Tolerant of Pollution

Midge Larva: small, but visible head intense wiggler

Planaria: 2 eye spots & very small

Black Fly Larva: one end is swollen

Leech: flattened & segmented

GROUP 4 – Very Tolerant of Pollution

Aquatic Worms: segmented "earthwormy"

Left-Handed Snail: must be alive to count

Rat-tailed Maggot

Blood Midge Larva: bright red

Macroinvertebrate Adults Key

GROUP 1 – Young are Very Intolerant of Pollution



Stonefly
Adult



Mayfly
Adult



Riffle Beetle
Adult



Caddisfly
Adult



Dobsonfly
Adult



Water
Penny
Adult



Right-
Handed
Snail

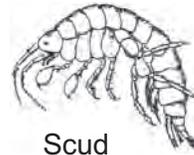
GROUP 2 – Young are Moderately Intolerant of Pollution



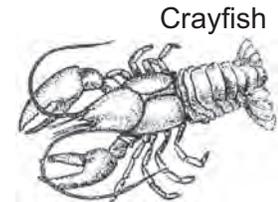
Damselfly
Adult



Dragonfly
Adult



Scud



Crayfish



Sowbug



Cranefly
Adult



Clam/Mussel

GROUP 3 – Young are Fairly Tolerant of Pollution



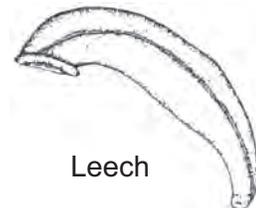
Midge
Adult



Planaria



Black Fly
Adult



Leech

GROUP 4 – Young are Very Tolerant of Pollution



Aquatic
Worms



Left-Hand-
ed Snail



Hoverfly
(Rat-tailed maggot adult)



Blood Midge
Adult

Water: Fishy Food Chains

Activity Series:
Water
Grade: 3-6
Time: 20-60 min.

Main Idea

Pollutants can be transferred through food chains, eventually ending up in the food that people eat. At each level of the food chain, the concentration of chemical pollutants gets higher. Scientists call this biological amplification. Youth will simulate the transfer of chemicals through a food chain and discuss the impacts of pollutants on the health of organisms.

Motivator

Cut and separate the two fish advisory signs from the New York State Department of Health at the end of this packet. Show youth the signs. These signs make it clear where you can and cannot fish. What if there were no signs? How could you tell if a place was safe to fish? How could you know if a fish you caught was safe to eat?

Pre-Activity Questions

Before you start the activity, ask the students:

- Who catches fish? Who eats fish?
- How do you know it is safe to fish at a location? (There are signs that say you can fish, the water looks good, others are fishing there)
- When might you choose not to fish at a location? (The water looks bad, there's a bad smell, a sign says not to)
- Can you think of reasons why you might not eat a fish you caught? (If it was deformed, diseased, already dead, etc.)

Activity

- 250 feet of yellow nylon rope
- 100 feet of white nylon rope
- Five fishing hats or vests
- 40 copies of sunfish handout (attached)
- Whistle
- Copies of the most recent New York State Department of Health publication "Health Advisories for Chemicals in Sportfish and Game." Available at <http://www.health.state.ny.us/environmental/outdoors/fish/fish.htm>

1. On the back side of five sunfish, write "I ate mercury." On another five, write "I ate pesticide." On another five, write "I ate PCBs." On the other five, write "I ate dioxin." Leave the remaining sunfish blank. If your group is larger than 15, copy extra fish, with half being "contaminated".
2. Fold the fish in half so the words are hidden inside. Secure with tape or hook and loop fastener to seal.
3. Divide the class into two groups depending on size of group. In each group, two to five students should be fisherpersons (who will wear vests or hats), the rest of the students will be bass.

Objectives

- Learn how pollutants are concentrated as they move through the food chain
- Discover that some pollutants are not easily detected, but can still be present

Learning Standards

(See Matrix)

Common SET Abilities 4-H projects address:

- Predict
- Hypothesize
- Evaluate
- State a Problem
- Research Problem
- Test
- Problem Solve
- Design Solutions
- Develop Solutions
- Measure
- Collect Data
- Draw/Design
- Build/Construct
- Use tools
- Observe
- Communicate
- Organize
- Infer
- Question
- Plan Investigation
- Summarize
- Invent
- Interpret
- Categorize
- Model/Graph
- Troubleshoot
- Redesign
- Optimize
- Collaborate

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Revised By

Margo Bauer, CCE Monroe County

Water: Fishy Food Chains

4. Rope off a large area with the yellow rope. This will represent the lake in which the bass will feed. Scatter the paper sunfish around in this area.
5. Rope off another section with the white rope inside the boundary made by the yellow rope. This area will represent a boat and must be large enough to accommodate five fisherpersons and at least 10 bass.
6. Blow the whistle to tell the bass to start feeding. They are to gather ("eat") as many of the paper sunfish as possible.
7. After approximately 30 seconds, blow the whistle again. The fisherpersons are now allowed to start fishing for the bass (the bass may continue feeding on the sunfish while trying not to get caught).
8. The fisherpersons must tag one bass at a time and bring it back to the boat for storage before they head back into the lake to catch another bass. Each fisherperson can catch only two bass so that some bass will remain in the lake at the end.
9. When the fisherpersons have caught their limit, blow the whistle to stop the game.
10. At this point, have the bass and fisherpersons open the sunfish that they have "eaten" / caught to see if they were healthy or contaminated. If more than half of the sunfish are contaminated, the bass are not safe to eat.
11. Any bass that were not caught should look at their sunfish. If more than half of their sunfish are contaminated, the bass are now considered dead.
12. Talk with the group about what they experienced.

Science Checkup - Questions to ask to evaluate what was learned

- How does a food chain work?
- How might chemicals enter and affect food chains?
- What precautions should you take when consuming fish? (Clean and cook properly, read guidelines for how many to eat safely.)
- What factors might determine if chemicals harm an organism? (size, age, overall health, pregnancy, etc.)

Extensions

- Examine the New York State Department of Health publication "Health Advisories for Chemicals in Sportfish and Game." Discuss why this publication is important and what information it contains.
- Have the youth research the story of how DDT affected the health of bald eagles. DDT had a terrible effect on these birds that led to the banning of this chemical. Are there other chemicals or toxins that are now banned from use? (Fishing weights were made of lead, but are now made of zinc. Why?)

Vocabulary

Bioaccumulation: The build-up of chemicals that don't break down or break down very slowly in the body.

Biological Amplification: The increase in concentrations of chemicals in organisms at successively higher levels of a food chain.

Dioxin: A highly toxic chemical formed as an unintentional by-product of many industrial processes involving chlorine, such as waste incineration, chemical and pesticide manufacturing and pulp and paper bleaching. Dioxin was the primary toxic component of Agent Orange, a herbicide that made many Vietnam War veterans sick.

Food Chain: A series of organisms that survives by eating the preceding one.

Mercury: A naturally occurring but toxic metal that can be absorbed directly from the water or from eating other organisms that have absorbed it.

Find this activity and more at: <http://nys4h.cce.cornell.edu>

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Water: Fishy Food Chains

PCBs: Man-made chemicals that were used in electrical products until banned in the mid-1970's. These chemicals accumulate in the fatty tissues of organisms.

Pesticide: Any chemical designed to kill or slow the growth of an organism that people consider to be undesirable.

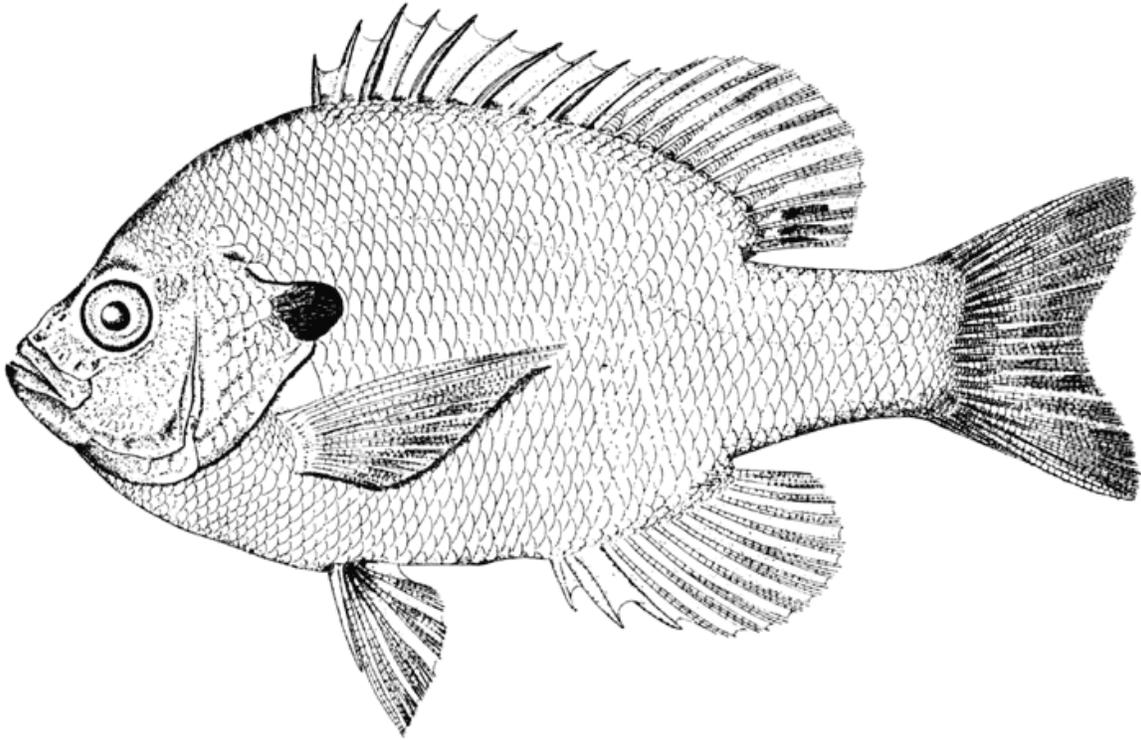
Background Resources

- <http://www.fws.gov/midwest/eagle/recovery/biologue.html> Find out more about how the eagle made a comeback after DDT poisoning.
- <http://www.epa.gov/osw/hazard/tsd/pcbs/pubs/about.htm> Information about PCBs can be found here. This website is best for adults, as background information.
- <http://www.epa.gov/superfund/community/index.htm> Information about community involvement in clean-up efforts, especially around superfund sites.

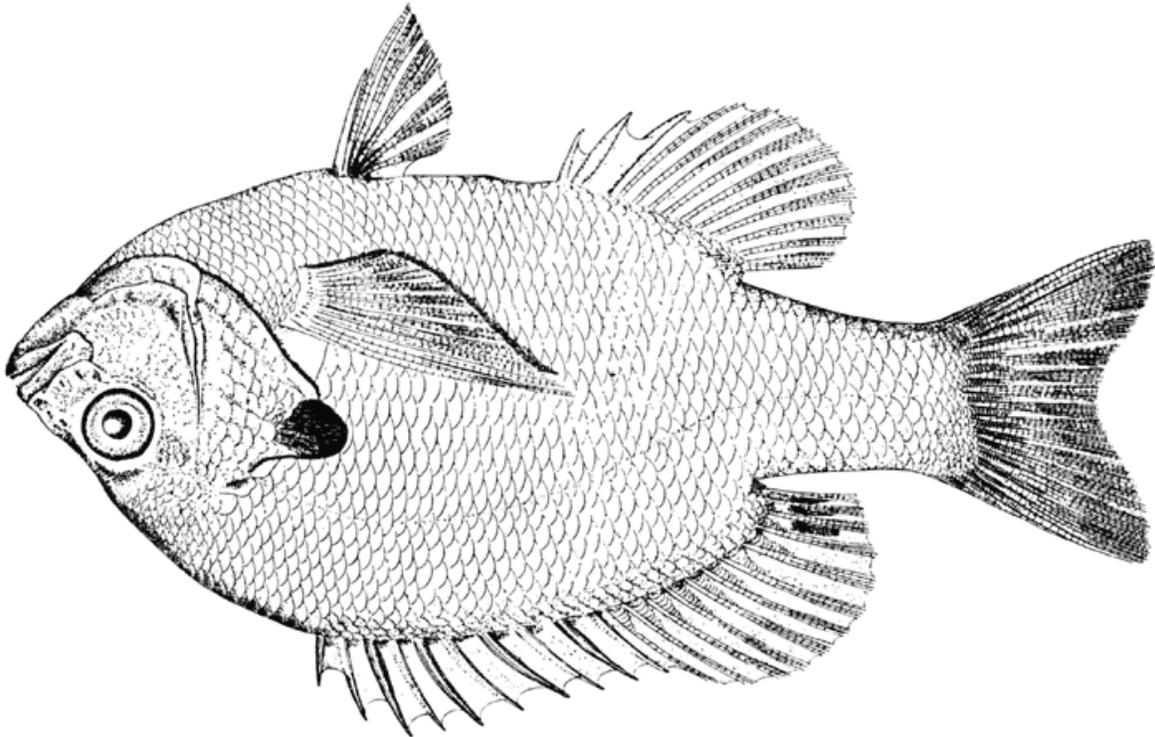
Background Information

- Signs can tell us where a location is safe to fish. Signs don't always tell us if the fish themselves are safe to eat. Some fish may take in contaminants from the water where they live and/or the food that they eat.
- Chemical pollution, such as pesticides and heavy metals, enter food chains at the level of plants and microorganisms. Over time, the chemicals can become concentrated in the bodies of wildlife and people that consume them because the chemicals do not pass out of their bodies but accumulate in them.
- These chemicals are passed on through the food chain in a process called biological amplification. Moving up the food chain, higher order organisms accumulate greater amounts of the pollutants in their bodies because they eat more. The greater the number of contaminated organisms they eat, the more chemicals their bodies are collecting and storing. These chemicals may make organisms – including people – sick.
- Water from rivers and lakes are tested each year to determine the amount of harmful chemicals and pollution present. Fish are also tested, to determine the quantity of chemicals their bodies contain. A guide is then written to help people know how many fish can be safely eaten from the water that was tested.
- **This activity is not meant to scare people from eating fish.** Be sure to discuss the health benefits of eating fish and the means of reducing exposure to unwanted contaminants by following guidelines in annual fish advisories.

Water:
Fishy Food Chains



Fold paper here



Water:
Fishy Food Chains



Water: Alien Invaders

Activity Series:
Water
Grade: 5 and up
Time: 30 min.



Main Idea

Through an interactive card game, youth will learn about some of the aquatic native and invasive plants and animals in New York State. Youth will discover the negative impacts of invasive species and learn about ways they can take action against the spread of invasive species.

Motivator

Plants and animals from other places are invading our wetlands, and will take over if we don't try to stop them!

Pre-Activity Questions

Before you start the activity, ask the students:

- What does it mean to be a native of a country or town? (That you and your family have lived there for a long time, maybe your whole life.)
- Give an example of a predator-prey relationship between an animal and plant, and an animal and animal. (turkey-acorns) (spider-grasshopper)

Supplies

Activity 1: "Go Native" card game

- Copies on cardstock or other durable paper of each of the cards attached to this lesson: Two copies each for the 22 pairs of native species and one copy each of the eight individual invasive species cards, cut into cards.

Goal of the game: Be the player with the most pairs of native species, while avoiding invasive species, which destroy/eliminate native pairs.

1. This game is played similarly to the card game "Go Fish." Shuffle the cards and deal out 7 cards to each of the players.
2. The remaining cards are spread out in a fan in the center. Players may remove matching pairs from their hands and place them face up in front of them.
3. Once all matches have been made, the player to the left of the dealer has the first turn. Players take turns asking for matching cards from their neighbor's hand. If a match is made, a player places the pair face up in front of him. The player reads aloud the information on the native card so that other players can learn about that species. The player may take another turn. If no match is available, the player then chooses a card from the center pile.
4. If an invasive card is in the hand dealt to the players, or drawn from the center pile, the invasive species will destroy one of their existing native pairs. The invasive card is immediately placed on top of an existing native pair and that native pair no longer counts for that player. The player will read aloud the information on the invasive card, so that other players can learn about that species.

Objectives

- Learn about some of the native and invasive plants and animals in NY.
- Discover ways to take action against the spread of invasive species.

Learning Standards

(See Matrix)

Common SET Abilities 4-H projects address:

- Predict
- Hypothesize
- Evaluate
- State a Problem
- Research Problem
- Test
- Problem Solve
- Design Solutions
- Develop Solutions
- Measure
- Collect Data
- Draw/Design
- Build/Construct
- Use tools
- Observe
- Communicate
- Organize
- Infer
- Question
- Plan Investigation
- Summarize
- Invent
- Interpret
- Categorize
- Model/Graph
- Troubleshoot
- Redesign
- Optimize
- Collaborate
- Compare

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Water: Alien Invaders

5. If a player “goes out” and no longer has any cards, the game should continue with the remaining players. Once all cards have been drawn and matches/eliminations have been made, each player counts the native pairs that have not been destroyed by an invasive species. The winner is the player with the most native pairs, regardless of who “goes out” first.
- ** Can other players place an invasive card on another player’s native pair? No! No one should deliberately “plant” an invasive species to destroy someone else’s landscaping or habitat!

Science Checkup - Questions to ask to evaluate what was learned

- What happens when a pond or stream becomes crowded with too many invasive species?
- Give an example of how one invasive species can have an effect on many native species.
- How can we help prevent the spread of invasive species?

Extensions

- Find out more about the invasive and native species in the game. Are they found in your area? What efforts are being made to control invasive species in your community?
- Search your local waterways for invasive species. Make a map of where they are located. You could use GPS/GIS technology to make a detailed map to share with local conservation organizations, parks departments or town officials.
- Get involved! You can help prevent the spread of invasive species! If your community sponsors an invasive species “round up,” take part in it. Share your knowledge and ask questions of others. There are several “Citizen Science” programs to search for and report sightings of invasive species.
- Visit these websites to learn more about how you can help:
 - A good video produced by the American Wildlife Conservation Foundation about forest invasive species is on the Web. <http://www.vimeo.com/8981916>
 - Join Cornell University scientists looking for a garden pest, the Viburnum Leaf Beetle. <http://www.hort.cornell.edu/vlb/>
 - The New York State Department of Agriculture and Markets has a website with information about many New York state pests. <http://www.agmkt.state.ny.us/CAPS/>

Vocabulary

Native: A plant or animal living in its natural habitat. Predator-prey relationships keep the plant or animal population in control.

Non-Native: A plant or animal that now lives in a new environment, different from where it was commonly found.

Invasive: A plant or animal that can reproduce rapidly because no predator-prey relationship exists to keep its population under control.

Background Resources

- New York Invasive Species Information, <http://nyis.info/Default.aspx>, New York Seagrant, Cornell Cooperative Extension (Photos and information about invasive species in New York state.)
- New York State Department of Environmental Conservation, Invasive Species information, <http://www.dec.ny.gov/animals/265.html>. (Good information about invasive plants and animals.)

Find this activity and more at: <http://nys4h.cce.cornell.edu>

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Water: Alien Invaders

- Seagrant Great Lakes Network, Invasive Species, <http://www.miseagrant.umich.edu/greatlakes/ais.html>. (Information from the Great Lakes states. On this site, you can play a great interactive game called “Nab the Aquatic Invader, which also has facts about the spread, impact and control of invasive species.)
- USDA Natural Resources Conservation Service, Plants Database, <http://plants.usda.gov/index.html>. (Learn about wetland plants, invasive plants and plants recommended for conservation plantings.)

Background Information

Invasive species are almost always non-native, having been brought to our region, either intentionally or non-intentionally, from another region or country. Aquatic invasive species can arrive in the ballast water of large ships or stick to the bottom of recreational boats and canoes. Unused live bait, emptied into a water body, can survive and reproduce. These non-native species often have no natural predators in their new habitat, and therefore, reproduce rapidly. If the invasive species is an animal, it may eat many of the same foods as native animals, but may not be eaten by predators. These non-native species can crowd out our local native species, causing their decline. Some invasive species may be responsible for habitat destruction by their behavior or growth habit.

Controlling an established population can be very difficult. Using pesticides to control them can be dangerous to native plants and animals and cause harm. Predators brought in to eat the invasive species may also eat native plants and animals. Plants may be removed by hand, but this is a long process that must be constantly done for many years, often longer.

What is the best way to control an invasive species? The best way is to prevent them from getting here in the first place. All over New York people are learning the importance of not emptying their bait buckets into the water, cleaning their boats when moving from one lake to another and using native plants in their landscaping.

Native

Common Name: Arrowhead or Duck Potato

Scientific Name: *Sagittaria cuneata*

Seeds and root tubers provide food. Dense leafy growth is good cover for nesting water birds.



Native

Common Name: Blue Flag Iris

Scientific Name: *Iris versicolor*

Flowers attract birds and pollinators. Leaves provide cover for animals along the shore.



Native

Common Name: Cattails

Scientific Name: *Typha latifolia*

Roots provide food for many animals. The leaves and stems become building materials for animal homes.



Native

Common Name: Marsh Marigold

Scientific Name: *Caltha palustris*

The entire plant is eaten by deer, and birds enjoy the seeds.



Native

Common Name: Coontail

Scientific Name: *Ceratophyllum* spp.

Coontail plants grow underwater and provide habitat for tiny organisms that live on the leaves. Small fish eat these tiny creatures.



Native

Common Name: Bladderwort

Scientific Name: *Utricularia* spp.

This floating plant has air filled sacks on its stems. Underwater stems provide habitat for macroinvertebrates, which are eaten by fish. Dead plants are food for other animals.



Native

Common Name: Bulrush

Scientific Name: *Scirpus* spp.

There are several types of rushes, all have round stems. They provide good cover for spawning fish and food for wildlife.



Native

Common Name: Water lily

Scientific Name: *Nymphae* spp.

Flowers can be pink or white. Large floating leaf has a slit to the center. Seeds are eaten by birds, and the leaves and roots are eaten by beavers and muskrats. Fish enjoy the shade made by their large leaves.



Native

Common Name: Duckweed

Scientific Name: Lemna spp.

This tiny floating plant can cover a pond. It is eaten by many species of ducks, fish and other animals. Duckweed can be used to filter excess nutrients from the water.

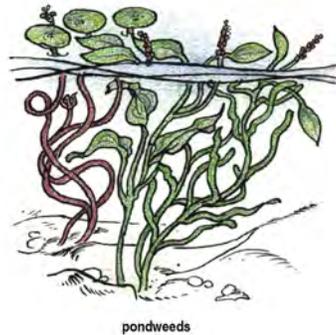


Native

Common Name: Pondweed

Scientific Name: Potamogeton spp.

There are many varieties of pondweed, not all of them are native. Pondweed tubers are an important food source for water birds. Plants provide cover for fish.



Native

Common Name: Planktonic Algae

Scientific Names: Chlorella, Euglena, Anacystis, etc.

Planktonic algae are microscopic, one-celled floating plants that are the basis for aquatic food chains. There are millions of them and they can turn a pond shades of green, brown or red.



Native

Common Name: Common Merganser

Scientific Name: Mergus merganser

This duck dives for its food, catching small fish, frogs and other aquatic creatures in the shallow areas of the pond and marsh. They nest in tree cavities in a nearby forest or in nest boxes provided for them.



Photo from the US Fish and Wildlife Service website

Native

Common Name: Red Winged Blackbird

Scientific Name: Agelaius phoeniceus

Red winged blackbirds are commonly seen near marshes or other soggy areas. They build their nests from wetland plant materials. They eat insects in spring and summer, and seeds in winter.



Native

Common Name: Pumpkinseed sunfish

Scientific Name: Lepomis gibbosus

The pumpkinseed lives in ponds and lakes among the weeds in shallow water. It eats small insects, and is eaten by many other animals, including larger fish, birds and mammals.



Native

Common Name: Yellow Perch

Scientific Name: Perca flavescens

Yellow perch prefer lakes with clear water, and some vegetation to protect them. They hunt for small fish, insects, worms and crustaceans in water up to 30 feet deep.



Native

Common Name: Dragonfly, (Nymph)

Scientific Name: Varies, there are many different kinds.

Dragonflies are amazing predators. When they are young, the nymphs prey on tiny insects underwater. As an adult, they fly through the air feeding on flying insects.



Native

Common Name: Caddisfly (larva)

Scientific Name: Varies, there are many different kinds.

Caddisfly larva build a protective shell from sand, mud or small sticks. They hunt for food by crawling, and hide inside if threatened. Adults have very large wings, and do not eat.



Native

Common Name: Eastern Ribbon Snake

Scientific Name: *Thamnophis sauritus*

Ribbon snakes are slender with an extremely long tail. They are much brighter than garter snakes and are almost always found in or near water. They primarily eat frogs, but also eat salamanders, small fish, leeches and other small invertebrates.



Native

Common Name: Pickerel Frog

Scientific Name: *Rana palustris*

This small nocturnal frog likes slow moving water with dense vegetation. When threatened, it secretes a poisonous substance which will kill other frogs. So don't put it into a bucket with other frogs, and wash your hands after handling one!



Native

Common Name: Common Musk Turtle (Stinkpot)

Scientific Name: *Sternotherus odoratus*

Stinkpots are found in shallow, weedy coves of lakes and large ponds. They eat algae, snails, leeches, worms, aquatic insects, crayfish, small fish and tadpoles, as well as carrion. They release a smelly odor to deter predators!



Native

Common Name: Muskrat

Scientific Name: *Ondatra zibethicus*

Muskrats can swim underwater for 15 minutes and they can swim backwards! Cattails and grasses are a large part of their diet. They build lodges of mud and sticks. Many other aquatic animals eat the tiny muskrat.



Native

Common Name: Mink

Scientific Name: *Neovison vison*

Mink are excellent hunters and swimmers. They feed at or near the water's edge, on fish, frogs, crayfish, other small mammals, including muskrats. They live in dens that are abandoned by other animals.



Invasive

Common Name: Common Reed
(Phragmites)

Scientific Name: *Phragmites australis*

Quickly crowds out native grasses, and has low value for native wildlife.



Invasive

Common Name: Purple Loosestrife

Scientific Name: *Lythrum salicaria*

Crowds out native plants, reproduces rapidly. Low value for native wildlife.



Invasive

Common Name: Didymo (Rock Snot)

Scientific Name: *Didymosphenia geminata*

Covers rocks and eliminates bottom habitat for fish. Slippery.



Photo:
Tim
Daley,
PA DEP

Invasive

Common Name: Water Chestnut

Scientific Name: *Trapa natans*

This floating plant forms dense rafts that suffocate aquatic life living below. It also makes swimming, boating and other recreational activities difficult or impossible.



Invasive

Common Name: Zebra Mussel

Scientific Name: *Dreissena polymorpha*

This filter feeder eats a lot and native mussels can't compete. Forms cement like clumps on anything stationary. Sharp shells cut your feet.



Invasive

Common Name: Mute Swan

Scientific Name: *Cygnus olor*

Mute swans eat lots of underwater plants and make the water muddy while feeding. They are very aggressive and prevent other water birds from nesting nearby.

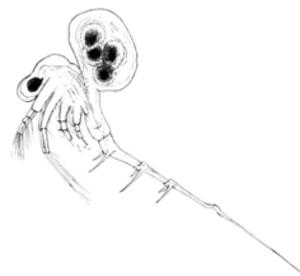


Invasive

Common Name: Spiny Waterflea

Scientific Name: *Bythotrephes longimanus*

Spiny waterfleas are only 1/4 inch long. They eat tiny crustaceans that are a very important food for local fish. Small fish won't eat them because of their sharp spines.



Invasive

Common Name: Round Goby

Scientific Name: *Neogobius melanostomus*

This small fish takes the best spawning sites. They spawn frequently and aggressively prevent native fish from spawning nearby.



Go Native!



Go Native!



Go Native!



Go Native!



Go Native!



Go Native!



Go Native!

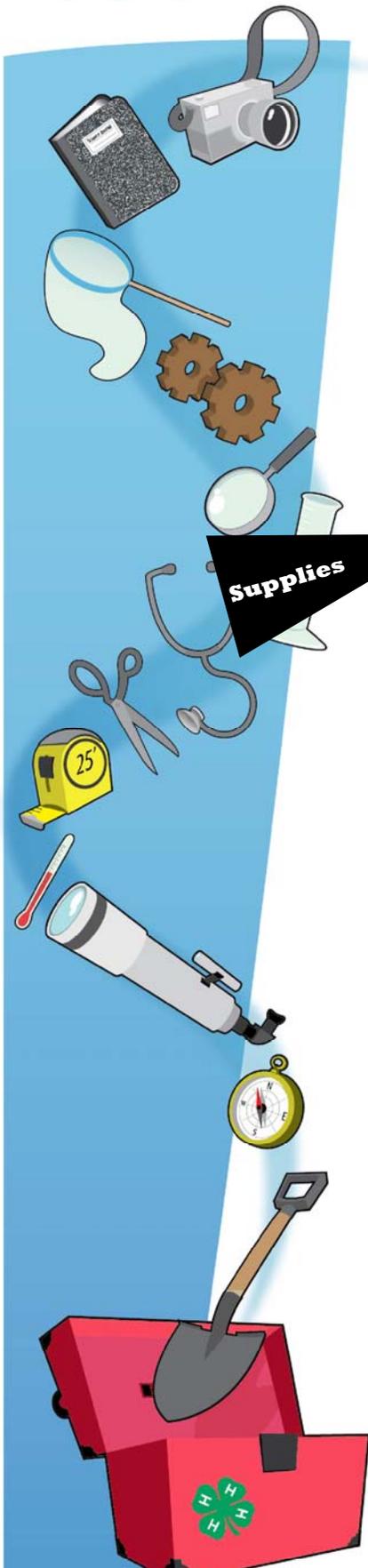


Go Native!



Water: Using Water at Home

Activity Series:
Water
Grade: 6 and up
Time: 60 min.



Main Idea

All water is and will be reused forever, so it is very important that we use water carefully and clean it properly afterward. Through these activities, students will discover how much water they use each day, learn more about what happens to water as it leaves their homes and determine some simple things they can do to use less water.

Motivator

Imagine it's a hot, July day. You are sweaty and thirsty after a long bike ride and come inside for a cool drink. You turn on the faucet and nothing comes out!

Supplies

Activity 1: Measuring our water use

- Paper and pencil for each student

1. The average family of four uses 400 gallons of water each day! Most of that water is used in the house. Do you know how much water you use in a day?
2. Have students brainstorm a list of all the ways they use water during the day. For this activity, leave out the outdoor activities like washing the car, watering the lawn and backyard fun. Your list could include activities like bathing, drinking, washing hands, washing dishes or clothes and others.
3. Once you've made the list, have everyone make a guess of how many times each day they do the things on the list. If students take showers instead of a bath, have them guess how many minutes they spend in the shower.
4. Once everyone has made their guesses, use the following information to estimate how many gallons of water each student uses in a day. Does this total surprise them?

Bath: 50 gallons
Shower: 2.5 gallons per minute
Teeth brushing: 1 gallon
Hands/face washing: 1 gallon
Face/leg shaving: 1 gallon
Dishwasher: 20 gallons/load
Dishwashing, by hand: 5 gallons/load

Clothes washing (machine): 10 gallons/load
Toilet flush: 3 gallons
Glass of drinking water: 8 oz. per glass (1/16th of a gallon)

5. These amounts are just estimates. Each member of your family uses a slightly different amount of water. You may take a quick 5-minute shower, while your brother takes a long one. You might not turn the water off as you wash your hands, but Mom might. More water is used by toilet flushing than any other use and older toilets use more water than newer ones.

Objectives

- Understand how water is used in the household
- Learn how wastewater is treated
- Practice water conservation methods.

Learning Standards

(See Matrix)

Common SET Abilities 4-H projects address:

- Predict
- Hypothesize
- Evaluate
- State a Problem
- Research Problem
- Test
- Problem Solve
- Design Solutions
- Develop Solutions
- Measure
- Collect Data
- Draw/Design
- Build/Construct
- Use tools
- Observe
- Communicate
- Organize
- Infer
- Question
- Plan Investigation
- Summarize
- Invent
- Interpret
- Categorize
- Model/Graph
- Troubleshoot
- Redesign
- Optimize
- Collaborate
- Compare

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Water: Using Water at Home

Pre-Activity Questions

Before you start the next activity, ask the students:

- Where does water go when we are through with it? (Down the drain)
- Do you know where it goes after you flush or let water go down your drain? (Septic tank, wastewater treatment facility.)

All wastewater that leaves your home must be cleaned so it can be used again. Remember that all water is used over and over. Some homes are connected to a septic tank. Others are connected to the big water treatment facility in your town. Both do the same thing. Dirty water enters, passes through a series of filters and cleaning tanks, then leaves. Both septic tanks and sewerage treatment facilities are designed to manage a specific amount of wastewater.

Supplies

Activity 2: Down the Drain

- A piece of wood, PVC pipe or tape approximately 8 feet long
 - 4 pieces of wood, PVC pipe or tape approximately 2 feet long
 - Shredded newspaper or office paper
 - Small cardboard box.
1. Using the wood, tape, or PVC piping, students will construct a simple pipeline shape from a neighborhood to a treatment facility. Lay the objects on the floor, with the cardboard box at one end of the long object.
 2. Lay two short pieces at the other end of the long object, coming off at an angle. This represents two shorter neighborhood pipe connections to the main sewer line. The box represents the treatment facility.
 3. Wastewater flows from individual homes in a neighborhood, into a spur line, and then into the main sewer pipe. It then flows to the treatment facility. Have two students stand at the ends of the neighborhood spurs. Give each a handful of shredded paper. At the command of "flush", each youth should walk down the spur and along the main line to the treatment facility. Throw the paper into the box.
 4. Now grow the community by adding the last two short objects to the middle of the main line. Have two youth stand at the end of each spur. The community has grown, and population has increased. Each time you give the signal to "flush," one student from each community should walk down and throw their paper into the box. Flush again quickly so there is a crowd at the treatment facility. The box may overflow with shredded paper. After all eight youth have thrown their paper into the box, discuss what happened.

Science Checkup - Questions to ask to evaluate what was learned

- What caused the backup at the treatment facility? (Too much wastewater to treat at the same time).
- What problems might occur at the facility because of this? (Water may not be properly cleaned, water use may be restricted by the town to prevent overflow, no new homes will be allowed to be built)
- What can each home do to prevent back up at the treatment facility? (Conserve water)
- What can the community do? (Conserve water, build a bigger treatment facility)
- Septic systems can also experience back up. Has anyone in the group had this happen at your house? What happened? What did their family do?

Find this activity and more at: <http://nys4h.cce.cornell.edu>

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Water: Using Water at Home

Extensions

- Where is your treatment facility? Which streets/homes in your community have septic systems or are connected to the town sewer line? Your town hall may have a map. Identify patterns you may find.
- Visit your local municipal treatment facility. You'll learn a lot! Call your town hall to find out how to visit.

Supplies

Activity 3: Conserving water (to be done at home)

- Paper and pencil
- Food coloring

How can we use less water? Shower once a week? There are ways to use less, without changing your habits.

1. First, check your water meter. Your water meter may be located inside your house, outside your house or in the lawn under a cover. It looks like a row of numbers that spin. Look at the meter while someone is using water. You should see the numbers change. The meter measures how many gallons of water are being used. You can use the meter to find out how many gallons of water various appliances in your home use. Try the dishwasher or the washing machine. Does it make a difference which settings are used?
2. The water meter can also tell us if there is a water leak somewhere in the house. Look at the meter in the morning before everyone leaves for school and work. Write the number down. During the day, when no one is home, the meter should not change, since no one is using any water. When the first person gets home, before using any water, check the meter again. Is the number different? If it isn't exactly the same, you have a leak somewhere. Go on a "leak hunt" around your home. Look and listen for leaky faucets and toilets that run. Check your toilet for silent leaks by putting food coloring in the toilet tank. Wait 15 minutes. If color appears in the toilet bowl without flushing, then water is leaking from the tank into the bowl. This extra water in the bowl is removed automatically by the toilet. Think about it, if it didn't, the toilet bowl might eventually overflow.
3. Report the results to your club or group!

Science Checkup - Questions to ask to evaluate what was learned

- Did you find any leaks in your home? If they were not fixed, how many gallons of water would be lost in a week? In a month?
- What household appliance uses the most water? How many gallons does it use in one cycle? Did this surprise you?

Extensions

- Once you have found and fixed the leaks, use water saving household appliances to conserve more water. Some showerheads, faucets, and hose nozzles have water saving settings. Your dishwasher and washing machine may as well. Look closely on faucets and showerheads for the letters gpm. This means gallons per minute, the amount of water each fixture allows. If it says 1.5 gpm, it means that the fixture allows only 1 ½ gallons of water to pass through it each minute. This saves water without you even knowing it!
- What ways can you think of to conserve while washing the car, watering the lawn, or during summer backyard fun?

Find this activity and more at: <http://nys4h.cce.cornell.edu>

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Water: Using Water at Home

Vocabulary

Conservation: Actions taken to prevent excessive or wasteful use of a resource.

Wastewater: Water that has been used or is no longer needed for the purpose it was intended.

Stormwater: Water which runs off streets, roofs and other surfaces when it rains.

Water Treatment: The method that is used to clean wastewater so it can be reused.

Background Resources

- The 4-H Water Project, Units 1, 2, 3, <http://extension.psu.edu/4-h/leaders/publications>. From Pennsylvania 4-H. Conservation, properties of water, water science and water quality.
- Water Science for Schools, <http://ga.water.usgs.gov/edu/index.html>. Games, quizzes, facts, maps and more! United State Geological Survey website.
- Great tips for saving water for kids and adults from the Environmental Protection Agency, www.epa.gov/watersense
- U.S. Geological Survey website, <http://water.usgs.gov/outreach/OutReach.html>. Poster series with color drawings of where water is found and the many ways water is used. The reverse of each poster has information and activities.
- Go Figure! <http://gofigure.cce.cornell.edu/>. Interactive website for youth. Click on Waterways.

Background Information

We are lucky to live in a country where water is plentiful and clean. How much do you really know about how much water your family uses? Do you know how it gets cleaned? We use water for a variety of purposes. We need water for drinking and cooking, brushing our teeth and bathing, flushing the toilet, and washing clothes and dishes. When we are finished using the water, it becomes wastewater, and leaves our homes.

Wastewater is water that has been used or is no longer needed for the purpose it was intended. There are two types of waste water: water that leaves our homes and stormwater, which runs off streets, roofs and other surfaces when it rains.

Stormwater flows to storm drains, grates in the streets and parking lots. In some communities, this stormwater flows through pipes to a treatment facility. In other communities, stormwater pipes empty directly into a nearby water body, and the water is not cleaned.

Household wastewater comes from sinks and showers, laundry and toilets. This water leaves your house through pipes that take it to be cleaned. If your home has a septic tank, the water is cleaned and filtered in a big tank buried under your lawn. If your home is connected to the city sewer, the water that leaves your house and other houses in your neighborhood, goes to a treatment facility, where a series of tanks filter and clean the water. All water is and will be reused forever, so it is very important that we use water carefully and clean it properly afterward.