Welcome to the

Pond Activity Guide

We have developed a variety of activities that you can use "as is" or tailor to meet the needs of your students as you explore your pond.

Why a Pond Activity Guide?

The purpose of the Pond Activity Guide is to help you and your students better understand the nature of your pond.

Who benefits from using the Pond Activity Guide?

The Pond Activity Guide is applicable to students in grades K to 12.
Teacher focus groups have suggested the activities in this guide for their grade-level appropriateness.

What can I expect my students to learn from these activities?

The activities align broadly with national state standards in reading, writing, mathematics, art, and science. This calculated design lets you maximize student learning in a motivating, engaging learning environment: the pond!

What can I expect to find in the Pond Activity Guide?

The Pond Activity Guide will help you comprehensively incorporate the pond into your curriculum. The chart on the following page provides an overview of what to anticipate in the Activity Guide.

How can I integrate the activities in this guide into existing curricula?

To help you integrate these activities into your curricula, we have listed the most relevant National Education Standards for each of them. Of course, many of these activities are cross disciplinary, addressing important topics in mathematics, language arts, social studies, and the fine arts.

How can I assess my students' performance as they complete these activities?

We have included a simple rubric for assessing individual student performance on group activities. In addition, many of the activities require students to produce individual or group projects that you can assess.

Pond Activity Guide

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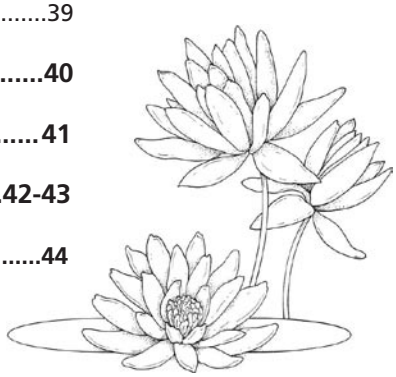


Activity #1

WHAT MAKES A POND A POND? Grades K to 3

OBJECTIVE

The students will examine features of a pond to learn how scientists use these components to classify ponds.

TIME

40 minutes

MATERIALS

- Student Page 1
- Measuring tape
- String
- Weight
- Thermometer

PONDERING THE ACTIVITY

The students often hear the word *pond* used to describe a body of water. However, many of them do not know why a body of water is a pond instead of a lake, river, or bog. In this activity, the students will learn the attributes of a pond and how to recognize these attributes in a pond environment.

PREPARING FOR THE ACTIVITY

Display several photographs or magazine pictures of different bodies of water around the classroom. Share these pictures with the students as you help them understand what makes a pond a pond.

PROCEDURES

1. Show the students the pictures of different bodies of water and ask them what these bodies of water might be called. Words could include *pond, lake, river, ocean, sea, puddle, slough,* and *canal*.
2. Escort the students to the school pond. Ask them which word they think best describes the pond and why. Back in the classroom, have the students make a list of features that might make ponds different from other wet places.
3. Explain that scientists use four features to define a pond. If any of these features are true for a nonflowing body of water, then it's a pond.
4. Hand out Student Page 1 to illustrate these features. Did your students come up with any of the same features? Discuss how you could determine if your pond is truly a pond.
5. Challenge the students to answer the four questions on Student Page 1 using the string, measuring tape, weight, and thermometer. Each student can record his or her findings on Student Page 1. You might have to go out on a blustery day to answer the last question.
6. Summarize by explaining that if the answer is "yes" to any of the four questions, your schoolyard body of water fits the definition of a pond.

NATIONAL SCIENCE EDUCATION STANDARDS

Unifying Concepts and Processes: Evidence, models and explanation, Change, constancy and measurement

K-4 Physical Science: Properties of objects and materials

K-4 Science as Inquiry: Abilities necessary to do scientific inquiry

VOCABULARY

pond: an enclosed, naturally or artificially created body of water, usually not as wide and deep as a lake.

POND EXTENSIONS

1. Have the students research and define other bodies of water.
2. Provide the students with nature magazines to help them create pond collages. They can cut out different elements of a pond and arrange them on a piece of paper to show their understanding of what makes a pond a pond.

QUOTE TO PONDER

"In the end we will conserve only what we love; we will love only what we understand; and we will understand only what we have been taught." ~Baba Dioum

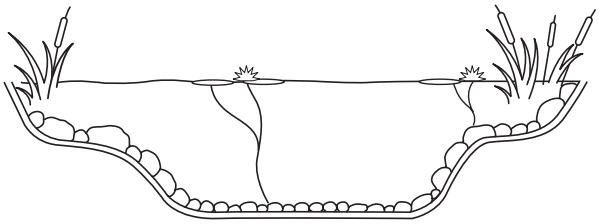
According to Baba, who is a Senegalese conservationist, the West African understanding of the word "taught" is different from the one we commonly use. His use of the term encompasses actual experiences in nature as well as what we are taught by others. This is an important distinction.

Worksheet #1

WHAT MAKES A POND A POND?

DIRECTIONS: Read each statement carefully. Use the diagrams to answer the questions. Circle yes or no.

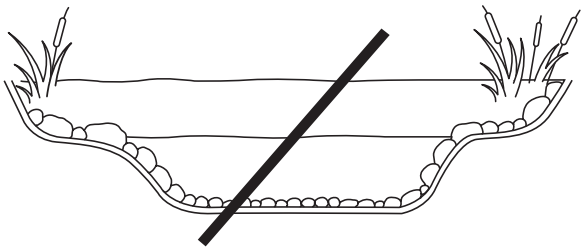
1. Ponds have rooted plants near the middle of the water.



1. Are there plants in the middle?

YES NO

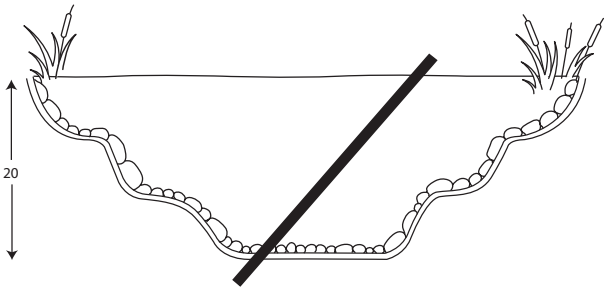
2. Ponds have the same water temperature at the bottom and on top.



2. Is the water at the bottom and on top the same temperature?

YES NO

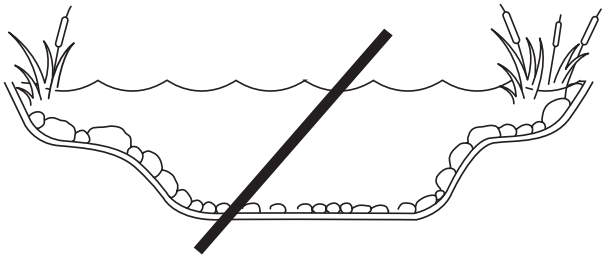
3. Ponds are no deeper than 20 feet.



3. Is the pond shallower than 20 feet?

YES NO

4. Pond surfaces are smooth (without waves), even on windy days.



4. Is the pond surface smooth?

YES NO

Name _____

Activity #2

THE ROLES OF PONDS Grades K to 3

OBJECTIVE

The students will learn about the roles of ponds by examining some examples of pond and wetlands metaphors.

TIME

50 minutes

MATERIALS

- Student Page 2
- Sponge (to show that wetlands absorb excess water)
- Coffee filter (to show that wetlands filter out pollutants)
- Pacifier (to show that wetlands serve as nurseries for many species)
- House key (to show that wetlands provide shelter for many species)
- Fork (to show that wetlands feed many animal species)
- Map (to show that wetlands are rest stops for migrating species)

PONDERING THE ACTIVITY

A pond is one of many types of wetlands. Allowing the students to examine the pond as a wetland will expand their knowledge of and appreciation for the pond's functions in the ecosystem.

Wetlands serve a variety of ecological functions in communities. First, many birds, mammals, insects, and fish call wetlands home. Second, wetlands are nurseries for other species. Wetlands also help protect homes from weather-related conditions. For example, during periods of heavy rain or snow, wetlands help lower floodwaters by holding excess water.

PROCEDURES

1. Discuss the different roles people and places play in your community. For example, what is the role of a school, a hospital, or a farm? How about a teacher, a policeman, or a carpenter? Explain that ponds and other wetlands also play some very important roles in natural communities.
2. Rather than describing the various roles that ponds can play, the students will get the answers from clues you provide. The clues will come in the form of representative objects.
3. Start by laying out the representative objects on a visible surface in the room. Explain that each object on display symbolizes one of the roles of a pond.
4. Distribute Student Page 2 to the students. Explain that their job is to figure out the significance of each representative object by filling in the pond function next to it.
5. Take your students to the pond and guide them, individually or as a group, as they try to match the objects to the roles of a pond. You may have to help them figure out what a pond's roles are.
6. After the students have completed Student Page 2, return to the classroom and have them share their answers.

NATIONAL SCIENCE EDUCATION STANDARDS

Unifying Concepts and Processes: Systems, Order and Organization, Evidence, models and explanation

K-4 Life Science: Organisms and environments

VOCABULARY

habitat: an area in which a species finds food, water, shelter, and space to live.

pond: an enclosed, naturally or artificially created body of water, usually not as wide and deep as a lake.

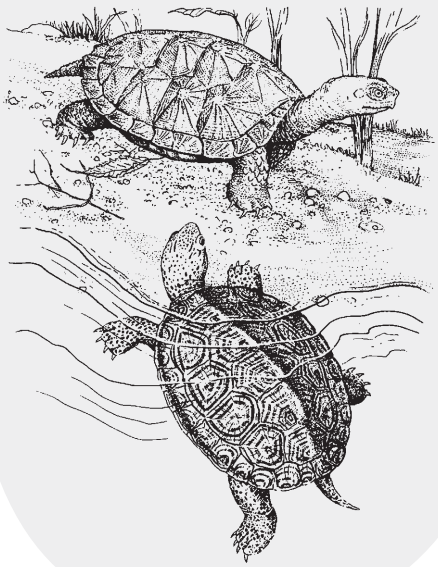
wetland: a lowland area that is saturated with water and is the habitat for many species.

POND EXTENSION

One of the key ideas behind the concept of habitat is the fact that most living things in a habitat are connected. We call these connections the web of life. You can demonstrate these webs by trying the web of life activity found on the Web at http://www.kidsplanet.org/wol.

QUOTE TO PONDER

"…Nature and peace are my shelter and companion..." ~ Wayne Kramer



Worksheet #2

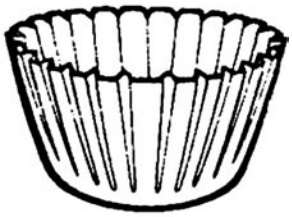
THE ROLES OF PONDS

DIRECTIONS: How do these objects relate to functions of a pond? Fill in the pond-related function for each object.

1. Sponge

REPRESENTS _____

2. Coffee Filter



REPRESENTS _____

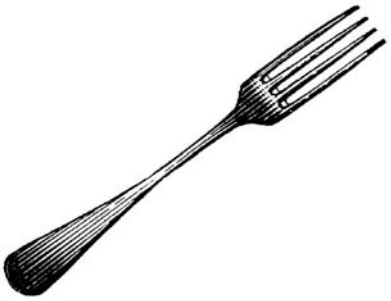
3. Pacifier

REPRESENTS _____

4. House Key

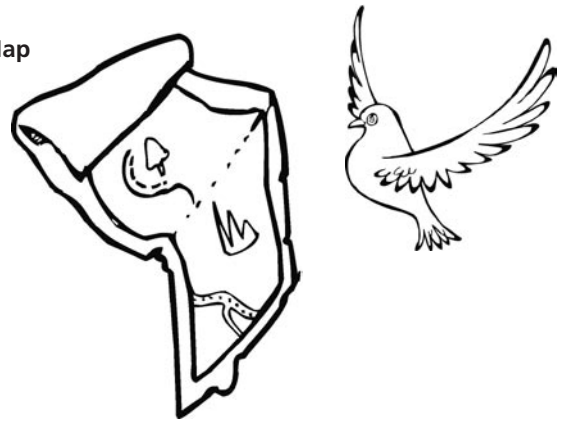
REPRESENTS _____

5. Fork



REPRESENTS _____

6. Map



REPRESENTS _____

Name _____

Activity #3

THE ARTISTIC POND Grades 1 to 12

OBJECTIVE

The students will examine the artistic elements of paintings and drawings of ponds.

TIME

40 minutes

MATERIALS

- Monet print
- A variety of painting and drawing supplies

PONDERING THE ACTIVITY

Take a closer look at a pond. The wondrous mix of colors, textures, and shapes makes it a natural choice for artists to emulate in their works. One famous artist who captured the beauty of ponds was Claude Monet. One of his most famous depictions of a pond is presented in his painting *The White Water Lilies*, 1899.

PROCEDURE

1. As preparation for this activity, be sure to visit the school pond with your students during different types of weather. Make sure to always take a minute to have the students reflect on the visual aspects of the ponds. What does it look like under different conditions? You may want to take digital or print photos that the students can refer to later on.
2. In the classroom, ask the students to make a visual representation of the pond of their choice. Have each student explain what he or she is trying to capture. Each student might want to discuss color, shape, texture, light, or action.
3. Show Monet's *The White Water Lilies* to the students. Discuss what they think he was trying to capture.
4. Challenge the students to draw the pond again from a new point of view. They can use the photos you took as reference, or you can have them rely on only their imagination. Use a single sheet of paper for each drawing. Here are some possible approaches:
   - Draw the water's surface from underwater.
   - Draw the bottom of the pond.
   - Draw a close-up of just a small section of the pond.
   - Draw the pond from a 100-foot-high viewpoint.
   - Draw the pond in different times of year.
   - Draw the pond in different weather conditions.
   - Draw the pond at night.
5. Arrange all of the pictures on a classroom wall in the shape of the pond. Encourage the students to study the different ways of representing a pond.

NATIONAL STANDARDS FOR ARTS EDUCATION

K-4 Visual Arts: Choosing and evaluating a range of subject matter, symbols, and ideas

K-4 Visual Arts: Making connections between visual arts and other disciplines

POND EXTENSION (for Grades 6 to 12)

Have the students view pictures of Monet's ponds and use the pictures to help them interpret the following quote by Monet:

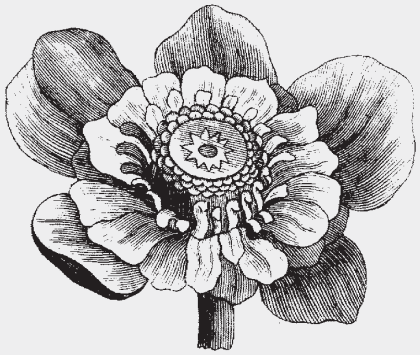
"The only merit I have is to have painted directly from nature with the aim of conveying my impressions in front of the most fugitive effects."

Have the students write their interpretations of the quote in essay form.

QUOTE TO PONDER

"I've caught this magical landscape and it's the enchantment of it that I'm so keen to render."

~ Claude Monet



Activity #4

HOW TO BUILD A POND (AND FIND A LEAK) Grades 1 to 5

OBJECTIVE

The students will learn how a pond is built and how it mimics the functions of a natural pond.

TIME

50 minutes

MATERIALS:

- Student Page 4a (student and teacher versions)
- Student Page 4b

PONDERING THE ACTIVITY

Students who participate in building a pond will have a more personal understanding of the process. However, any group can do this activity. The following pond parts are featured:

- A liner that retains water.
- Gravel over the liner. The gravel protects the liner from sunlight and punctures, and it provides a place for bacteria to grow. The bacteria clean the water and help prevent algae from building up.
- A skimmer that removes material on the pond surface. The material collects in a skimmer bag.
- A pump that moves water from the skimmer to the biofalls.
- Biofalls, where water is pumped through filter materials and rocks. The rocks are also home to the bacteria that clean the water. Water flowing over the falls is replenished with oxygen.
- Plants that are found in the biofalls and in the pond. They also help clean the pond.

PROCEDURES

1. Begin by asking the students the following questions:
   - What defines a pond? (Refer to "Activity 1: What Makes a Pond a Pond?")
   - What happens in a pond? (Water flows in, water is retained, water flows out, and different plants and animals call it home.)
   - How do ponds differ from each other? (Different water sources, banks, depths, and plants and animals all result in different water flow and water quality.)
2. Explain that the Aquascape pond in your schoolyard is designed to mimic a natural pond. The better it mimics a natural system, the less work it takes to maintain it and the more attractive it is to plants and animals. Most people like ponds that are relatively clear, but for that to happen, there must be plenty of oxygen in the water and little algae. The best way to add oxygen is to mix the pond water with air. The best way to prevent algae is to starve it of nutrients. Bacteria can do a good job of eating the nutrients that algae crave. **CONTINUED >**

NATIONAL SCIENCE EDUCATION STANDARDS

Unifying Concepts and Processes: System, order and organization, Evidence, models and explanation, Form and Function

Science as Inquiry: Abilities necessary to do scientific inquiry

K-4 Life Science: Organisms and environment

K-4 Science and Technology: Abilities of technological design

K-4 Science in Personal and Social Perspectives: Science and technology in local challenges

VOCABULARY

algae: a mostly aquatic group of plants that lack stems, roots, and leaves.

bacteria: living things with only one cell.

mimic: to copy.

oxygen: an element that is used by most forms of life.

POND EXTENSION

Have the students create their own edible ponds! Provide them with the following items:

- A mini chocolate pie crust (to mimic the ground and pond area)
- Blue fruit roll-ups (pond water)
- Fudge sauce (patches of dirt)
- Animal and fish crackers
- Green lollipops (trees and plants)
- Coconut flakes dyed green using food coloring (grass and shrubs)

Encourage the students to look at the school's pond to help them create their edible ponds. Have them show their pond creations to the rest of the class before enjoying.

QUOTE TO PONDER

"The song of the river ordinarily means the tune that waters play on rock, root and rapid". ~ Aldo Leopold

Aldo Leopold is generally credited with being the first American conservationist to develop a written land ethic.

Activity #4

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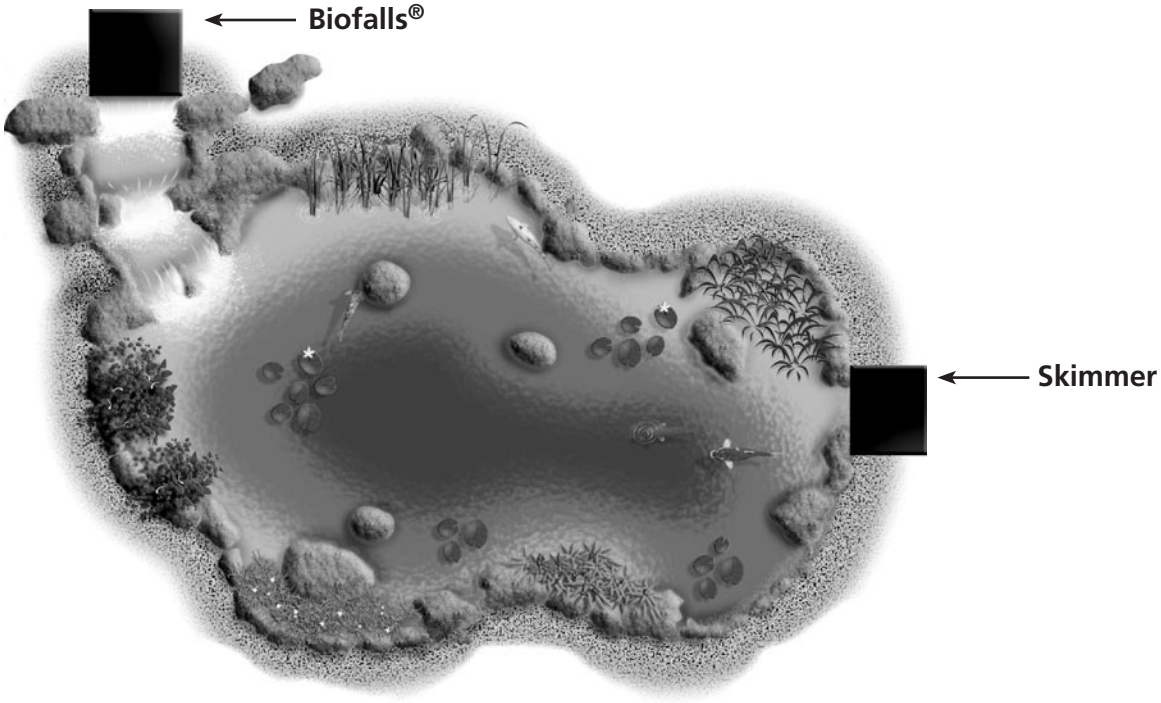
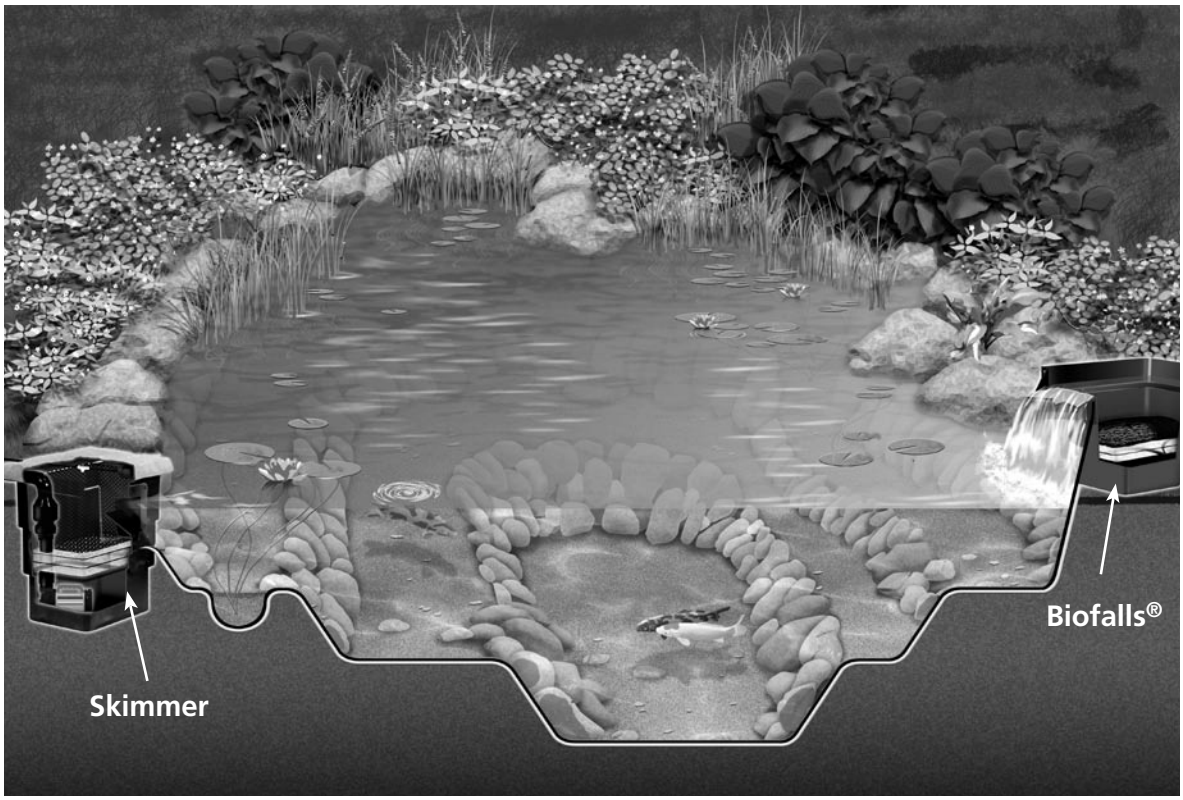
3. Distribute Student Page 4a to the students. Explain that it shows a plan of a typical pond (a view from above) and an elevation (a view from the side).
4. Assign each student a partner. Each team's job is to closely examine the pond to discover any features they believe help mimic a natural pond. They can capture their thoughts by labeling features on the two sketches. Have both students in each team fill out their own Student Page by sharing their individual thoughts.
5. Back in the classroom, do a round-robin, with each team sharing one of the features it has discovered. Continue until all of the students' features have been listed.
6. As a follow-up exercise, challenge the teams to diagnose the possibility of a leak in the pond. Pond designers sometimes have to figure out how a leak occurs. Act as if your pond has such a leak. After a round-robin similar to the one in step 5, share Student Page 4b and have the two students in each team discuss the answer. For younger students, you will need to read the description of the process.

Worksheet #4a

HOW TO BUILD A POND (AND FIND A LEAK)





TEACHER VERSION

HOW TO BUILD A POND (AND FIND A LEAK)

DIRECTIONS:

If you notice you have to add water on a daily basis, you may have a leak. We have found that 99% of leaks occur along the perimeter of the waterfalls and pond edges. Small leaks are generally due to the ground settling; this causes the water to trickle over the edge of the liner in the stream or waterfall. Leaks such as these can be easily fixed.

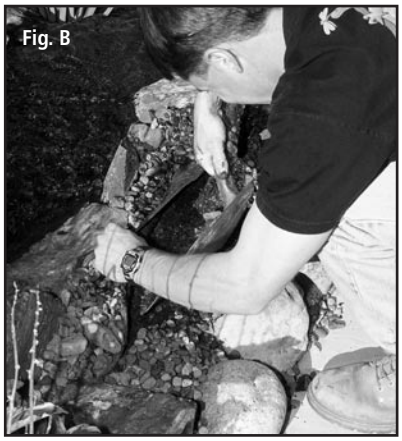


Fig. B

Steps in finding a leak:

- Check the perimeter of the pond for any areas that are wet. Damp or saturated soil is usually a good indicator that water is leaking over the liner (See fig. A).
- Check to make sure any slow moving sections of the stream/waterfalls have not become obstructed by leaves, plants or other debris, causing the water to back up over the edges of the liner.
- Investigate the outside perimeter of the waterfall and stream. Look for any water that is noticeably being diverted over the side of the liner.
- Once you have found the leak, simply pack soil beneath the liner in order to raise the edge above the water level. Hide the exposed liner by replacing the gravel and add mulch. (See fig. B & C)

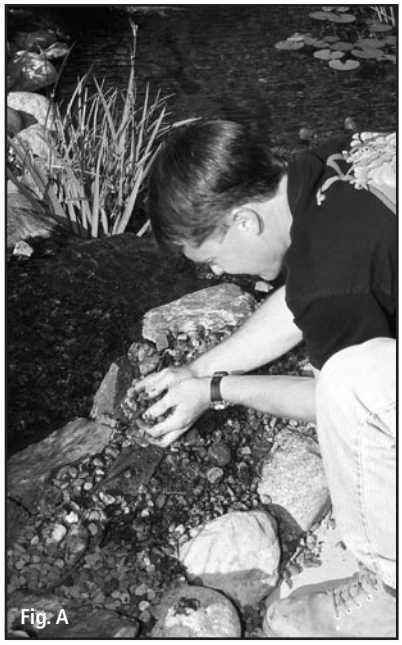


Fig. A

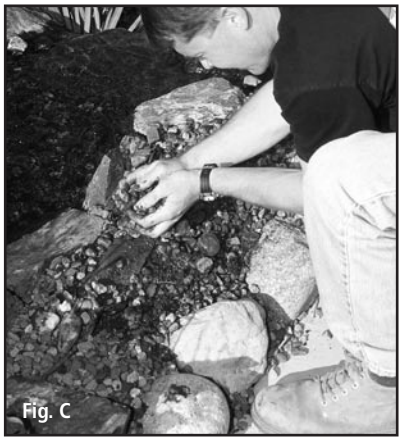


Fig. C

Activity #5

MAPPING A POND Grades 3 to 8

OBJECTIVE

The students will study the structure and details of the pond in order to render a scaled map.

TIME

50 minutes

MATERIALS

- Student Pages 5a and 5b
- String
- Stakes
- Compasses
- Yardsticks
- Colored pencils or markers

PONDERING THE ACTIVITY

Maps are useful tools that provide visual representations of areas. The students will create a map of the major structural elements of the pond. The map can become the basis of future activities.

PROCEDURES

1. Share words that are important to reading maps, such as accuracy, contour, key or legend, grid, scale, and topography. Adjust the list of terms to fit your students' grade level.
2. Discuss with your students the purpose and function of maps. You may choose to share different types and styles of maps. Have the students examine each map for:
   - Purpose (the reason for which it was created).
   - Function (how practical it is).
   - Accuracy (how true to its rendition it is).
3. Have the students examine and discuss a variety of maps. They can bring maps from home or use those you supply in the classroom. Good discussion topics are listed above, in "Preparing for the Activity." Make sure that the students understand related vocabulary terms. (See the "Vocabulary" sidebar.) Clarify any confusing terms.
4. After studying the key features of other maps, your students are ready to discuss what features should be on their pond map. Take your class to the pond for a discussion of what features they think are important. Back in the classroom, create a map key that captures what they feel are important features to map, such as rocks and water. Discuss the difficulty of mapping features like plants. (Some plants are visible only for parts of the year.)
5. To create an accurate map, the students will need to use string and tent stakes to divide the pond into square sections called quadrants. Individual quadrants make up a grid that stretches across all parts of the pond. We suggest your class creates a grid of 5-foot by 5-foot squares. **CONTINUED >**

NATIONAL GEOGRAPHY STANDARDS

Standard 1: How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information.

VOCABULARY

contour: an imaginary line on the ground that indicates the same elevation above or below a specific point.

key or legend: a simplified explanation of symbols.

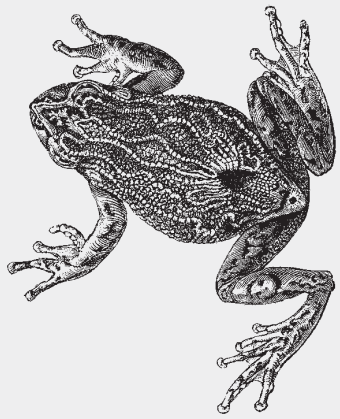
quadrat: a small, usually rectangular plot of land used to study the distribution of plants or animals in an area.

scale: the relation between the size of something and a representation of it.

topography: an illustrative representation of the surface features of a place or region on a map, signifying their relative positions and elevations.

POND EXTENSIONS

1. The students can map the zones of the pond used by wildlife (e.g., where you can find fish).
2. Older students can create a topographic map of their pond by using yardsticks to map the depth of their quadrant.



Activity #5

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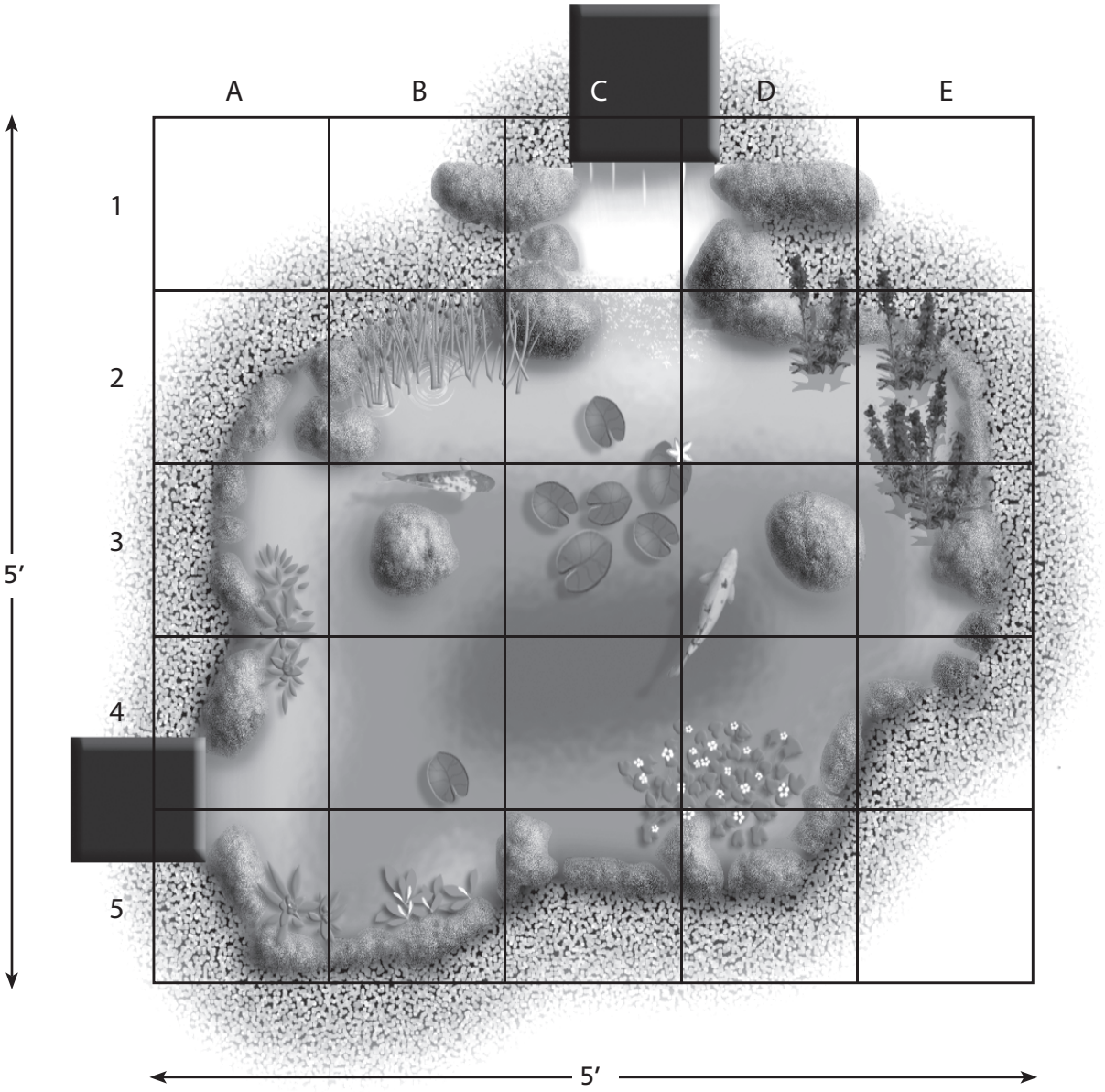
This means the grid lines (the string) will be staked apart every 5 feet in both directions. Make sure that the grid extends at least 5 feet beyond the longest and widest parts of the pond. Have the students label the grid with other stakes so that on one side, the quadrants are numbered (1, 2, 3, etc.) and on the other, they are lettered (A, B, C, etc). Hand out Student Page 5a to illustrate to them what the grid and labeling might look like.

6. Arrange teams of three or four students. Within each team, one student should play the role of leader and another student, the recorder. The other students in each team will make measurements and check the recorder's work. Assign each team to map two quadrants of the pond (i.e., B3 and F4). Some teams may have to map three quadrants.
7. Explain that to make an accurate map that's smaller than the pond, each 5-foot by 5-foot pond quadrant will be represented on a 6-inch by 6-inch square of paper. In other words, the student map will be to 1/10 scale. If a rock in the pond is 20 inches long, then on the map it will be 2 inches long.
8. Hand out Student Page 5b. Instruct each group to gather drawing tools (e.g., crayons, colored pencils, or markers), Student Page 5b, and their map key. Have them map their first quadrant, including a key. Make sure that north on their maps is aligned with north on your pond.
9. After checking the quality of each team's map, have the students map their second quadrant.
10. Once the students have mapped all of the pond sections, cut out the 6-inch squares and assemble the complete map. Use the quadrant codes and the north orientation to align all of the pieces correctly.
11. Copy the complete map to serve as a reference tool for future activities.

Worksheet #5a

MAPPING A POND



Name _____

Worksheet #5b

MAPPING A POND

DIRECTIONS: Using the 5-foot by 5-foot pond, draw a 6-inch x 6-inch square of one of the quadrants below. Your map will be 1/10 scale. Example: If a rock in the pond is 20 inches long, then on the map it will be 2 inches long.

6″

6″

Map Key:

Name _____

Activity #6

WAY-OUT WATER OLYMPICS Grades 3 to 8

OBJECTIVE

The students will learn about cohesive and adhesive properties of water and surface tension.

TIME

50 minutes

MATERIALS

- Student Pages 6a, 6b, 6c, and 6d
- The materials listed on Student Pages 6a, 6b, and 6c

PONDERING THE ACTIVITY

Look around the pond. Many forms of life live on its surface. Why is this since most life forms appear to be much heavier than the water? The answer lies in the cohesion and adhesion of water molecules and the surface tension of the water.

Because of their molecular structure, water molecules are attracted to each other. The result is that these water molecules "stick" together. This attraction is called cohesion.

Surface water molecules behave differently than other water molecules. These water molecules are strongly attracted to the molecules below them. As a result, a thin layer of "skin" is formed on the surface of the water, creating surface tension.

Water molecules can also be attracted to dissimilar molecules in materials such as paper or soil. The attraction of dissimilar molecules is called adhesion.

Did You Know?

- Water is the most common substance on Earth. From 70% to 75% of the Earth's surface is covered by water.
- People take in over 16,000 gallons of water over their lifetime.
- About 1,000 gallons of water are required to grow and process each pound of food Americans consume.
- A person can survive a long time without food but only five to seven days without water.

PROCEDURES

1. Visit the school pond with your students. Encourage them to observe the properties of water. What's different about how things behave at the water surface? At the edges? At the bottom (if visible)?
2. Have the students play with water. What happens when they drip water on different surfaces?
3. Arrange the students into teams of three. In each group, assign the following roles: the observer (the student who ensures that the experiment is done correctly), the tester (the student who performs the experiment), and the recorder (the student who writes the predictions and outcomes). **CONTINUED >**

NATIONAL SCIENCE EDUCATION STANDARDS

Unifying Concepts and Processes: Evidence, models and explanation, Change, constancy, and measurement

Science as Inquiry: Abilities necessary to do scientific inquiry, Understandings about scientific inquiry

5-8 Physical Science: Properties and changes of properties in matter

VOCABULARY

adhesion: the attraction of dissimilar molecules to each other.

cohesion: the attraction of water molecules to each other.

surface tension: when all water molecules at the top of the water column are attracted to each other in all directions, creating a thin "skin" on the surface of the water.

POND EXTENSION
(for Grades 6 to 8)

Challenge the students to create experiments that test the properties of water. Arrange the students into small groups. You may wish to assign each group an area to explore: water cohesion, water adhesion, or surface tension. Give the students enough time to research their area and to develop a test that demonstrates their assigned water property. You may take this challenge one step farther by having other classes try the experiments and vote for the ones that best demonstrate each water property.

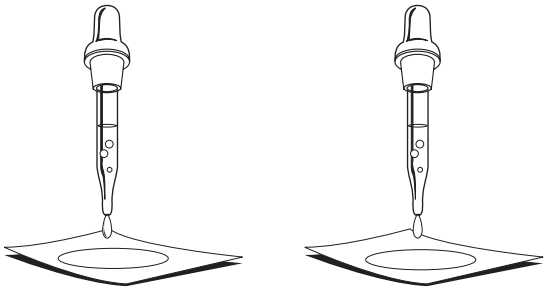
Activity #6

< CONTINUED FROM PREVIOUS PAGE

4. Distribute Student Pages for the following events:
   - Student Page 6a: Racing Water
   - Student Page 6b: Penny Water Drop Race
   - Student Page 6c: Floating Paper Clip
5. Read the directions for each event with the students. Clarify any directions that may seem confusing. Equip each team with the needed supplies.
6. As the students complete each event, monitor their progress. Have the students use Student Page 6d to record their answers.

WAY-OUT WATER OLYMPICS

EVENT 1: RACING WATER



MATERIALS

- Two 2-inch by 2-inch squares of paper towels, with each square labeled by brand
- Two droppers
- Pond water
- Red pen
- Ruler

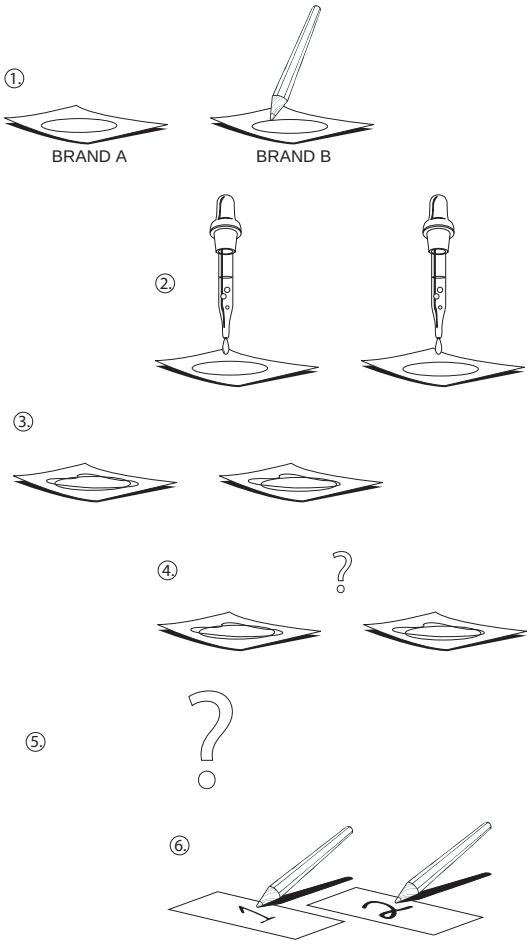
Paper towels are composed of paper fibers. The attraction between water molecules and paper fibers — an example of adhesion — is strong. The stronger the attraction, the quicker a paper towel will absorb the water.

QUESTION:

Which paper towel do you predict will absorb the water fastest?
Write your prediction on Student Page 6d.

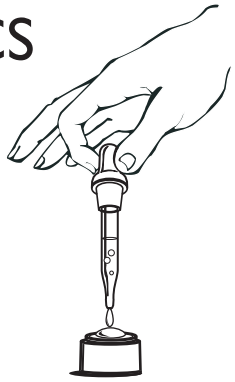
PROCEDURES

1. Draw a 1-inch-diameter circle on each paper towel square.
2. Place one drop of water in the middle of each paper towel square.
3. Allow the water to absorb into each paper towel square.
4. On which square of paper towel did the water first fill the 1-inch-diameter circle?
5. Compare your prediction with the actual outcome of the experiment.
6. Give yourself 2 points if your prediction was correct. Give yourself 1 point if your prediction was incorrect.



Name _____

WAY-OUT WATER OLYMPICS



EVENT 2: PENNY WATER DROP

MATERIALS

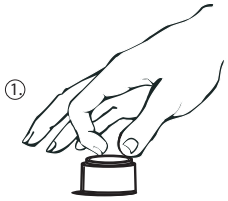
- One dry penny
- One dry plastic bottle cap
- Water dropper
- Water

Water molecules tend to "stick" together, a phenomenon called "cohesion." Water's cohesive nature allows for many more drops of water than you think to remain on a flat surface before spilling over the edges.

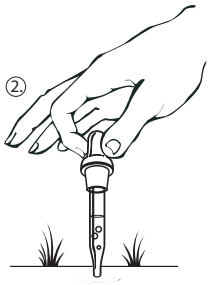
QUESTION:

How many drops of pond water can you pile onto the penny without spilling the water? Write your prediction on Student Page 6d.

PROCEDURES

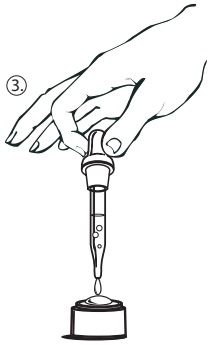


1. Place the dry penny on top of the dry bottle cap.



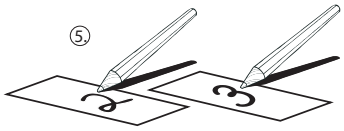
2. Fill the dropper with the pond water.

3. Count how many drops of water can be piled onto the penny before the water spills over.



4. How many drops of water did the penny hold? Compare your prediction with the actual outcome of the experiment.

5. Give yourself 3 points if your prediction is correct. Give yourself 2 points if your prediction is only one number off from the actual results. Give yourself 1 point if your prediction is more than one number off from the actual results.



6. For extra credit, try to figure out if a di el, or quarter would also hold extra wa or why not?

Name _____

WAY-OUT WATER OLYMPICS

EVENT 2: FLOATING PAPER CLIP

MATERIALS

- One square of paper towel
- Small bowl of pond water
- Two dry paper clips

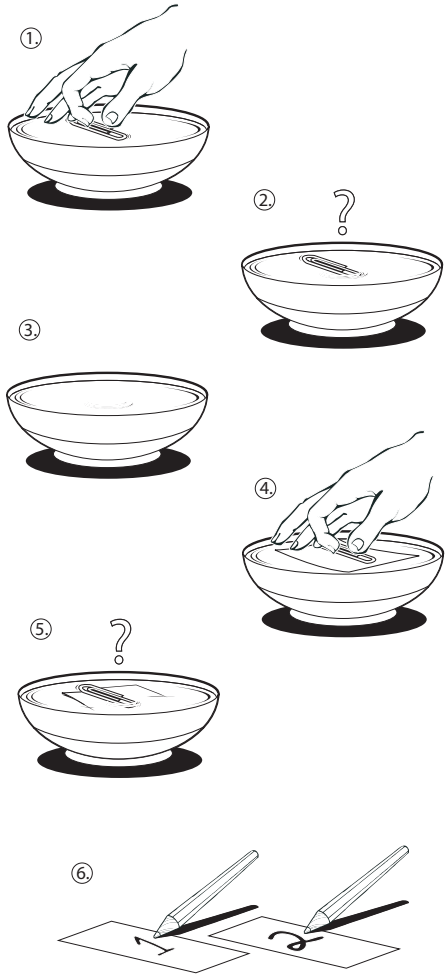
Because of "surface tension," a thin layer of "skin" forms on the surface of water. The surface tension of water responds differently to different materials.

QUESTION:

What happens when you place a paper clip into a bowl of water? What happens if the paper clip rested on a piece of paper towel in the water? Write your predictions on Student Page 6d.

PROCEDURES

1. Place the paper clip into the bowl of water. Try to make the paper clip float.
2. Does the paper clip float? Compare your prediction with the actual outcome of the experiment.
3. Remove the paper clip from the water.
4. Place the square piece of paper towel onto the surface of the pond water. Carefully rest the paper clip on top of the paper towel.
5. Does the paper clip float? What happens to the paper towel? Compare your prediction with the actual outcome of the experiment.
6. Give yourself 2 points if your prediction was correct. Give yourself 1 point if your prediction was incorrect.



Name _____

Worksheet #6d

DIRECTIONS: Fill in the following chart with your findings from Worksheets 6a, 6b and 6c.

Event	Prediction	Outcome	Points
Racing Water	Paper Towel No. _____	Paper Towel No. _____	☐ 2 Points ☐ 1 Point
Penny Water Drop	No. of Water Drops _____	No. of Water Drops _____	☐ 3 Points ☐ 2 Points ☐ 1 Point
Floating Paper Clip	Paper Clip Floats *Without* Paper Towel? ☐ Yes ☐ No	Paper Clip Floats *Without* Paper Towel? ☐ Yes ☐ No	☐ 2 Points ☐ 1 Point
	Paper Clip Floats With Paper Towel? ☐ Yes ☐ No	Paper Clip Floats With Paper Towel? ☐ Yes ☐ No	

Name _____

Activity #7

PERSUASIVE WRITING – PONDS FOR SALE

Grades 3 to 8

OBJECTIVE

The students will be introduced to persuasive writing techniques.

TIME

50 minutes

MATERIALS

- Student Pages 7a and 7b

PONDERING THE ACTIVITY

As the students develop their writing skills, they will be required to practice persuasive writing. Persuasive writing teaches them how to effectively and succinctly state their points, opinions, or positions in an argument. Providing the students with a persuasive writing checklist teaches them how to evaluate their work or the work of their peers.

PROCEDURES

1. Explain that the goal of this activity is to write a "For Sale" advertisement for a pond aimed at a fish buyer.
2. Distribute Student Page 7a to the students.
3. Take your students to visit the pond. Give them 15 minutes to observe the pond and complete Student Page 7a. Have them use this page to write notes about their observations of the pond.
4. Bring your students back into the classroom and distribute Student Page 7b. Review the persuasive writing checklist on Student Page 7b.
5. Ask the students to begin writing their draft. Circulate around the room. Use the observation checklist to monitor their work. Guide the students who are having difficulties beginning their draft.
6. Combine the "For Sale" descriptions into a pond real estate section for general distribution. The students can add illustrations to make the ads more appealing.

NATIONAL STANDARDS FOR ENGLISH LANGUAGE ARTS

K-12.5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.

VOCABULARY

persuasive writing: writing intended to influence a reader's beliefs or actions.

POND EXTENSIONS

1. Add prices to the pond ads and have the students from another class make a purchase.
2. After the students have completed their writing activity, have them research the following fish for practical inclusion in the school's pond:
   - Koi
   - Goldfish (e.g., shubunkin, comet, calico, oranda)
   - Tropical fish (e.g., swordtail, tilapia, plecostomus)
   - Native fish (e.g., bass, sunfish)
3. Assign the students to groups. Have them write down the pros and cons of using each fish. Instruct the groups to indicate their choice for the best fish to include in their pond. Have the groups share their choices and rationale with the class.

QUOTE TO PONDER

"Works of imagination should be written in very plain language; the more purely imaginative they are the more necessary it is to be plain."

~ Samuel Taylor Coleridge

Worksheet #7a

PERSUASIVE WRITING – PONDS FOR SALE

DIRECTIONS: Record your observations of the pond below.

Observations: What is the setting of the pond?

Thoughts: Why is the pond a good place for fish to live?

Selling Points of the Pond: Why might a fish live here?

Name _____

Worksheet #7b

PERSUASIVE WRITING – PONDS FOR SALE

DIRECTIONS: Write your draft below using the observations and notes you made on Worksheet 7a. Use the writing checklist to be sure you include everything.

Draft:

Writing Checklist:

- ☐ My introduction explains my topic and my position on it.
- ☐ My ideas clearly support my position. I use examples, reasons, and/or explanations to prove my position.
- ☐ I order my ideas in a way that makes sense to my readers.
- ☐ My sentences and paragraphs show smooth transitions.
- ☐ My conclusion restates my position.

Name _____

Activity #8

THE QUALITY OF WATER Grades 4 to 12

OBJECTIVE

The students will conduct three simple tests to gather information about the quality of the water in the pond.

TIME

50 minutes

MATERIALS

- Student Page 8
- One pencil per student pair
- One of the following per group of six students:
  - ☐ White or very light Frisbee with 3/8-inch hole poked through the middle (in advance, hammer a Phillips screwdriver through the center of each Frisbee)
  - ☐ Black permanent marker
  - ☐ 1/8-inch-thick, 8-foot-long rope or heavy twine
  - ☐ 6-foot measuring tape
  - ☐ Ruler
  - ☐ pH test kit
  - ☐ Thermometer
  - ☐ Plastic bucket

PONDERING THE ACTIVITY

How do you know if a pond is healthy? No single test can assess the overall quality of pond water, but the students will have a pretty good idea of water quality when they conduct and compare results from three tests.

Background Information for Water Transparency Test

The Secchi (SEC-key) disk is a fun, surprisingly simple way to measure the transparency of a body of water. It is a rough estimate of how much light penetrates the body of water. Scientists have been using it since Professor P. Secchi invented it in 1865.

A Secchi disk is usually 8 inches across, has alternating black and white quadrants, and has a rope attached to its center. Researchers lower the disk into the water, often from the side of a boat, until it disappears from sight and then slowly raise it until it is just visible again. At the point where the disk reappears, they mark the rope at the surface of the water. The distance from the disk to the mark on the rope is the Secchi depth.

As a general rule, light can penetrate to a depth of two times the Secchi depth. As light penetration increases, so does the amount of plant growth and oxygen produced by algae and aquatic plants.

Background Information for pH Test

Another simple way to assess water quality is with a pH test. pH means potential of hydrogen. The more hydrogen in the water, the more acidic the water. **CONTINUED >**

NATIONAL SCIENCE EDUCATION STANDARDS

Unifying Concepts and Processes: Evidence, models and explanation, Change, constancy, and measurement

Science as Inquiry: Abilities necessary to do scientific inquiry, Understandings about scientific inquiry

5-8 Physical Science: Properties and changes of properties in matter

5-8 Science and Technology: Understandings about science and technology

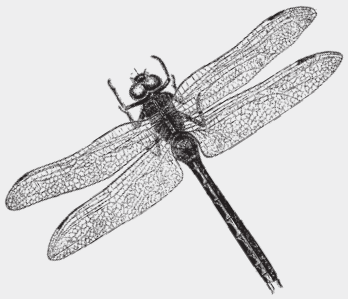
VOCABULARY

Secchi disk: a tool used to measure water clarity.

pH: a scale used to measure acidity.

POND EXTENSION

Have the students compare the pH of pond water to other samples of water, such as tapwater, bottled water, and drinking water.



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pH is measured on a scale of 1 to 14. Low numbers are more acidic, high numbers are less acidic (more "basic"), and numbers in the middle are more neutral. A pH of 7 is the most neutral. Typical ponds have a pH range of 6 to 11, which is slightly acidic to very basic. Most wildlife have difficulty surviving in waters with a pH outside of this range. For example, a pH of 4 is acidic enough to dissolve nails!

Background Information for Temperature Test

A third way to test the pond's health is much like the way you test your own health: take its temperature. You must leave the thermometer in the water long enough to get an accurate reading (about 90 seconds). The temperature of a healthy pond is related to the temperature of the surrounding environment. However, an unusually warm pond can indicate an overabundance of decomposing algae, which produces heat.

PROCEDURES

1. Instruct the students to divide into groups of six and find a partner within their group. Tell them that each group will conduct three different water-quality tests. Assign each group a number, which they will enter on their data sheet, and assign each pair primary responsibility for one of the three tests: the transparency test, the pH test, or the temperature test.
2. Explain that before the students can go out to the pond, they must first make one of the testing devices in the classroom. Show them a premade Secchi disk, explain how it's used, and ask them to discuss how measuring the Secchi depth could be useful in assessing water quality. (See "Background Information" above.) Ask them questions about water quality and transparency. What do plants need to grow? What happens if the pond is so murky that sunlight can't shine through and reach aquatic plants? What happens to the animals if the plants die off?
3. Give each group a marker, rope, ruler, and Frisbee. Tell them to use the ruler and marker to make quadrants on the inside "cup" of the Frisbee. Have them color in two opposite quadrants with the black permanent marker. Demonstrate how to thread the rope through the hole in the center of the Frisbee and hold it in place by tying a knot in the end, under the cup. When holding the rope, the disk should dangle, colored quadrants facing up.
4. Hand out Student Page 8, then take the students to the pond. They should bring the disk, the black marker, the measuring tape, and the data sheets. You should bring all of the other materials listed above.
5. Since weather influences light penetration and water temperature, ask the students to describe the weather conditions as indicated on their data sheets.
6. Tell each group to find a place around the pond. Review how to measure the Secchi depth. Tell the students to lower their Secchi disks into the water, allowing the Frisbee cup to fill with water so that the disk slowly sinks.

CONTINUED >

Activity #8

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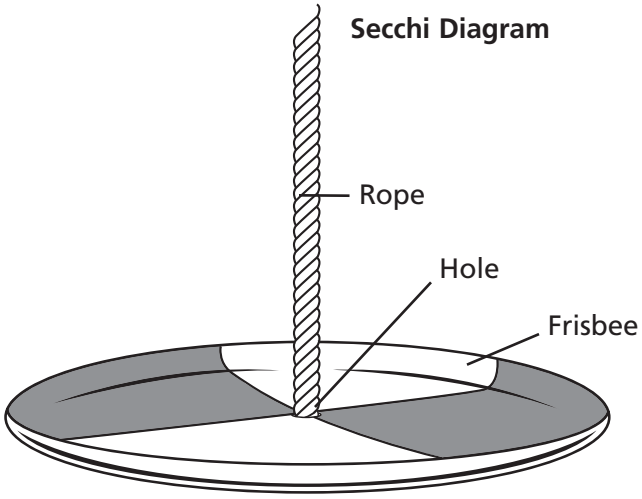
7. Ask the pair of students within each group that is in charge of the transparency test to measure the Secchi depth and record it on their data sheet.
8. Gather the group together and ask the students to compare their results. Were the readings the same? If not, why? Discuss how readings taken in the shade would differ from those taken in the sun.
9. Explain that it is now time to conduct the next two tests of the day: pH and temperature. Distribute a bucket and pH test kit to the pair within each group that is responsible for the pH test. Distribute the thermometers to the pair responsible for the temperature test.
10. Explain or demonstrate how to conduct the pH test. (Refer to the directions provided with the kit.) Have the students circle the appropriate number on their data sheet.
11. Explain or demonstrate how to take the water temperature by inserting the thermometer into the bucket. The students should wait 90 seconds, then record the temperature on their data sheet.
12. Invite the students to return to the same spot where they conducted the transparency test and complete the other two tests.
13. Gather the group together at the pond's edge or back in the classroom, then review and discuss the results. Ask the following questions: Based on the results, is your pond healthy? Why or why not? Are these three tests comprehensive enough to determine the total health of the pond? What other types of tests could inform you about the health of your pond?
14. Explain that recording changes over time in the amount of various pond plants and animals is another excellent way to determine the health of a pond. (See the "Bioblitz" activity.)

Worksheet #8

THE QUALITY OF WATER

DIRECTIONS:

Secchi Diagram



WEATHER CONDITIONS

Air Temperature _____

Cloud Cover (circle one): Low Moderate High

Precipitation _____ Other _____

RESULTS

Secchi Depth _____

pH (circle one)

1	2	3	4	5	***6***	***7***	***8***	***9***	***10***	***11***	12	13	14
Acidic													Basic

Normal Range: 6 to 11

Temperature _____ Normal Range _____

Name _____ **Group #** _____ **Date** _____

Activity #9

THE POND POET Grades 6 to 12

OBJECTIVE

To help the students better use their senses to experience a pond, then turn that experience into a pond poem.

TIME

40 minutes

MATERIALS

- Student Page 9
- Pen and paper

PONDERING THE ACTIVITY

The pond is a fascinating place that gives the students an opportunity to use all of their senses--sight, sound, touch, and smell--to experience the wonders of the pond. By writing about these experiences, the students will be better able to articulate their feelings and thoughts about the pond.

PROCEDURE

1. Ask your students to close their eyes, then read them the poem from Student Page 9. Ask them which images stuck in their mind. Do they think the poem captures the elements of their pond? Could they write what they consider a better poem?
2. Explain that they are going to participate in a poetry slam about the pond. A poetry slam is a game in which people compete by reading their best poems. It's a loud, raucous affair where the audience cheers after each poem is read.
3. Each student will write and read a poem that he or she thinks best captures some element of the pond. Encourage the students to think about different ways they can sense a pond: through sight, sound, touch, and smell.
4. Take your students to the pond and give them time to gather thoughts for their poem. Give them a few days to work on refining their work.
5. Encourage the students to give animated, active performances as they read their poems during the poetry slam.
6. Poetry slams typically use audience response to select the best poems. You can have the students clap, vote by hand, or use written ballots to select the three best poems. Or, for a noncompetitive event, just have the audience express appreciation for each reader. The more animated the poem, the louder the response from the audience. The goal is to make poetry reading a participatory event.
7. The winners can be asked to create a new pond poem for the following week, when they can compete against each other or against winners from another class.

NATIONAL STANDARDS FOR ENGLISH LANGUAGE ARTS

K-12.4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes

K-12.5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.

K-12.6: Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre

POND EXTENSION

Ask the students to read the excerpt from Chapter 9, "The Ponds," of Henry David Thoreau's Walden. Have the students use the bottom of Student Page 8 to interpret the meaning of this excerpt. Have them share their interpretations with the class.

QUOTE TO PONDER

"They are too pure to have a market value; they contain no muck. How much more beautiful than our lives, how much more transparent than our characters, are they!"

~ Henry David Thoreau

THE POND POET

Pond Life
by Margaret Lindsay Holton

while handsome bullrushes finally spear up
as drooping willows listfully weep
and a miniature tree frog chorus bellows
at a throaty red-winged black bird swaying
while big mud turtles freeze frame
as daring dragonflies whiz by
and feverish minnows hopefully charge
at long-limbed water spiders skating
while wood ducks snort green algae
as black-eyed snakes weave ribbons
and Queen Anne ruffles her fine lace
at a common thistle braying
while merry buttercups pucker up
as delicate bluebells dingle dangle
and a Great Blue Heron stares
at a prickly porcupine playing
while broad leaf burdocks brood
and Canadian geese back paddle
at a coyotes wet shadow fleeting
while a young buck antlers tilt
as several barn swallows swoop
and mysterious brown bats dervish
at mosquitoes buzzing flourish
– this pond lives on

I had it all
As I recall.

Name _____

Activity #10

TRANSECT STUDY Grades 6 to 12

OBJECTIVE

The students will learn to measure changes in a landscape through the use of a transect line.

TIME

50 minutes

MATERIALS

- Student Page 10
- Length of rope (dependent on your schoolyard)
- Measuring tape and rulers
- Thermometer
- Light meter (if available)
- Tent pegs
- Plant field guides

PONDERING THE ACTIVITY

Transect readings are one method that scientists use to study changes in habitats. A transect is simply a rope stretched out across a landscape. Researchers take measurements at set distances along the rope. This activity will help the students measure changes in plant diversity around the pond.

PREPARING FOR THE ACTIVITY

Ideally, the transect should run across the widest point of your pond and extend equally on both sides. A 50-foot transect might cross the pond so that there is 20 feet of rope on each side of the pond and 10 feet across it. You need to select a rope size that makes sense for the size of your pond and schoolyard.

PROCEDURES

1. Explain that the class will be studying changes in plant diversity in relation to habitats around the pond. Have the students give their definition of a habitat. What kinds of habitats do they think exist around the pond. What kinds of plants will be found in each habitat? Make some predictions on the chalkboard.
2. Visit the pond with your students to observe the habitats and plant diversity. What do they see? Does it support their prediction? What are the characteristics of different habitats. How could they measure diversity in different habitats around the pond?
3. Explain that one method that scientists use to measure changes in habitats is a transect. Explain that the class will stretch a transect line across the pond so that it extends equally on both sides. The class will then use the tent stakes to mark points along the line at regular intervals.
4. Place the students in teams of four. Each team will be responsible for taking measurements at two points along the transect line. Have the students figure out how many points they will need to mark along the line. For example, if there are 24 students, there will be six teams, each team

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NATIONAL SCIENCE EDUCATION STANDARDS

Unifying Concepts and Processes: Systems, order and organization, Evidence, models and explanation, Change, constancy, and measurement, Evolution and equilibrium

Science as Inquiry: Abilities necessary to do scientific inquiry, Understandings about scientific inquiry

5-12 Life Science: Population and Ecosystems, Diversity and adaptations of organisms, Behavior of Organisms

5-8 Science and Technology: Understandings about science and technology

VOCABULARY

diversity: a measure of the different types of things--plants, animals, etc.--found within a given area.

sampling: the process of collecting data at a few points to gain an understanding of an entire species or group of objects.

substrate: a surface on which a plant or animal grows or is attached

transect: a linear measuring device along which points are marked at a regular interval.

POND EXTENSION

Do a transect study that crosses from a lawn to another habitat. Which has greater plant diversity?

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will measure two points, so 12 points along the transect will need to be measured. If your rope is 50 feet long and each end counts as a point, there will be 10 points between the ends. Since 50 divided by 10 equals 5, the students will mark the transect every 5 feet by driving a stake into the ground.

5. Discuss how they will measure and mark points along the transect that are over water.
6. Once the teams and measuring points have been decided, distribute two copies of Student Page 10 to each team. Explain that for two of the points along the transect, each team will be gathering data on habitat characteristics and plant diversity.
7. Following the directions on how to collect habitat data on the Student Page, each team will collect the following data at each point marked with a tent stake: temperature at ground level, temperature one foot above the ground, light level (with a light meter), and a description of the substrate.
8. To collect plant data, the students will use a ruler to mark or otherwise indicate a 12-inch circle around a data point. Any plant that has any part within that circle is counted. The students will record how many plants of each type are found within the circle. They can identify a plant through a written description or learn the species name with a field guide. (Students who are performing the experiment at points over water may need to take off their shoes and socks and roll up their pants.)
9. Have each student analyze differences between the two transect points. Are there differences in plant diversity? Do these differences have anything to do with the habitat characteristics?
10. Assemble all of the transect reports in the order they appear on the transect. Can the students trace changes that match the changes they see outside?

Worksheet #10

TRANSECT STUDY

DIRECTIONS:

Temperature at Ground Level _____

Temperature One Foot Above Ground Level _____

Light Level _____

Description of the Substrate at Data Point:

_____

_____

_____

_____

_____

_____

Plant Name or Description:

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

# of Individuals in group _____

Names _____

Activity #11

LANDSCAPE DESIGN CHALLENGE Grades 6 to 12

OBJECTIVE

The students will research the process of pond design and use their research to design their own ponds.

TIME

120 minutes

MATERIALS

- Student Pages 11a, 11b, and 11c
- Large sheets of paper
- Regular and colored pencils
- Ruler
- Computer with Internet access

PONDERING THE ACTIVITY

Pond construction is an excellent metaphor for how art and science are integral to so many human endeavors. For this activity, the students will experience the challenge of matching the needs of an imaginary client with the science and the math behind pond construction.

PROCEDURES

1. Inform the students that their job is to take on the role of pond designer and builder and that they will be designing a pond. What do they think goes into the pond design process? What issues must they deal with? Read with them Student Page 11a, which explains the types of questions that must be answered in the process of designing a pond.
2. Arrange the class into groups of approximately four students. Instruct the groups to use the Internet and your pond binder to research information on pond construction, especially the Aquascape Designs, Inc. approach. The students will need to be familiar with basic elements of the pond--liner, biofalls, skimmer, etc.--to proceed.
3. Each group of students needs to select a potential client whose needs they must meet. The client could be a parent of one of the group members, a different homeowner, or a teacher in the school. An interview with the client will establish the scope of the pond and answer many of the questions on Student Page 11a.
4. To complete the assignment, the students will need to present a "bid" to their client. (students can experiment with rope or a garden hose to estimate dimensions) The bid will include a plan, rough elevation, and cost estimate. Student Page 11b shows examples of the first two. Student Page 11c shows a bid sheet. The bid sheet requires the students to calculate the various amounts of material they need based on the size and characteristics of the pond. Establish a timeline for completion of the project. Major milestones include completing the interview, completing the plan, and completing the cost estimation.
5. Have groups share their designs with the class, ideally with the client present to critique the approach and how well it fits the budget. If the client isn't available, another student or teacher can stand in.

NATIONAL SCIENCE EDUCATION STANDARDS

Unifying Concepts and Processes: Systems, order and organization, Evidence, models and explanation, Change, constancy, and measurement

Science as Inquiry: Abilities necessary to do scientific inquiry, Understandings about scientific inquiry

5-12 Life Science: Populations and Ecosystems

5-12Science and Technology: Abilities of technological design, Understandings about science and technology

5-12 Science in Personal and Social Perspectives: Science and technology in local, national, and global challenges

Principles and Standards for School Mathematics

PreK-12 Connections: Recognize and apply mathematics in contexts outside of mathematics.

VOCABULARY

scale: the relation between the size of something and a representation of it.

POND EXTENSION

Have the students create three-dimensional models of their designs using various materials.

QUOTE TO PONDER

"…A fine landscape is like a piece of music; it must be taken at the right tempo…" ~ Paul Scott Mowrer

Worksheet #11a

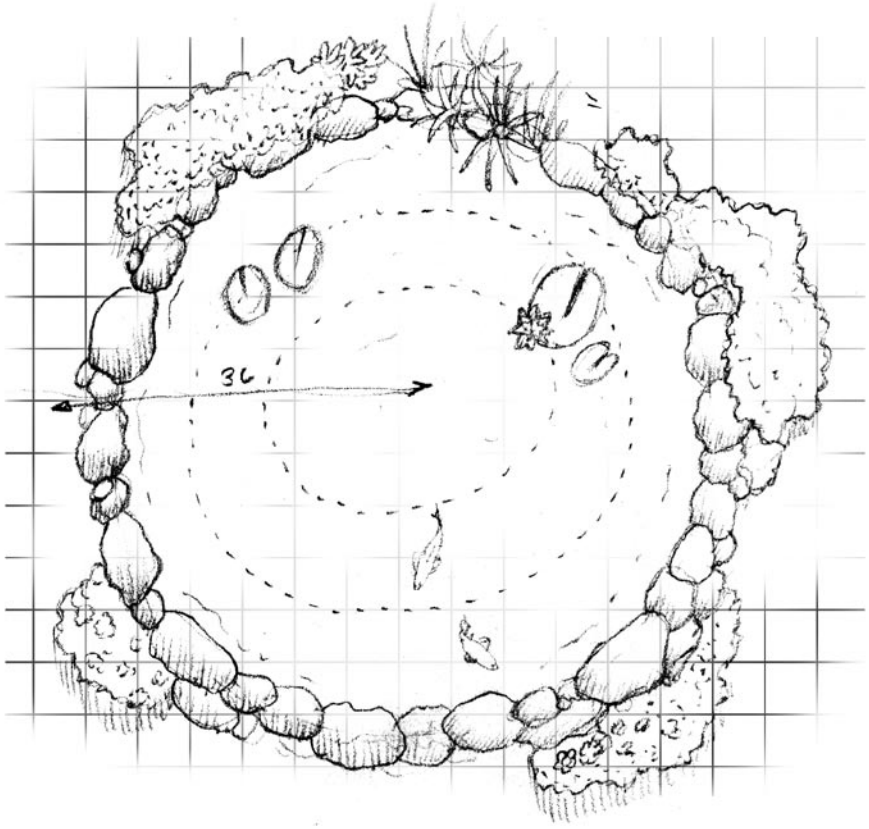
LANDSCAPE DESIGN CHALLENGE

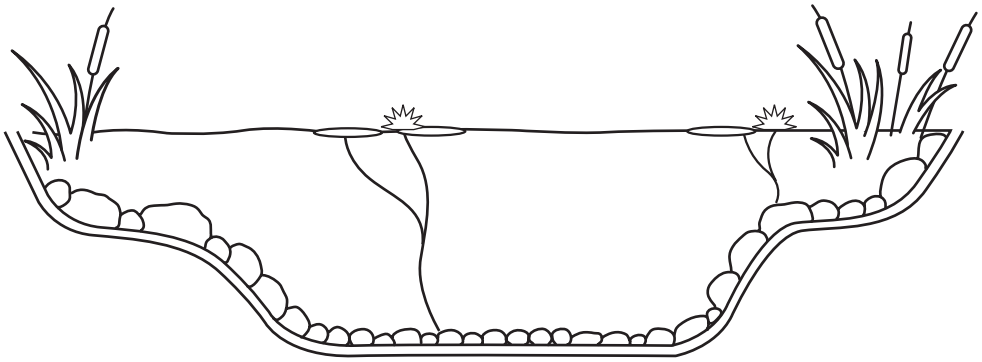
Pond Design Factors	Client Notes
What does the client want?	
Atmosphere: What should the pond look like? A quiet, tranquil spot? An active stream? A piece of the Rockies?	
Vegetation?	
Fish?	
Edge Treatments?	
Streams and Waterfalls?	
Lighting?	
Hardscapes? (patios, etc.)	
Interaction? (stepping stones, etc.)	
How much does the client want to spend?	
What will the site support?	
Does the site have any topography?	
How big is the site?	
What existing features does the pond need to accommodate (views from the house, trees, etc.)?	

Name _____

LANDSCAPE DESIGN CHALLENGE

DIRECTIONS:





Name _____

Worksheet #11c

LANDSCAPE DESIGN CHALLENGE

Water Garden Estimate for _____

Product	Model	Qty	Price	Total
Skimmers	_____	_____	_____	_____
Biofalls Filter	_____	_____	_____	_____
Pumps	_____	_____	_____	_____
Pipe	_____	_____	_____	_____
	2″	_____	_____	_____
	3″	_____	_____	_____
Lights	_____	_____	_____	_____
Liner ($.96 per sq. ft x L x W)		_____	_____	_____
Underlayment ($.25 per sq. ft x L x W)		_____	_____	_____
Stones		_____	_____	_____
River Pebbles		_____	_____	_____
Labor				_____
TOTAL				_____
Illinois State Tax (6.75%)				_____
Labor Charge				_____
GRAND TOTAL				_____

Pond Calculation Factors:

Gallons = length (ft) x width (ft) x average depth (ft) x 7.48
Liner Size = length (ft) + width (ft) + deepest point (ft) x 2
Water Flow = 2″ = 4,800 gallons per hour
3″ = 10,500 gallons per hour
Quantity of Boulders (tons) in a pond = length (ft) x width (ft) / 65
Quantity of Gravel (tons) = tons of boulders x .45
Quantity of Boulders (tons) in a stream = ? ton per 10 ft. stream length
Quantity of Gravel (tons) for streams = 1/3 ton per 10 ft stream length
Cost Per Month = amps x volts / 1000 x $ per kilowatt hour x 24 hours x 30.4 days
Flow Rate = stream width x 1,500 gallons per hour

Name _____

Activity #12

BIOBLITZ BONANZA Grades 5 to 12

OBJECTIVE

The students will learn how to quickly assess the biodiversity of their pond and collect data in a consistent manner.

TIME

90 minutes

MATERIALS

- Student Page 12
- Animal identification guides
- Field guides
- Dip nets
- Binoculars
- Plastic containers
- Thermometers
- Magnifying glasses

PONDERING THE ACTIVITY

A biodiversity blitz, or bioblitz, is a quick assessment of the variety of life forms that inhabit a specific area. Participating in a bioblitz is a great way to increase the students' awareness of local conservation efforts, as well as area resources. By collecting data in a consistent fashion over the years and between sites, scientists and students can see trends in biodiversity.

PROCEDURES

1. Start with a class discussion about the students' impressions of life in the pond. Do they think their pond is rich in life? How does it compare to other ponds? How does it change over the season? Explain that scientists take a "snapshot" of the life in a set area through an activity called a bioblitz. The idea is to measure all of the life found within a given area in a short amount of time.
2. Distribute Student Page 12 to the students. Inform them that they will be participating in a bioblitz.
3. Prepare the students for beginning their bioblitz by arranging them into three teams: pond invertebrates, pond vertebrates, and land vertebrates visible by an observer standing within 10 feet of the pond.
4. For consistency from year to year and between ponds, it is important that data be collected in a consistent manner. We recommend that you pick a day and time of day (e.g., the third Wednesday in May before noon) when you collect data each year. You should also collect data for a specified time period. We recommend that you collect data over one 50-minute class period for the pond invertebrates and two 50-minute class periods for the pond invertebrates. For the land vertebrates, we recommend that you keep the data for each 50-minute period separate.

CONTINUED >

NATIONAL SCIENCE EDUCATION STANDARDS

Unifying Concepts and Processes: Systems, order and organization, Evidence, models and explanation, Change, constancy, and measurement, Evolution and Equilibrium

Science as Inquiry: Abilities necessary to do scientific inquiry, Understandings about scientific inquiry

5-12 Life Science: Populations and Ecosystems, Diversity and adaptations of organisms, Interdependence of organisms

5-12 Science in Personal and Social Perspectives: Environmental Quality, Science and technology in local, national, and global challenges

PRINCIPLES AND STANDARDS FOR SCHOOL MATHEMATICS

PreK-12 Connections: Recognize and apply mathematics in contexts outside of mathematics.

VOCABULARY

bioblitz: a quick assessment of the variety of life forms that inhabit a specific area.

biodiversity: the number and variety of life forms found within a specific area.

POND EXTENSIONS

1. Have the groups graph the number of subspecies found for each species. They can tally the species in a chart. Post a graph in a common area of the room. Record the numbers from the chart on the graph.

2. Do a bioblitz in the spring and the fall. How do the findings differ?

QUOTE TO PONDER

"When one tugs at a single thing in nature, he finds it attached to the rest of the world."
~ John Muir

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5. Each team should collect data on separate days with the pond invertebrate team going last since they will dramatically disturb the pond.

   Pond invertebrates should be gently collected with dip nets and kept in pond water for identification in the classroom. They can be collected from the water surface, from the water column, or from the substrate on the bottom. After counting and identification, they should be released back to the pond.

   Pond vertebrates should be counted but not collected. The pond vertebrate team will need to develop a system that allows them to comprehensively "sweep" the pond without double counting. Pond vertebrates would include any vertebrates, such as frogs, in the water or on the shore.

   Observers of land vertebrates should position themselves within 10 feet of the pond and count any visible birds or mammals.

6. Have the students record their findings on Student Page 12. We have supplied a photo guide for common pond invertebrates and vertebrates, but additional field guides would be useful.

7. If you have data from previous years or seasons, compare your results with the class.

Worksheet #12a

BIOBLITZ BONANZA **DATA COLLECTION SHEET**

DIRECTIONS:

(circle one):

Pond Invertebrate
Pond Vertebrate
Land Vertebrate

Date _____

Air Temperature _____

Water Temperature _____

Notes_____

_____

_____

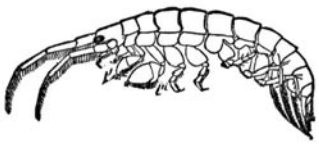
_____

Species or Type _____ Number Collected _____

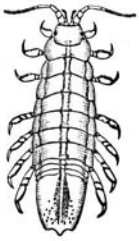
Team Names _____

Worksheet #12b

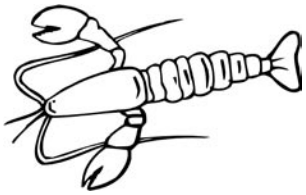
BIOBLITZ BONANZA



Scuds
(Amphipoda)

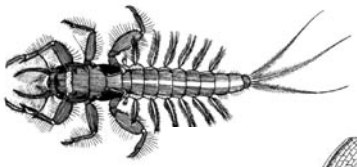


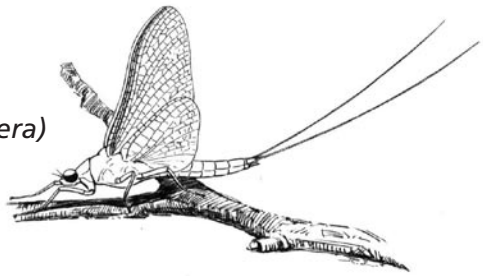
Aquatic sowbug
(Isopoda)



Crayfish
(Decapoda)

Dobsonfly
(Hellgrammite)

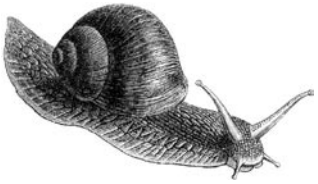




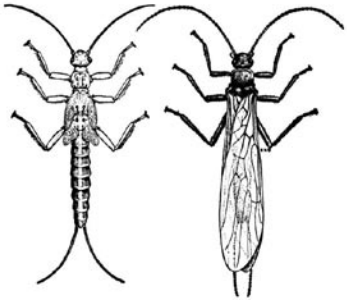
Mayfly
(Ephemeroptera)

Millipede
(Polydesmida)

seed shrimp
(Cladoceran)



Snail
(Mollusca)



Stonefly
(Plecoptera)

Water Penny
(Coleoptera)

Rubric

3 = CONSISTENTLY demonstrates behavior
2 = OCCASIONALLY demonstrates behavior
1 = SELDOM demonstrates behavior

ACTIVITY _____

DATE _____

Student Name	Follows Directions	Actively Participates in Group Activity	Understands Role in Activity	Delivers Well-Developed and Clear Ideas About the Topic	Additional Comments	Score

Glossary

adhesion: the attraction of unlike molecules to each other.

algae: a mostly aquatic group of plants that lack stems, roots, and leaves.

bacteria: living things with only one cell.

bioblitz: a quick assessment of the variety of life forms that inhabit a specific area.

biodiversity: the number and variety of life forms found within a specific area.

cohesion: the attraction of water molecules to each other.

contour: an imaginary line on the ground that indicates the same elevation above or below a specific point.

diversity: a measure of the different types of things--plants, animals, etc.--found within a given area.

habitat: an area in which a species finds food, water, shelter, and space to live.

key or legend: a simplified explanation of symbols.

mimic: to copy.

oxygen: an element that is used by most forms of life.

persuasive writing: writing intended to influence a reader's beliefs or actions.

pH: a scale used to measure acidity.

pond: an enclosed, naturally or artificially created body of water, usually not as wide and deep as a lake.

quadrant: a small, usually rectangular plot of land used to study the distribution of plants or animals in an area.

sampling: the process of collecting data at a few points to gain an understanding of an entire species or group of objects.

scale: the relation between the size of something and a representation of it.

Secchi disk: a tool used to measure water clarity.

surface tension: when all water molecules at the top of the water column are attracted to each other in all directions, creating a thin "skin" on the surface of the water.

topography: an illustrative representation of the surface features of a place or region on a map, signifying their relative positions and elevations.

transect: a linear measuring device along which points are marked at a regular interval.

wetland: a lowland area that is saturated with water and is the habitat for many species.

References

BOOKS TO SHARE WITH YOUR STUDENTS

FOR GRADES K TO 4

Kirkpatrick, R.K., A. Milne (illustrator), and P. Stebbing (illustrator). *Look at Pond Life*. Raintree Publishers.

Fleming, D. 1998. *In the Small, Small Pond*. Henry Holt and Company, Inc.

Reid, G.K., H.S. Zim, and T. Dolan (illustrator). 2001. *Pond Life.*

Silver, D.M., and P.J. Wynne, (illustrator) 1997. *Pond.* The McGraw-Hill Companies.

FOR GRADES 5 TO 12

Josephs, D. 2000. *Lakes, Ponds, and Temporary Pools.* Scholastic Library Publishers.

Parker, S., and P. Dowell (photographer). 2000. *Eyewitness: Pond and River.* DK Publishing, Inc.

Sayre, A.P. 1997. *Lake and Pond.* Millbrook Press.

Towler, A. 1999. *Life in a Wetland.* Scholastic Library Publications.

GENERAL

Cvancara, A.M. 1989. *At the Water's Edge: Nature Study in Lakes, Streams and Ponds.* John Wiley and Sons, Inc., New York

Mitchell, J.G. 1992. *Our disappearing wetlands.* National Geographic 182(4): 2-45.

U.S. Environmental Protection Agency (USEPA). 1988. *America's Wetlands: Our Vital Link Between Land and Water.* USEPA, Washington, D.C., 10 pp.

U.S. Environmental Protection Agency (USEPA). 1993. EPA *Wetlands Fact Sheets.* USEPA, Washington, D.C., 50 pp.

U.S. Environmental Protection Agency (USEPA). 1988. *Welcome to the Wetlands.* USEPA, Chicago.

POND GUIDES AND SUPPLEMENTS

Earth Force, Inc. 2001. *Protecting Our Watersheds Activity Book.* Earth Force, 86 pp.

Edelstein, K. 1993. *Pond and Stream Safari: A Guide to the Ecology of Aquatic Invertebrates.* Cornell University, Ithaca, New York, 60 pp.

Environmental Concern Inc. and The Watercourse. *WOW! The Wonders of Wetlands.* Montana State University, Bozeman, Montana, 332 pp.

Farthing, P., B. Hastie, S. Weston, D. and Wolf. 1992. *The Stream Scene: Watersheds, Wildlife and People.* Oregon Department of Fish and Wildlife, Portland, Oregon, 208 pp.

Green, R.J. 1988. *Aquatic Field and Classroom Activities.* Missouri Department of Conservation, Jefferson City, Missouri, 49 pp.

Lynn, B. 1988. *Discover Wetlands.* Washington Department of Ecology, Olympia, Washington, 177 pp.

The National Council for Agricultural Education. 1992. *Aquaculture.* The National Council for Agricultural Education, Alexandria, Virginia.

National Wildlife Federation (NWF). 1992. *NatureScope: Wading into Wetlands.* National Wildlife Federation, Washington, D.C., 65 pp.

References

Tennessee Valley Authority. 1994. *The Water Sourcebook.* Water Environment Federation, Alexandria, Virginia.

The Watercourse and Western Regional Environmental Education Council. 1995. *Project WET.* Montana State University, Bozeman, Montana, 516 pp.

Western Regional Environmental Education Council. 1992. *Project WILD Aquatic.* Western Regional Environmental Education Council, Bethesda, Maryland, 242 pp.

FIELD GUIDES

Caduto, M.J. 1985. *Pond and Brook: A Guide to Nature in Freshwater Environments.* University Press of New England, Hanover, New Hampshire, 276 pp.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States.* U.S. Fish and Wildlife Service, Publ. FWS/OBS-79-31.

Parker, S. 1988. *Pond and River.* Alfred A. Knopf, New York, 64 pp.

AUDIOVISUAL

Colorado Division of Wildlife, Colorado Wildlife Heritage Foundation., P.O. Box 211512, Denver, CO 80221. *Water Wonders.* 25 min.

Environmental Media Corporation/North Carolina State Museum of Natural Science, P.O. Box 1016, Chapel Hill, NC 27514. *Freshwater Wetlands: Life at the Waterworks.* 32 min.

National Wildlife Federation, 1400 Sixteenth Street, N.W., Washington, D.C. 20036-2266. *Saving Our Wetlands: Facts and Fictions.* 16 min.

Oregon State University, Publication Orders, Extension and Station Communications, 422 Kerr Administration, Corvallis, OR 97331-2119. *Strangers in Our Waterways.* 28 min.

WEBSITES

www.nwf.org

The National Wildlife Federation has been inspiring Americans to protect wildlife for our children's future since 1936. They represent the power and commitment of 4 million members and supporters joined by affiliated wildlife organizations in 47 states and territories.

WHY SHOULD YOU CREATE A SCHOOLYARD HABITATS® SITE?

The planning, design, implementation, and on-going monitoring and maintenance of a Schoolyard Habitats project provides endless opportunities to meet and exceed high academic standards across the curriculum. Teaching with the Schoolyard Habitats site as an integrating context across the subject areas can both support and deepen the quality of instruction and student engagement.

"From pre-school through high school, Schoolyard Habitats projects enhance the teaching and learning of science, math, social studies and English in many ways. Using a habitat-based learning site makes learning more real, fun, hands-on, interdisciplinary and relevant." (Benchmarks for Science Literacy)

Resources

Order a free ***Create A Paradise*** DVD from Aquascapes by calling 1-866-877-6637. Refer to the Keycode **1656**. This DVD will answer all of the most commonly asked questions on ponds. It is an amazing resource as you are just getting started.

THE POND ECOSYSTEM DIAGRAM

WEBSITES, PROGRAMS & ORGANIZATIONS

www.nawgs.org

North American Water Garden Society's website is a place to find good information on everything about water gardening. You can locate local clubs, learn about Ponds for Kids, as well as find a Pond tour closest to you.

www.pathwaystonature.com

Pathways to Nature was established in 1999 and, so far, has donated $740,000 to 25 projects. The projects funded include the creation and maintenance of trails, boardwalks, wildlife-viewing platforms and nature center exhibits.

www.wildbirdsunlimited.com

Wild Birds Unlimited is deeply committed to educating the public about the importance of understanding our environment and preserving our natural wildlife habitats.

www.batconservation.org

The organization for Bat Conservation is a non-profit organization whose mission is to preserve bats and their habitats through education, collaboration, and research.

www.nfwf.org

The National Fish and Wildlife Foundation is a private, non-profit, 501 (c) (3) tax-exempt organization, established by Congress in 1984 and dedicated to the conservation of fish, wildlife, and plants, and the habitat on which they depend whose goals are to promote healthy populations of fish, wildlife, and plants by generating new commerce for conservation.

www.epa.gov

The Environmental Protection Agency's mission is to protect human health and the environment. Since 1970, EPA has been working for a cleaner, healthier environment for the American people.

www.koivet.com

Dr. Erik Johnson is a practicing koi & pond fish veterinarian, and the author of two koi and goldfish health books as well as a feature-length video on fish diseases and health.

www.pondcrisis.com

Pondcrisis.com takes you by the hand and leads you through TWENTY steps, just twenty, to figure out what is wrong with the pond, and thus, the fish in a disease situation. Not just ponds, but in general enough terms to help all fish.

www.fishlinkcentral.com

Everything you ever wanted to know about fish and more!

www.iwgs.org

The International Waterlily and Water Garden Society (IWGS) is a great resource for everyone from the hobbyist to the professional water gardeners, hybridizers and commercial members.