STC
SCIENCE AND TECHNOLOGY CONCEPTS™
MIDDLE SCHOOL

Updates to *Ecosystems and Their Interactions*

Since publication of the Smithsonian's STC Middle School unit *Ecosystems and Their Interactions,* changes have been made to the materials. Please replace the following pages in your text with the revised page provided here.

This update includes the following:

Teacher Edition, Section 5, Materials Management and Safety, Page 9	The Water Quality Test Kit provided in the materials kit has changed. A new packing list description is shown.
Teacher Edition, Section 5, Materials Management and Safety, Page 11	Four stopwatches are needed to prepare the group water quality test kits in Lesson 1.
Teacher Edition, Section 5, Materials Management and Safety, Page 13	Four stopwatches are needed to prepare the group water quality test kits in Lesson 1.
Teacher Edition, Section 6, Unit Investigations, Lesson 1, Page 1g	Four stopwatches are needed to prepare the group water quality test kits in Lesson 1.
Teacher Edition, Section 6, Unit Investigations, Lesson 1, Page 1j	Preparation of the group water quality test kits in Steps 1 and 2 has been modified to describe the new materials provided in the kit.
Teacher Edition, Section 6, Unit Investigations, Lesson 1, Page 12	Students no longer test for dissolved oxygen. The sample table has a revised list of parameters that students will test.
Teacher Edition, Section 6, Unit Investigations, Lesson 1, Page 13	The Student Guide page has been updated.
Teacher Edition, Section 6, Unit Investigations, Lesson 7, Page 147g	Setup for Investigation 7.1, Step 4, has been revised to support the number of test strips provided in the new Water Quality Test Kit.
Teacher Edition, Section 6, Unit Investigations, Lesson 7, Page 150b	In Investigation 7.1, Procedure Step 7 has been revised to support the number of test strips provided in the new Water Quality Test Kit.
Teacher Edition, Section 6, Unit Investigations, Lesson 7, Page 151	The Student Guide page has been updated.
Student Guide, Lesson 1, Page 13	Students no longer test for dissolved oxygen. The list of water-quality parameters provided in Step 2 of the Procedure for Investigation 1.5 has been updated.
Student Guide, Lesson 7, Page 151	In Investigation 7.1, Procedure Step 7 has been revised to support the number of test strips provided in the new Water Quality Test Kit.

continued

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Water Quality Test Instruction Card Set	This card set replaces the cards supplied in the previous Water Quality Test Kit.

Photocopy and distribute these replacement pages as needed, or download them at CarolinaScienceOnline.com. Updated Spanish versions of this page is also available at this site.

If you have questions about these changes or about the module in general, call Carolina's product information staff at 800-227-1150 (8 a.m.–5 p.m. ET, M–F), or email curriculum@carolina.com.

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Item Description in Teacher's Edition	Item Description on Packing List	Item Type	Total Qty. Used	Lesson Number (Quantity Used)
Protist cultures				
Chilomonas culture	CHILOMONAS	C	1	1(1), Appendix E(1)
Chlamydomonas culture	CHLAMYDOMONAS SP	C	1	1(1), Appendix E(1)
Euglena culture	EUGLENA GRACILIS	C	1	1(1), Appendix E(1)
Paramecium culture	PARAMECIUM MULTI.	C	1	1(1), Appendix E(1)
Paramecium bursaria culture	PARAMECIUM BURSARIA	C	1	1(1), Appendix E(1)
Stentor culture	STENTOR	C	1	1(1), Appendix E(1)
Seed starter mix	SOIL,SEED STRT PTTG,16QT.	C	38 L	3(19 L), 10(19 L)
Set of chopsticks	CHOPSTICK,PK/8	N	8	8(8)
Set of Ecosystem Mats (1–5)	MAT,ECO,INVASIVE SPECIES,PK/8	N	8	7(8)
Sheet of Barn Owl Cards	PHOTO CARDS,ECO,BARN OWL,3 SHT	N	3	6(3)
Sheet of cardstock	PAPER,WHT 12×18 10PT C1S,PK/16	C	16	6(16)
Sheet of Koala Cards	PHOTO CARDS,ECO,KOALA,8 SHTS	N	16	3(16)
Sheet of Mouse Cards	PHOTO CARDS,ECO,MOUSE,8 SHTS	N	16	6(16)
Sheet of Resource Cards	PHOTO CARDS,ECO,RESRCE,15 SHTS	N	15	3(15)
Sheet of transparent rulers	TRANSPARENCY RULER,ECO,1 SHT	C	1	9(1)
Small pompom		N		3(400)
Blue pompoms	POM POM,1/4",R.BLUE,PK/100	N	1,200	8(1,200)
Red pompoms	POM POM, 1/4", RED, PK/100	N	1,200	8(1,200), 9(160)
White pompoms	POM POM,1/4",WHT,PK/100	N	1,200	8(1,200), 9(1,200)
Yellow pompoms	POM POM, 1/4", YLW, PK/100	N	1,200	
Sunflower seed	SEED,SUNFLOWER,16OZ.,PAIL	N	X	8(X)
Syringe, 10 mL	SYRINGE, 10 ML, PK/20	N	10	4(10)
Test tube	DISPOSABLE CULTURE TUBES	N	54	4(54)
Toothpick	TOOTHPICK,FLAT,PK/750	C	750	1(16), 2(32), 3(32), 4(32), 5(32), 6(32), 7(272), 8(X), 9(32), 10(32)
Transparency Quadrat Sheet	TRANSPARENCY QUADRT,ECO,1 SHT	C	1	7(1), 9(1)
Water Quality Test Kit	ECOSYS WATER TEST KIT, 1-CLASS	C	1	1(1)
Wheat seeds	WHEAT SEED, 1TBS	C	2 tsp	1(2 tsp)
Yeast	YEAST, PACK OF FLEISCHMANN'S DRY	C	2 g	4(2 g)

Item Description in Teacher's Edition	Lesson											
	1	2	3	4	5	6	7	8	9	10	11	App E
Graph: "Five Decades of Fluctuating Wolf and Moose Populations"						✸						
Hot plate					1							
Incandescent lightbulb or access to a sunny windowsill				8								
Landsat image of Mount St. Helens							✸					
Light bank	✸	✸	✸	✸	✸	✸	✸	✸	✸	✸	✸	✸
Masking tape	✸			✸	✸							
Measuring cup and spoon			✸									
Measuring spoon, 1 tsp	2											
Metric ruler, 30 cm (12 in)	2								4			
Microscope	16	16	16	16	16	16	16	16	16	16		
Pair of disposable gloves	132	33	33	66	33	33	66	33	33	33		1
Paper cutter (optional but recommended)			1			1						
Paper towels	✸	✸	✸	✸	✸	✸	✸	✸	✸	✸		
Pens, colored pencils, or markers (3 different colors)	96											
Permanent marker	3		1	9	9							
Poster board	21	48			8				16	16	8	
Projector						1						
Resealable plastic bag, 946 mL (1 qt)			24			16						
Resealable plastic bag, 3.8 L (1 gal)	4											1
Rubber band (optional)						16						
Safety goggles				33								
Science notebook	32	32	32	32	32	32	32	32	32	32	32	
Scissors	3		1	1			1		1			
Set of markers	17	16			8	8	8		16	16	8	
Sheet of paper, 11 × 17 in						8						
Simulation: "Natural Selection"								✸				
Soap	✸	✸	✸	✸	✸	✸	✸	✸	✸	✸		
Sponge												✸
Spring water	✸	✸	✸	✸	✸	✸	✸	✸	✸	✸		✸
Stopwatch or other timing device	4	4	4	9	4	4	4	8	4	4		
Tape	✸	✸	✸	✸		✸	✸	✸	✸			
Video clip of competition						✸						
Wide-mouthed holding container												✸

	Material	Quantity	Not Supplied	Consumable
Lesson 1 cont'd.	Microscope slide	44		
	Organism Card Set	1		
	Pair of disposable gloves	132	*	*
	Paper towels	*	*	*
	Pens, colored pencils, or markers (3 different colors)	96	*	
	Permanent marker	3	*	
	Petri dish	1		
	Pipet	35		*
	Plastic aquarium, 11 L (3 gal)	2		
	Plastic container, 1.4 L (48 oz)	4		
	Plastic container, 473 mL (16 oz)	10		
	Plastic cup, 118 mL (4 oz)	4		
	Plastic cup, 207 mL (7 oz)	16		
	Plastic spoon	2		
	Pond (from Investigation 1.2)	2	*	*
	Poster board	21	*	*
	Protist cultures			
	Chilomonas culture	1		*
	Chlamydomonas culture	1		*
	Euglena culture	1		*
	Paramecium culture	1		*
	Paramecium bursaria culture	1		*
	Stentor culture	1		*
	Resealable plastic bag, 1 gal	4	*	*
	Science notebook	32	*	*
	Scissors	3	*	
	Set of markers	17	*	
	Soap	*	*	*
	Spring water	*	*	*
	Stopwatch or other timing device	4	*	
	Tape	*	*	*
	Toothpick	16		*
	Water Quality Test Kit	1		*
	Wheat seeds	*		*
Lesson 2	Access to resources	*	*	
	Access to water	*	*	*
	Algae and Protists Mat	8		
	Aluminum foil	*		*
	Bottle of Protoslo	4		*
	Coverslip	32		*
	Group water quality test kit (from Lesson 1)	4	*	*
	Macroorganisms Mat	8		

continued

Pre-Assessment: Ecosystems and Their Interactions

Materials

For the teacher

- 16 Plastic cups, 207 mL (7 oz)
- 12 Microscope slides
- 10 Plastic containers, 473 mL (16 oz)
- 4.6 kg Aquarium gravel (10 lbs)
- 4 Plastic containers, 1.4 L (48 oz)
- 4 Plastic cups, 118 mL (4 oz)
- 3 Pipets
- 2 *Daphnia* cultures
- 2 Plastic spoons
- 1 Organism Card Set
- 1 Water Quality Test Kit
- Algae cultures
  - 1 *Anabaena* culture
  - 1 *Chlorella* culture
  - 1 *Oedogonium* culture
  - 1 *Staurastrum* culture
  - 1 *Synedra* culture
  - 1 *Volvox* culture
- Protist cultures
  - 1 *Chilomonas* culture
  - 1 *Chlamydomonas* culture
  - 1 *Euglena* culture
  - 1 *Paramecium bursaria* culture
  - 1 *Paramecium* culture
  - 1 *Stentor* culture
- Aquarium of 8 dwarf aquarium frogs†
- Aquarium of *Chara*†
- Holding container of *Lumbriculus*†
- 5 Poster boards*
- 4 Digital thermometers*
- 4 Pairs of disposable gloves*
- 4 Resealable plastic bags, 1 gal*
- 4 Stopwatches or other timing devices*
- Access to electricity*
- Masking tape*

For the teacher *continued*

- Permanent marker*
- Scissors*
- Set of markers*
- Spring water*

For each student

- Science notebook*
- 5 Student Sheet 1.1: *KWL Chart**
- 4 Pairs of disposable gloves*
- 3 Pens, colored pencils, or markers (different colors)*

For each pair of students

- 2 Coverslips
- 2 Microscope slides
- 2 Pipets
- 1 Toothpick
- 1 Organism Card†
- 1 Microscope*
- 1 Poster board*
- 1 Set of markers*

For each group of eight students

- Pond (shared)†
- Group water quality test kit†

For each group of sixteen students

- 1 Bag of soil
- 1 Bag of timothy hay
- 1 Petri dish half
- 1 Plastic aquarium, 11 L (3 gal)
- Wheat seeds
- 2 Containers of aquarium gravel†
- 1 Graduated cylinder, 50 mL*
- 1 Measuring spoon, 1 tsp*

For each group of sixteen students *continued*

- 1 Metric ruler, 30 cm (12 in)*
- Permanent marker*
- Scissors*

For the class

- 16 Hand lenses
- 8 Algae and Protists Mats
- 8 Macroorganisms Mats
- 4 Bottles of Protoslo®
- Alga-Gro® Freshwater Medium Concentrate
- Aluminum foil
- 4 *Chara* wet-mount slides†
- 4 Containers of *Chara*†
- 4 Containers of dwarf aquarium frogs†
- 4 Cups of algae†
- 4 Cups of *Daphnia*†
- 4 Cups of *Lumbriculus*†
- 4 Cups of protists†
- 4 *Daphnia* wet-mount slides†
- 4 *Lumbriculus* wet-mount slides†
- 12 Microscopes*
- Access to water*
- Light bank*
- Paper towels*
- Soap*
- Spring water*
- Tape*

* needed but not supplied
† teacher-prepared material

Blackline masters are available at www.carolinascienceonline.com

You may receive *Daphnia* or *Tubifex* in place of *Lumbriculus*. If so, identify the substituted organism for students, and use it just as you would *Lumbriculus* to complete the investigations in this module.

Investigation 1.5

1. Prepare four group water quality test kits for students to use throughout the unit. To do so, label each of four 1-gallon resealable plastic bags with a group number 1 through 4. In each bag, place the following materials:
   - 1 Stopwatch or other timing device
   - 1 Digital thermometer
   - 1 Plastic cup, 4 oz
   - Items from the provided Water Quality Test Kit:
     - 1 Water Quality Test Instructions Card Set
     - 3 Testing cups, 1 oz

   Note: All cups must be rinsed and dried after each use and returned to the bags for subsequent tests.
2. The provided Water Quality Test Kit includes three types of test strips:
   - Ammonia
   - Nitrates and Nitrites
   - pH and Total Alkalinity

   These test strips will be used as part of the group water quality test kits in each lesson. Groups will need to compare the color of each of their test strips to the color chart on the corresponding bottle of test strips. Determine a strategy to distribute test strips to each group and have the bottles available during testing. Consider the following options:
   - Set up separate testing stations for each type of test strip.
   - Monitor a central distribution area for all the test strips.
   - Place one bottle of test strips in each group water quality test kit and have groups share among themselves.

   Note: Your kit supplies enough test strips for each class to complete 80 tests of each type by the end of the unit. Store strips in a cool, dry place away from direct sunlight. Students should avoid taking strips from the bottles with wet fingers.
3. Set out spring water in a central location. Each group will need to add water to its pond at the end of the investigation.
4. Set out the following materials at a central materials station for students to access:
   - Disposable gloves
   - Group water quality test kits
   - Paper towels
5. Make sure students have access to soap and water for hand washing at the end of the investigation.
6. Have extra aluminum foil and tape on hand in case groups need to repair or replace the foil on the aquariums.

Investigation 1.6

1. Set out the following materials at a central materials station for students to access:
   - 16 Poster boards
   - 16 Sets of markers
2. Have the Organism Card Set ready to distribute. Each pair of students will get one card from this set.

Investigation 1.4: Examining the Creatures in Your Pond (Part 2) *continued*

9–11. Walk around the room and monitor groups as they add the organisms.

12. Instruct students to clean up their lab area and to wash their hands before leaving class.

Table 1.1. Sample Student Data Table

Parameters	Readings									
	1	2	3	4	5	6	7	8	9	10
Ammonia										
pH										
Total alkalinity										
Nitrates										
Nitrites										
Temperature (surface)										
Temperature (bottom)										

Investigation 1.4 continued

10. Add the contents of two containers of *Lumbriculus* to your pond.

11. Carefully add two cultures of *Daphnia* to your pond according to the following instructions. The *Daphnia* must be added carefully to avoid trapping air in their carapaces, which will cause them to float and ultimately die.

- **a.** Take the culture jar of *Daphnia* and hold it at a 45-degree angle.
- **b.** Slowly lower the container into the aquarium until water begins to enter the jar.
- **c.** While keeping the edge of the cup in the water, slowly turn the jar over so that the opening is toward the bottom of the aquarium. Allow all of the *Daphnia* to enter the aquarium.

12. Follow your teacher's instructions to clean up your area. Thoroughly wash your hands before leaving the lab area.

Figure 1.8

Samples taken from a body of water can provide a lot of information about the health of the ecosystem.

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NOTE

Provide a pair of disposable gloves for each student for this investigation and suggest that students wear them while working with the model pond. Model safety yourself by wearing gloves as well. All students should wash their hands thoroughly before leaving class at the end of the investigation.

Investigation 1.5

Matter in Your Pond

Materials

For you

- Science notebook
- Pair of disposable gloves

For your group

- Group water quality test kit
- Pond (shared)

For your class

- Access to water
- Paper towels
- Soap
- Spring water

Procedure

1. In this investigation, you will start taking readings of your pond. These measurements are baseline readings. Baseline readings are a starting point. They let you know the initial conditions so that you can observe changes over time.
2. Create a data table in your science notebook. Over the course of this unit, you will measure several water-quality parameters. Include enough space in your table to take 10 measurements. You will measure:
   - **a.** Ammonia
   - **b.** pH
   - **c.** Total alkalinity
   - **d.** Nitrates
   - **e.** Nitrites
   - **f.** Temperature (surface)
   - **g.** Temperature (bottom)
3. Carefully remove the aluminum foil. Try not to rip it. Examine your pond, and record your observations in your science notebook.
4. Replace the aluminum foil and secure it.

Safety Warning

- **Wash your hands thoroughly with soap and water before leaving class.**

5. Use your thermometer to measure the temperature of your pond. Take the temperature at both the bottom of your pond and the surface of your pond. Record your data in your table in your science notebook.
6. Fill the plastic cup with water from your pond. Be careful not to catch any large organisms. If any large organisms are caught, return them to the pond. You will use this water to perform the water quality tests.
7. Follow the instructions on the provided cards to conduct your water quality tests. Record your results in the table in your science notebook.
8. Add spring water to raise the level of your pond. It should again be slightly lower than the level of the aluminum foil. You are replacing the water that you used for testing.
9. Follow your teacher's instructions to clean up your lab area. Then, thoroughly wash your hands with soap and water.
10. Read Building Your Knowledge: *Water Quality* and record your answers to the following questions in your science notebook:
    - **a.** Why is monitoring water quality important?
    - **b.** What do you think monitoring the water quality of your pond will tell you?
    - **c.** What patterns do you expect to see in your water quality tests?
    - **d.** How do you think the measurements of water quality will change over time?
    - **e.** What types of things do you think people do that impact water quality?

Lesson 1 / Pre-Assessment: Ecosystems and Their Interactions 13

Setup

Investigation 7.1

1. Set up 16 microscope stations for students to use. These stations will need to share eight Algae and Protists Mats and eight Macroorganisms Mats. Place one of each mat between each pair of stations so that students at both stations can share it.
2. Set out the following materials at a central materials station for students to access:
   - 40 Coverslips
   - 40 Microscope slides
   - 40 Toothpicks
   - 10 Pipets
   - 10 Plastic aquariums, 1.9 L (0.5 gal)
   - 4 Aquarium nets
   - 4 Bottles of Protoslo
   - Additional materials to investigate population changes in the pond (optional)
   - Aluminum foil
   - Assorted plastic cups
   - Disposable gloves
   - Group water quality test kits
   - Paper towels
   - Spring water
   - Tape
3. Make sure students have access to soap and water for hand washing at the end of the investigation.
4. Each time students make observations of the sample ponds they construct in this investigation, you will need to make the above materials accessible (excluding assorted cups and aquarium nets). There are enough materials provided for each group to conduct a test of their experimental ponds once per week for three weeks. There are also enough materials for four groups working together (16 students) to test one control pond once per week for three weeks.

Investigation 7.2

1. Set up the equipment you will need to access the Internet and project the Mount St. Helens Landsat images.

Investigation 7.3

1. Use scissors to cut the Transparency Quadrat Sheet on the dotted lines to separate the transparency quadrats.
2. Place a set of five Ecosystem Mats and a transparency quadrat at each group's work area.
3. Groups of four students will need access to markers for this activity.

Investigation 7.4

1. Place an Introduced and Invasive Species Card Set at each group's work area.

Investigation 7.5

1. Set up 16 microscope stations for students to use. These stations will need to share eight Algae and Protists Mats and eight Macroorganisms Mats. Place one of each mat between each pair of stations so that students at both stations can share it.
2. Set out the following materials at a central materials station for students to access:
   - 32 Coverslips
   - 32 Microscope slides
   - 32 Toothpicks
   - 4 Pipets
   - 4 Bottles of Protoslo
   - Disposable gloves
   - Group water quality test kits
   - Paper towels
   - Spring water
3. Make sure students have access to soap and water for hand washing at the end of the investigation.
4. Have extra aluminum foil and tape on hand in case groups need to repair or replace the foil on the aquariums.

Investigation 7.1: Changes to Your Pond *continued*

aquatic plants when they make their sample ponds. If your class does not discuss it as part of their consensus, discuss with students that they will need to only take one-fifth or less of each component for each smaller pond. Remind students that they do not have to take all of the water for their sample ponds from the large pond and that they can use spring water.

Explain that the larger pond models will not be used after this investigation. Instead, students will monitor the smaller experimental and control ponds in all future pond investigations.

5. Monitor groups as they create their control ponds. Ensure that they are leaving enough material for the four experimental ponds. For example, students should only take one-fifth of the substrate and not one-half.

Ask students why they are creating a control pond from both of the larger ponds and not only one. Students should be able to explain that the two ponds are different so they need a control for each pond so they can compare their experimental ponds to a control pond made using the same materials. If they did not, they would not know whether their results were due to their treatment or to differences in the ponds.

6. Conduct a class discussion in which students describe what they want to change and how they plan to change it. If students suggest things that are impractical for a classroom, like changing the temperature of their pond, have them thoroughly discuss what they plan to do and consider the practicality of maintaining that changed condition for several weeks.

7. It is suggested that you guide the class to take readings of both of their ponds at the same intervals. The class should come to consensus on when they will conduct their water quality tests. If students want to take more frequent readings, explain to them that there are enough materials provided for each group to conduct a test of their experimental ponds once per week for three weeks. There are also enough materials for four groups working together (16 students) to test one control pond once per week for three weeks.

8. Carefully review each group's plan. Accept all reasonable plans, but be sure to check for any safety concerns. There are enough materials for eight groups of four students to create one experimental pond in a provided half-gallon aquarium.

9. Allow groups to gather their materials and build their experimental ponds. After all groups have set up their experimental ponds, direct students on how to dispose of the contents of the larger ponds. After class, clean all pond materials with bleach solution. See Preparing to Teach at the beginning of this lesson for details.

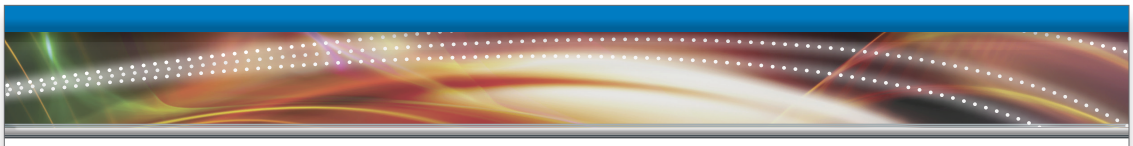
10. Explain that once the experimental pond is set up, students will need to take initial measurements, just like they did when they created their initial ponds during Lesson 1. Reinforce that this set of measurements will provide a baseline to which they can compare future data and thus look for patterns in any changes they observe in the sample ponds. Suggest that students set up a new data table in their science notebooks that is similar to the one they used to record data and observations of the larger ponds.

11–12. Monitor students as they conduct measurements of their experimental and control ponds. Each group of four students will collect measurements of their own experimental pond. Then, four groups will work together to make measurements of one of the two control ponds. Explain that the steps on Lesson Master 7.1 are the same ones they have carried out to take measurements of their initial pond in each lesson. Be sure students clean up and wash their hands thoroughly with soap and water. Throw away the aquarium nets that were used in this lesson.

13. Have groups predict what they think will occur to the populations in their ponds based on their change. Make sure they use evidence from their readings and the investigations they have done to explain their prediction, and have them record their prediction and reasoning in their science notebooks.

14. Help students keep track of monitoring the changes in the experimental ponds for three weeks, using the schedule the class has agreed upon. After three weeks, direct students on how to dispose of the contents of their experimental ponds. Do not dispose of control ponds at that time. Students will continue to monitor these until the end of Lesson 10. When finished, instruct students to clean up the lab area and thoroughly wash their hands with soap and water. After class, clean all pond materials with bleach solution. See Preparing to Teach for this lesson for details.

15. After three weeks, have groups discuss the questions in the Student Guide and the results of their experiment. Prompt them to record their answers in their science notebooks. Answers will vary dramatically depending on what change was made to each pond, but students should be able to see some populations rise and/or fall in response.



c. Explain how the process you will use to create your sample pond will allow you to ensure that it represents the larger pond.

4. Discuss your plan with your class and come to a consensus on how the sample ponds should be created. You will create five sample ponds from each large pond. One sample pond will be used as a control pond, and the other four will be used as each group's experimental pond. It is important that all the sample ponds created from the larger pond are set up the same way. Record your class's plan to create a sample pond in your science notebook.
5. Create a control pond. Work with three other groups to follow the plan your class agreed on to create one control pond from the large, shared pond. Remember that you will be creating four more ponds from each larger pond, so make sure that you leave enough of each component of the pond for these other ponds.
6. With your group, determine what biotic or abiotic factor you would like to manipulate and explain how your group plans to manipulate this factor in an experimental pond. Remember that your experimental pond must be set up the same way as the control pond except for the one change you are making to a biotic or abiotic factor. Record your ideas in your science notebook.
7. You will observe your experimental pond for at least three weeks. You have enough testing materials to take initial measurements of your experimental pond and to measure changes once per week for three weeks. Create a data table for your experimental and control ponds in your science notebook that is similar to the one created in Lesson 1. Record your ideas in your science notebook and then discuss your plan with your class. Record any changes in your science notebook.
8. Get your teacher's approval of your plan. Record any changes necessary to your plan.
9. With your group, gather your materials and set up your experimental pond.
10. You will start by collecting information about your experimental and control ponds at this time by making both macroscopic and microscopic observations and performing water quality tests just as you have been throughout the unit. This will tell you where your control and experimental ponds are starting. This is called a baseline reading. What other baseline readings have you taken?
11. Perform the procedure on Lesson Master 7.1: *Pond Testing* to get baseline data for your experimental pond. Record your data in your science notebook.
12. With the three other groups you created the control pond with, perform the procedure on Lesson Master 7.1: *Pond Testing* to get baseline data for your control pond. Record your data in your science notebook.
13. Predict what you think will happen to the populations in your experimental pond based on the biotic or abiotic factor your group chose to manipulate. Use evidence from the readings and investigations you have done to explain your prediction. Record this in your science notebook.
14. Monitor the changes in your experimental pond for three weeks.
15. After three weeks, discuss the following questions with your group, and then record your answers in your science notebook:
    a. How did the populations in your experimental pond change?
    b. How do the populations in your experimental pond compare to the populations in your control pond?
    c. Based on the data you collected, explain why you think the changes that you observed occurred in your experimental pond.

Investigation 1.5

Matter in Your Pond

Materials

For you

- Science notebook
- Pair of disposable gloves

For your group

- Group water quality test kit
- Pond (shared)

For your class

- Access to water
- Paper towels
- Soap
- Spring water

Procedure

1. In this investigation, you will start taking readings of your pond. These measurements are baseline readings. Baseline readings are a starting point. They let you know the initial conditions so that you can observe changes over time.
2. Create a data table in your science notebook. Over the course of this unit, you will measure several water-quality parameters. Include enough space in your table to take 10 measurements. You will measure:
   - **a.** Ammonia
   - **b.** pH
   - **c.** Total alkalinity
   - **d.** Nitrates
   - **e.** Nitrites
   - **f.** Temperature (surface)
   - **g.** Temperature (bottom)
3. Carefully remove the aluminum foil. Try not to rip it. Examine your pond, and record your observations in your science notebook.
4. Replace the aluminum foil and secure it.

Safety Warning

- **Wash your hands thoroughly with soap and water before leaving class.**

5. Use your thermometer to measure the temperature of your pond. Take the temperature at both the bottom of your pond and the surface of your pond. Record your data in your table in your science notebook.
6. Fill the plastic cup with water from your pond. Be careful not to catch any large organisms. If any large organisms are caught, return them to the pond. You will use this water to perform the water quality tests.
7. Follow the instructions on the provided cards to conduct your water quality tests. Record your results in the table in your science notebook.
8. Add spring water to raise the level of your pond. It should again be slightly lower than the level of the aluminum foil. You are replacing the water that you used for testing.
9. Follow your teacher's instructions to clean up your lab area. Then, thoroughly wash your hands with soap and water.
10. Read Building Your Knowledge: *Water Quality* and record your answers to the following questions in your science notebook:
    - **a.** Why is monitoring water quality important?
    - **b.** What do you think monitoring the water quality of your pond will tell you?
    - **c.** What patterns do you expect to see in your water quality tests?
    - **d.** How do you think the measurements of water quality will change over time?
    - **e.** What types of things do you think people do that impact water quality?

c. Explain how the process you will use to create your sample pond will allow you to ensure that it represents the larger pond.

4. Discuss your plan with your class and come to a consensus on how the sample ponds should be created. You will create five sample ponds from each large pond. One sample pond will be used as a control pond, and the other four will be used as each group's experimental pond. It is important that all the sample ponds created from the larger pond are set up the same way. Record your class's plan to create a sample pond in your science notebook.

5. Create a control pond. Work with three other groups to follow the plan your class agreed on to create one control pond from the large, shared pond. Remember that you will be creating four more ponds from each larger pond, so make sure that you leave enough of each component of the pond for these other ponds.

6. With your group, determine what biotic or abiotic factor you would like to manipulate and explain how your group plans to manipulate this factor in an experimental pond. Remember that your experimental pond must be set up the same way as the control pond except for the one change you are making to a biotic or abiotic factor. Record your ideas in your science notebook.

7. You will observe your experimental pond for at least three weeks. You have enough testing materials to take initial measurements of your experimental pond and to measure changes once per week for three weeks. Create a data table for your experimental and control ponds in your science notebook that is similar to the one created in Lesson 1. Record your ideas in your science notebook and then discuss your plan with your class. Record any changes in your science notebook.

8. Get your teacher's approval of your plan. Record any changes necessary to your plan.

9. With your group, gather your materials and set up your experimental pond.

10. You will start by collecting information about your experimental and control ponds at this time by making both macroscopic and microscopic observations and performing water quality tests just as you have been throughout the unit. This will tell you where your control and experimental ponds are starting. This is called a baseline reading. What other baseline readings have you taken?

11. Perform the procedure on Lesson Master 7.1: *Pond Testing* to get baseline data for your experimental pond. Record your data in your science notebook.

12. With the three other groups you created the control pond with, perform the procedure on Lesson Master 7.1: *Pond Testing* to get baseline data for your control pond. Record your data in your science notebook.

13. Predict what you think will happen to the populations in your experimental pond based on the biotic or abiotic factor your group chose to manipulate. Use evidence from the readings and investigations you have done to explain your prediction. Record this in your science notebook.

14. Monitor the changes in your experimental pond for three weeks.

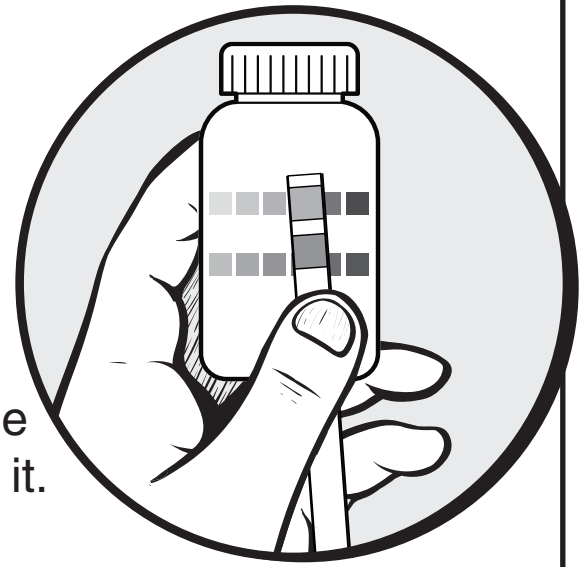
15. After three weeks, discuss the following questions with your group, and then record your answers in your science notebook:

a. How did the populations in your experimental pond change?

b. How do the populations in your experimental pond compare to the populations in your control pond?

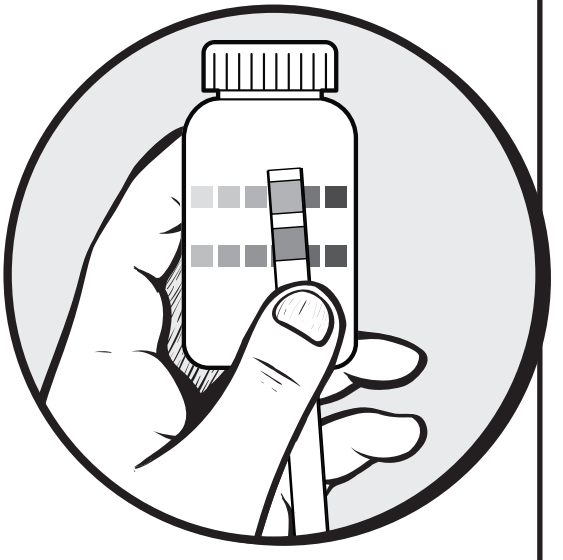
c. Based on the data you collected, explain why you think the changes that you observed occurred in your experimental pond.

Nitrate and Nitrite Tests



1. Fill a small test cup a little more than halfway with water from your pond.
2. Dip the test strip into the pond water sample. Make sure that both pads are completely underwater. Hold the strip in the pond water for **2 seconds** without moving it.
3. Take the test strip out of the pond water.
4. Wait **1 minute**.
5. Compare your test strip to the color chart on the bottle of nitrate and nitrite test strips. Hold the strip as shown in the picture on this card. Find the colors that match your test strip within **1 minute**. Record your results in the table in your science notebook.
6. Clean up and return materials by following your teacher's directions. **Do not throw away the test cups.**

pH and Total Alkalinity Tests



1. Fill a small test cup a little more than halfway with water from your pond.
2. Dip the test strip into the pond water sample. Make sure that both pads are completely underwater. Hold the strip in the pond water for **10 seconds** without moving it.
3. Take the test strip out of the pond water.
4. Immediately match your test strip to the color chart on the bottle of pH and total alkalinity test strips. Hold the strip as shown in the picture on this card. Find the colors that match your test strip within **15 seconds.** Record your results in the table in your science notebook.
5. Clean up and return materials by following your teacher's directions. **Do not throw away test cups.**

Ammonia Test

1. Fill a small test cup a little more than halfway with water from your pond.
2. Dip the test strip into the pond water sample. Make sure that the pad is completely underwater. Slowly move the test strip back and forth in the pond water sample for **10 seconds**.
3. Take the test strip out of the sample and gently shake excess pond water back into the test cup.
4. Immediately match your test strip to the color chart on the bottle of ammonia test strips. Record your results in the table in your science notebook.
5. Clean up and return materials following your teacher's directions. **Do not throw away test cups.**