

**PBIS**



# LIVING TOGETHER

*As a student scientist, you will...*





# What's the Big Question?

## *How does water quality affect the ecology of a community?*

Water is very important in your life. You drink it, you wash with it, you use it to cook, and you use it for play and exercise. You also know that plants and animals depend on water to stay alive.

If you need water, you can turn on a tap. Towns and cities in the United States have municipal water systems in place. That is where most people get their water. To make sure the quality of water you use is good, it is important to know where it comes from.

In this Unit, you are going to investigate how water use affects water quality. You will then look at how water quality affects the plants, animals, and humans in a community. **Ecology** is the study of how plants and animals, including humans, interact with one another and the physical environment.

**ecology:** the study of the relationships between organisms and their environment.

Look at the *Big Question* for this Unit: *How does water quality affect the ecology of a community?* This is a very big question. To answer the question, you will need to break it down into smaller questions you can answer. You probably already have some smaller questions you might want to ask. You will have a chance to ask those questions when you start working on your class *Project Board*.

*Welcome to Living Together.*  
This is a great opportunity for you to work  
as a student scientist.

## Think about the Big Question

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Before you start, it is a good idea to think about what you might already know about the *Big Question*. You will do two activities. They will help you think about how you use water in your daily life. You will also need to think about what is important about the quality of that water.

### Get Started: What Is Water Quality?

Your teacher will show you five jars. Each jar contains a different water sample. Observe the water in the jars. Record your observations. Then decide whether or not you would use the water in the jars to fish, swim, boat, or drink. Describe how you arrived at these decisions.





## Stop and Think

You have made some decisions about the quality of different water samples.

1. What is meant by quality? What is water quality?
2. How did you determine water quality for the bottles? Was this an adequate method?
3. How else could you measure water quality?
4. If you were walking along a river, lake, or stream, how could you determine the quality of the water?
5. You probably judged the quality of the water from a human's point of view. What if you were a water plant instead of a human? How would you judge the quality of water in each jar?
6. What if you were a fish? Which jar would have good water quality for a fish?

## Get Started: What Affects Water Quality?

As you were looking at the samples of water in the jars, you may have wondered where the samples came from and what could make them look so different.

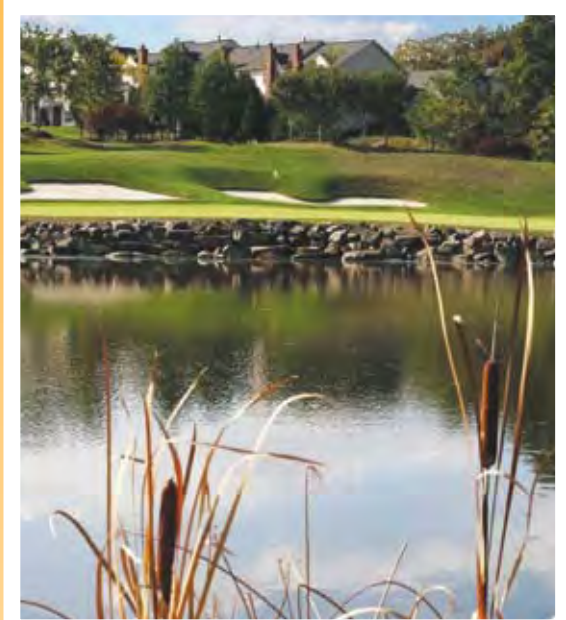
Look at the photos on the next two pages. They are taken in different locations along a river. The river runs through many different types of landscapes and areas. Examine the photos carefully. Think about what the quality of the water in the river might be at each location.

Try to match each water sample in the jar to one of the locations in the photos. Write down which photo you are matching to each jar and why you are making that match.



*Here the river runs through a farming community.*

*The river runs through a golf course. Notice the fairways and sand bunkers. In the distance there are several homes.*



*Here the river winds through a shipping yard. Notice the docked barges. In the right front there is a plant that produces paint. The paint is then shipped by barge, train, and truck from the plant.*

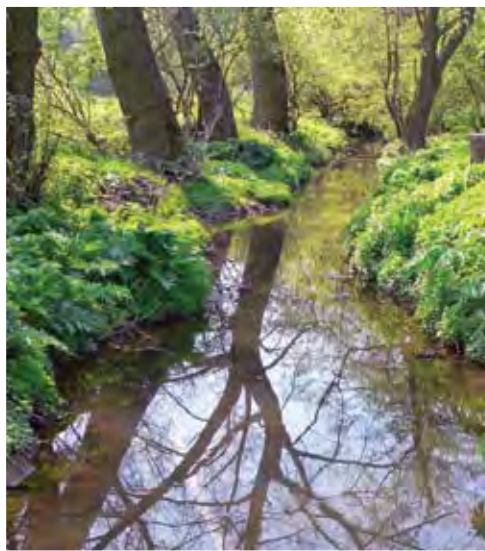


*Here the river widens and moves very slowly. In fact, the river enters into a lake at one end, and then it exits the lake through a small stream at the other end. This picture was taken from the yard of a small cottage on the lake. The dock belongs to the cottage owner.*



**Left:** The river runs past several housing communities and wildlife habitats.

**Below:** At one point, the river is very wide. It is often used for boating. There is even a powerboat race every Fourth of July.



**Above left and right:** This is a small drainage ditch near a highway. This ditch drains into the sewer pipe, and eventually the water flows into a larger part of the river.

**Left:** At the end of the 130-km (80-mile) river, it flows into an even larger river. At this point, there is a large manufacturing plant that makes cars.

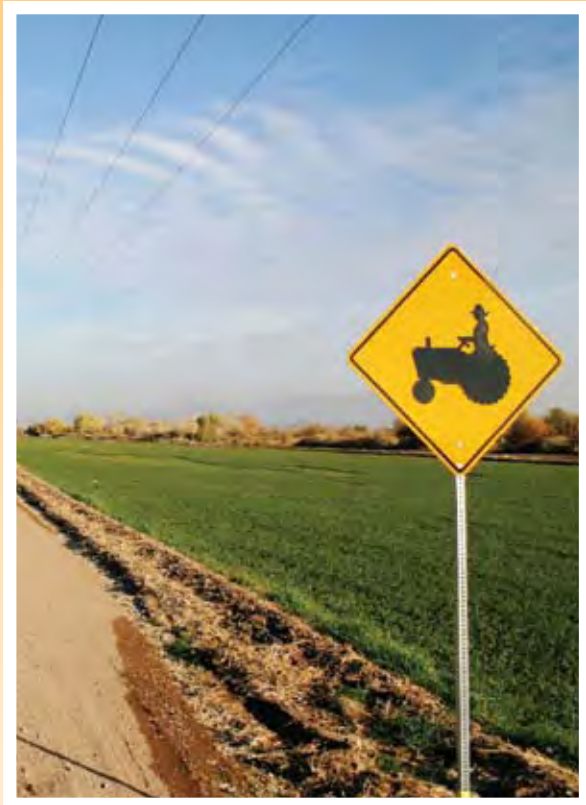


## Conference

Share your decisions with the rest of your group. Discuss why you made the matches you did. For some of the jars, you may agree with your group members on the matches you made. For some, you will have disagreements. It is important for each member of your group to discuss why they made their choices. See if you can come to an agreement. Make sure to clearly discuss the reasons for the matches each of you made, as you are trying to see if you agree.

This activity may have reminded you of some things you think you know or don't know about water quality. Jot down notes during the discussion so you will remember what was said when you share again with the class.

Decide as a group what are the most important things to know about water quality and what affects it. What questions are important to investigate to answer the *Big Question*?



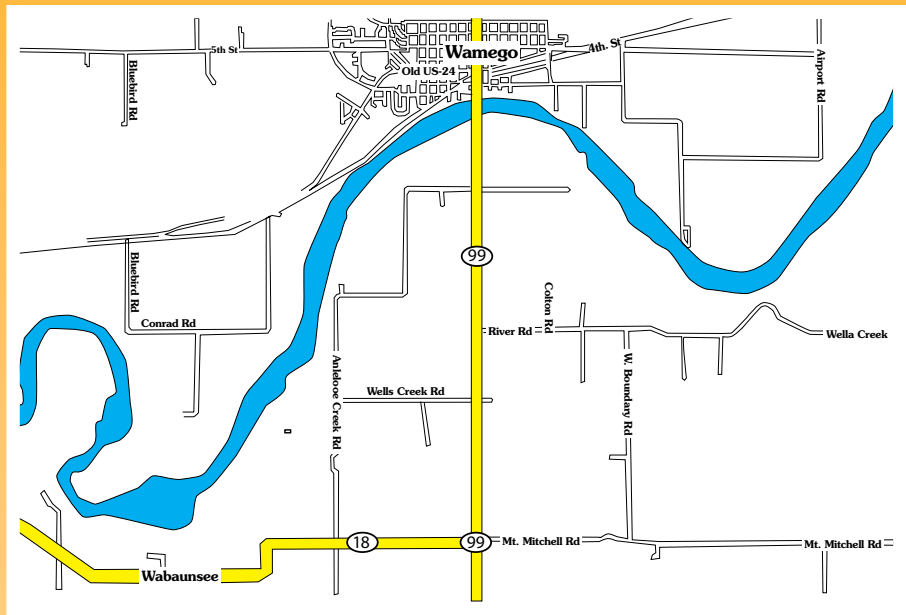
Wamego is a farming community.

## Your Challenge

### Wamego Needs Help!

To answer the *Big Question*, you will need to respond to a challenge. A small town requires help in making a decision that will affect its future. Wamego (hwah-MEE-goh) is the small town that needs your advice. It has a population of about 1800. It is located on the banks of the Crystal River. This town has always been a farming community. Most of the farmers grow corn and soybeans. These are the best crops to grow in this area. Nearly 95% of the residents are employed by Wamego's farming businesses. The local economy depends on farming. The other businesses in town all depend on the farmers and their employees (workers). These businesses include a grocery store, gas stations, a movie theater, and several restaurants.

The Crystal River is also important to Wamego. The river is a source of water for the crops. The river is also known as a good trout-fishing river. Trout need very clean, cold water to thrive. Crystal River suits their needs. Every summer Wamego has a Trout Festival. Many people who enjoy fishing travel to the area. The festival celebrates trout fishing and preservation.



The festival also educates people about what trout need to thrive. The goal of the education effort is to keep the number of trout at a healthy level. In that way, people can enjoy fishing there for many years to come. This festival is fun for many residents and tourists. It is also another income source for the residents of Wamego.

Lately, the farming business has not been good. Crop prices have dropped. The farmers are not making very much money. There is not enough to pay their workers or to support themselves. Some of the farmers have gone bankrupt. As a result, Wamego has lost 15% of its population during the last five years.

The town council is very concerned. They know farming will always be a part of life in Wamego. They do, however, worry about the town losing too many people. They do not want to get so small that there will be very few businesses and residents in Wamego.



### **FabCo Wants to Move In**

A mid-sized manufacturing company called FabCo has contacted the town council. FabCo manufactures cloth. The cloth is sold to companies that make clothes. FabCo is looking for a new location to build its company headquarters and manufacturing plant. FabCo is very interested in relocating to Wamego for several reasons.

- Wamego has a fairly large river and a train line running through the town. This, along with roads, would provide transportation routes for their products.
- The cost of living in the town is low. Their employees would like that.
- The river provides a natural resource (water). Water is important to the production of their cloth.

If FabCo is allowed to move to Wamego, the town could benefit as well. It would mean the following benefits:

- About 15,000 new residents would relocate to Wamego. This would require the building of many new homes, roads, and parks. A new school would need to be built. New businesses offering services to the company and the new residents would be needed. This means more buildings, parking lots, and roads would appear in Wamego.
- FabCo would offer many new jobs to Wamego's residents.
- The town would have money from taxes collected from FabCo and the new residents. This extra money could be used to improve life in Wamego in many ways, including a new hospital.
- The town would not have to depend on farming alone.

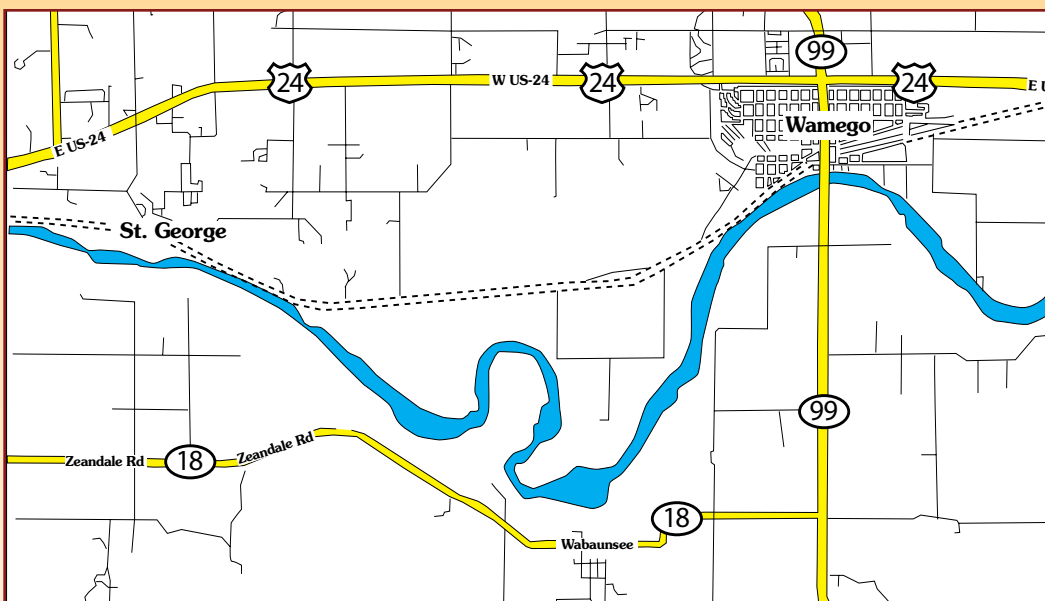
## Sounds Great! So, What's the Problem?

Many of the residents, including some town council members, are concerned. They worry that FabCo could mean problems for their community. Currently, the land is used for agriculture. If FabCo comes to town, the use of the land will change. The land will be needed for residential, commercial, and industrial purposes. Some people, including the organizers of the Trout Festival, wonder if this will change the river and the wildlife of Wamego.

Wamego residents are not the only ones concerned. Ten miles downstream is the town of St. George. It is also located along the Crystal River.



St. George is an even smaller town than Wamego. It is a resort town. People travel from all over to vacation in St. George. They use the river for recreation. There is fishing, swimming, boating, hiking, and camping in the area. There are several hotels and bed & breakfasts that provide accommodations for tourists. The Crystal River's water quality is very important to St. George's economy and residents. The residents of St. George are worried that the changes in Wamego might affect their lives.



As you answer the *Big Question*, you will also take on the challenge of giving advice to the town council of Wamego. What should they take into account in deciding whether or not to let FabCo move in? What will be the ecological advantages of FabCo building its plant in Wamego? What ecological problems might the project cause?

What ecological problems do you think might arise if FabCo moves in? What do you need to know more about to give the Wamego town council advice? Share your ideas with your group. Discuss the reasons for your ideas. Make lists of what you think might happen and what you think you need to investigate. You will share these with the class when you create a *Project Board*.

## Create a *Project Board*

It is useful, when you are working on a design project or trying to answer a hard question or solve a hard problem, to keep track of your progress. You also want to keep track of what you know and what you still need to do. Throughout this Unit, you will be using a *Project Board* to do that. During classroom discussions, your teacher or one of the students will record

the class's ideas on a class *Project Board*. At the same time, you will keep track of what has been discussed on your own *Project Board* page.

Recall that a *Project Board* has space for answering five guiding questions:

- What do we think we know?
- What do we need to investigate?
- What are we learning?
- What is our evidence?
- What does it mean for the challenge or question?

To get started on this *Project Board*, you need to identify and record the important science question you need to answer: *How does water quality affect the ecology of a community?* You also need to record your challenge: *What advice should we give Wamego?*

**How does water quality affect the ecology of a community?  
What advice should we give Wamego?**

What do we think we know?	What do we need to investigate?	What are we learning?	What is our evidence?	What does it mean for the challenge or question?

***What do we think we know?***

In this column of the *Project Board*, you'll record what you think you know about water quality and ecology. Discuss and post the things you think you and your classmates know about water quality and ecology. Have you studied these concepts before? What knowledge did you gain from your studies? Even if it is a small fact or idea, talk about it. Discuss any factors that you think might affect water quality, the ecology of a community, and the ecology of Wamego.

***What do we need to investigate?***

In this column, you will record the things you need to know about to answer the question and address the challenge. During your group conference, you may have found that you and others in your group disagreed about some ideas. You may not know how else to measure water quality. You and your group may not have agreed on where a particular water sample may have been taken. This second column is designed to help you keep track of things that are debatable or unknown and need to be investigated.

Later in this Unit, you will return to the *Project Board*. For now, work with your classmates and follow your teacher's instructions as you begin filling in the first two columns.