

# Stream Stewards



# Leader's Guide



**NEO PIPE**

YOUR REGIONAL STORM WATER  
*Public Involvement Public Education*  
RESOURCE



Cuyahoga  
Soil and Water  
**Conservation**  
District

6100 West Canal Road, Valley View, Ohio 44125  
216-524-6580 voice 216-524-6584 fax  
[www.cuyahogaswcd.org](http://www.cuyahogaswcd.org)

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Dear Group Leader,

Welcome to the NEO PIPE Patch Project. The NEO PIPE group consists of government and industry officials that deal with non-point source pollution and stormwater issues. Education is an important part of our work, and we designed the Stream Stewards program to get community groups involved. This project is intended to be flexible so that people of all ages and abilities can participate. Some activities are more appropriate for younger kids, while others should only be done with older or more responsible youth or adults. Please keep in mind the skills and resources of your particular group and guide them in the shaping of this project to take full advantage of these resources. Since NEO PIPE and its cooperating agencies are not overseeing each activity, we cannot be responsible for guaranteeing the safety of any activity. Use your discretion, and the safety guidelines of your organization.

To earn a patch, each person must complete an activity from each of the four categories; Discovery, Research, Outreach, and Publicity. They can work in groups, but try to make sure that each individual is participating. You, as a leader, will be the one responsible for setting the standards for your group, and deciding how meaningful this Patch Project is. If your group is interested in stormwater issues and wants to go further, there will be add-on patches for subsequent years. That information will become available to you when you request the patches upon completion of the project.

There are several strands woven into this project that go well together. Keep this in mind when you are choosing your activities. Ideally, each one will build on the previous one(s) and there is a common thread throughout. Some of the categories can be accomplished together. Plan to do storm drain stenciling and door hangers together, or teach your group about the town of Away and have them find out where 'Away' is from their house by mapping their watershed. Tour a water treatment plant and interview people who work there about their careers.

Your county soil and water conservation district (SWCD) can help you with many of these activities, or give you contact information for someone else who can. Your SWCD is also your source for patches, and can suggest locations for some of the outreach and publicity activities. Don't forget to contact the education specialist for ideas and resources. Some counties already have poster contests, and stenciling or monitoring programs in place. These are good opportunities for your group to be part of a larger project.



Discovery - (*n.*) Finding out or ascertaining something previously unknown or unrecognized; exploration; examination.

In this first section, you will be learning about stormwater. What is it? Where does it come from? How are you involved? Take on the role of a newspaper reporter and gain an understanding of the issues. Your leader, adult advisor or an expert in the field can help you discover what stormwater is all about.

### Activities:

- D1. **Fred the Fish** – Follow Fred the Fish on a journey downstream. Your leader will tell you his tale. Fred’s journey takes him past farm fields, housing developments, roads, parks, and factories. Each one has an effect on Fred and his surroundings.

Use the *Fred the Fish* story in the appendix to give your group members a fish-eye-view of what life is like in a polluted river. They will follow Fred the Fish downstream to gain an understanding of the importance of clean water, ways in which we pollute the water, and the impacts this has on wildlife. This activity provides a very tangible demonstration of what happens when we don’t take care of our environment.

- D2. **Away With Waste** – Where does litter go? How about the stuff that you put in your yard, such as fertilizers, pesticides and animal waste? Most people don’t really give it much thought because the stuff goes away. This activity will help you identify where ‘Away’ really is.

*Away with Waste* explores the notion of throwing things “away” and helps your group members determine where away really is. Use the *Away on the Bay* story to get your audience thinking about the concept of “away” and then engage the group members in discussion about water pollution and waste. The drawing activity in *Away with Waste* will help individual students to address how they feel about the concepts addressed in the *Away on the Bay* story. (The story and activity are both located in the appendix.)

- D3. **Runoff Racing** – Do your own exploration of runoff and infiltration. Where does rainwater go? What affects runoff rates? Learn how to demonstrate these ideas with some coffee cans, and a water jug.

This activity gives the group a chance to learn about what happens to the rain after it hits the ground, and what that means for water quality.

You will need: several cans of the same diameter (all coffee cans, or all soup cans, for example), a hammer or mallet, modeling clay, a measuring cup, an area of ground that you can disturb, watches with second hands or stopwatches, paper and pencil for each group. Remove both ends of the cans, and make a mark one inch up the side around the whole can. The opposite end can be taped for safety

- 1) Explain that you are going to do a scientific experiment about rainfall and runoff. They are going to simulate a summer storm and measure the results. Caution them about all safety requirements (sharp edges on the cans, safety glasses for hammering, boundaries, poison ivy, etc).
- 2) Take your group to an area with as many different plant communities as possible. Be sure that there is some paved area, and also grass or bare dirt where people walk frequently. It is best if there is also some forested area, and un-mown grassy area too. You may either let them choose places, or assign groups to a place.
- 3) Instruct them to set the can in a location, and pound it into the ground one inch (to the mark on the side). There should be one inch of metal underground and the rest



sticking up. For very hard dirt, or pavement, use modeling clay around the rim of the can to seal it to the surface, instead of hammering it into the ground. Variety is the key to this experiment. Have some people try lawns, flowerbeds, forested areas, trails, sandboxes, etc.

- 4) Give each group a measured amount of water. For coffee cans, a 20 oz. pop bottle that they fill out of a bucket works well. Use less water for smaller cans. Have each group dump the water into the can, being careful not to knock over the can. They can then time how many seconds it takes for the water to go away. In some cases, it might not be practical to wait for all the water to soak in.
- 5) Have each group share their results. Where was their location? What was it like there? Was it hard to get the can into the ground? How long did it take all the water to go away? Where did it go (into the soil, or along the surface)? Have them look for patterns in the results. Ideally, the more heavily used areas will take longer to soak in than in well-rooted, less traveled areas. Any paved or bricked areas should take the longest. If this wasn't the result, that's ok, see if you can discover why.
- 6) What does this mean over a larger area? What happens when a storm happens over a city? All the water from the impervious surfaces (roofs, roads, sidewalks, patios, etc.) has to run off because it cannot soak in. It tends to pick up pollution with it, and carry the pollutants through storm drains and into the nearest river, creek, or pond.
- 7) As an extension, and if you have permission, have the group dig a trench through their test area. Measure how deep the water got, and if it traveled sideways through the soil at all. Have them look for a pattern between these results and their times.

- D4. **Wetlands Exploration** – Wetlands provide many benefits, including collecting, slowing down and filtering storm water. They also help to absorb flood water. Visit a local wetland. Arrange to meet with a naturalist, or someone else who can tell you about the ecology of the wetland.

Wetlands are often misunderstood, and have a bad reputation. This is an opportunity for your group to break some of those myths. It is important to meet with someone who is familiar with the ecology and hydrology of wetlands and marshes. He or she can explain how the ecosystem treats stormwater and provides food and habitat for many animals. Also remember to ask about the history of wetlands in Ohio, and discuss with your group the implications that their destruction has on the water system.

- D5. **Who Knows, Who Cares** – There are lots of people out there who know and care about clean water. Many local agencies deal with water issues. They also educate people on those issues. Contact a local agency and invite them to a troop meeting to discuss water pollution.



## Research - (v. t.) To search or examine with continued care

Now that you know the basics, let's expand your knowledge. In this section, you can experiment within your watershed. Scientists in many fields do research every day. They carefully conduct experiments and record the results. The results then give the scientists a better understanding of the world around us.

### Activities:

- R1. **The End Of The Pipe** – Water comes into your house through pipes. It also leaves through pipes. Find the end of those pipes. Where does your drinking water come from? Where does wastewater go once it leaves your house? The stormwater that hits the roof of your house, driveway, sidewalk or lawn all has to go somewhere. How does this system of pipes flow? What happens between your rain gutters and the river? How do your daily actions affect the cleanliness of this water?

Especially for younger kids, research ahead of time so you can guide their inquiry, and have resources available to help them understand the processes. The important things to identify are that we are part of the water cycle, and our drains return to it, sometimes untreated.

- R2. **Your Watershed Address** – Everyone has an address. It starts with your name, then identifies your house by number, then the road you live on, then the town, and finally the state you live in. Each part of your address is a larger area. Watersheds work the same way. Each small stream is part of a larger river system. Find your watershed address. What is the closest stream? Is it named? What does it flow into? Then what? Keep identifying larger bodies of water until you get to the ocean. This is your watershed address. For example:

Jordan Smith (lives in the)  
Ward Creek (watershed which empties into the)  
Chagrin River (which drains to)  
Lake Erie (that is part of the)  
Great Lakes (that empty into the)  
St Lawrence River (which ends at the)  
St Lawrence Estuary (a part of the)  
Atlantic Ocean

Make a map of your watershed at a neighborhood level. Is your school in the same watershed as your house? How many of your friends also live in your watershed? Be sure to draw the watershed boundaries, rivers and streams, major roads, and places that you visit often.

The trick to making this activity work is access to many maps. Collect county and state road maps. They will have the larger streams and rivers labeled. See if your county SWCD has a watershed map available. USGS topographic maps are also very useful, but can be difficult for early elementary students to understand. Also use the group's knowledge as a resource. Chances are they can name a nearby river, and chances are that it is their watershed.

To aid younger students, use stick-on removable pointers to identify landmarks on the map like their school, where the group meets, the park, and the local grocery store. Help them to add their houses and other places that are important to them. If you already have the watersheds drawn on, then they can easily identify which one they live in.



- R3. **Pollution Glossary** – There are many terms that relate to stormwater. Sometimes the most difficult part of learning about something is understanding the language. Look at articles, web pages, news stories, and this booklet about stormwater and non-point source pollution. Gather a list of words you have heard and read during this project, and look up definitions for them.

This should be an opportunity for your group to explore their knowledge, and isn't necessarily intended to be quality time with a dictionary. Try searching for the terms on the Internet, or coming up with your own definition that everyone in the group can understand, then see how close it is to the 'dictionary definition'. Try using the terms to make a board game about clean water. Depending on the skill level of your group, adjust the task accordingly. The following is a list of suggested words. Feel free to add your own from research or newspapers, or remove ones that are too difficult for your group.

runoff	pollution	discharge	litter
infiltration	erosion	watershed	wetland
stormwater	sedimentation	hydrology	stewardship
nonpoint source	sewage	geology	riparian
point source	wastewater	ecology	turbidity

- R4. **Cleaning Green** – Many of the substances in polluted water come from household chemicals. These can be cleaners, pesticides, lawn products or home improvement products. Identify some hazardous wastes in your house. What are they used for? Where do they end up when you are done with them? Find out how to properly handle and dispose of household chemicals. Also research environmentally friendly 'green' alternatives.

Gather some common household cleaning supplies. Help the group identify the warnings and cautions on the labels, and predict what they would do to the environment. Find out who collects and disposes of household hazardous waste collections in your community. There are many good websites on environmentally friendly cleaning alternatives.

- R5. **Water Careers** – Who works with water? What do they do? This is your chance to explore some water careers. Visit someone at work, invite them to come to your meeting, or conduct interviews or a survey with people in several different water-related fields and present your findings to your group.

This is a great opportunity to explore some careers that young people don't necessarily think about. Especially with older groups, this can help them to formulate career goals and begin to identify the steps they can take to get there. Most people are willing to talk about themselves for at least a little while!

- R6. **Backyard Conservation** – Some of the most common pollutants in rivers and lakes come from our lawns and gardens. Learn how common lawn care habits can be adjusted to be more water-friendly. What are some alternatives? The National Wildlife Federation is a good source of information for environmentally sensible yards.



## Outreach - (v. t.) To reach beyond

Now you have an understanding of the science behind stormwater issues. In this section we are asking you to go beyond holding knowledge. Roll up your sleeves! Get involved! These projects all involve doing something for your watershed.

### Activities:

01. **Erosion Elimination** – Sediment is one of the leading causes of water pollution. It is just solid material that washes off the land and into the water. The best way to prevent this erosion is with plants. Find an area in your community that has bare dirt that washes away. Good places to look are school yards, parks, construction sites, and roadsides. If you mapped your watershed, mark areas of erosion on your map. Pick one of these areas and plant it!

This activity is designed to get your troop out and doing. Plants play an important role in preventing sediment from polluting our waterways. Check with your local Soil and Water Conservation District to determine which plants are best suited to help sustain the riparian areas in your community. Then pick a location and start planting. You can test your success by measuring the turbidity of the stream before and after vegetation is established.

02. **Litter pick-up** – Litter along streams is bad for the animals and plants that live there. Find a neglected section of stream, and clean up what others have carelessly left behind. Do you think that it mostly was carried there by wind or water, or dropped by people who visited the stream? Is it mostly food containers or household waste or maybe something else? How much of the litter is recyclable and what should you do with the rest?

The most important thing to keep in mind with this type of activity is safety. Be sure to caution people about sharp things, germs, and fast-moving water. Also make sure to have permission of the property owner, whether it is a private individual or a government agency. Have a plan on how to dispose of the junk and the recyclables, as well.

03. **Storm Drain Marking** – Storm drains gather lots of pollution off of the street and nearby yards. This water is then taken through pipes to the nearest stream. Some people think that the water from storm drains is treated, like the water that goes down the bathtub drain, so they dump chemicals down the storm drain. All across the country, groups have been working to mark storm drains so that people realize that the water goes directly to a river, lake, or bay. Find a neighborhood that has storm drains, and see what watershed they drain into. Work with your local SWCD, and the community to label these storm drains. Be sure to provide additional information to the people who live in the neighborhood.

Due to recent changes in regulations, many communities are looking for volunteers to label storm drains. Your local SWCD or municipal government will probably have equipment available for loan. Labels are either plastic disks stuck on with adhesive, or a stencil that is used to paint the message on the pavement, depending on your local government. If you live in an area without storm drains, ask other nearby communities if they need marking crews.



04. **Stream Monitoring** – Many groups in northeast Ohio help to monitor stream health. They wade out into a stream or river and collect physical data (like temperature), chemical data (like pH and nitrogen levels), and biological data (bugs and fish). This information is useful to tell how clean the water is. Schedule a monitoring session with your local SWCD or park.

This is probably not a project to do on your own, but many local agencies provide instruction and equipment for loan, or will come and instruct a monitoring session for your group. Ohio Department of Natural Resources, Division of Natural Areas and Preserves also provides training sessions. Their division is responsible for Ohio's Scenic Rivers program and has a volunteer monitoring program on the Cuyahoga, Grand and Chagrin rivers. If your group enjoys monitoring, consider becoming volunteers for Scenic Rivers.

05. **Adopt a Stream** – Most adults don't really pay attention to the world around them. Show them what they drive by every day. Choose a stream in your watershed and find out how to put a sign on it. Who do you need to get permission from? Where can you get the sign? How much would it cost to install it? Several counties already have a sign program in place that you could get involved in. This is a great opportunity to show people that your group cares about this stream.
06. **Green Lawns** - Do a Lawn Care Audit around your house. Identify problems and find 'green' alternatives to some of your family's gardening habits. Are you mowing the grass properly to keep clippings on the lawn and out of waterways and storm drains? Do you only apply fertilizers when necessary? Do you compost yard and garden waste? Identify and try out five ways to make your lawn and garden 'greener' or more ecologically sensible. If you care for other people's yards, encourage them to do the same.



Publicity - (*n.*) The quality or state of being public, or open to the knowledge of a community; notoriety; publicness

You are an expert in stormwater issues! You understand the problem, and have done first-hand research in your watershed. You have gotten out and gotten involved. Now it is time to share that wealth of knowledge. Consider the best way to represent your learning and share that learning with others. Who should know what you have learned? What is the best way to reach those people? How can you use your unique talents and strengths to reach people?

#### Activities:

- P1. **Poster Campaign** – You might think that people pollute because they don't care, but what if it is because they don't know any better? This is a chance for you to get a message out. Create posters that identify the problem and provide a solution. Tell people how their behavior affects their watershed. Find an appropriate place to display these posters, in local stores, your school, public buildings, or in a park.

Many posters on the same theme are a good way to get a message out. Try putting posters about proper handling of lawn care chemicals in all the local stores that sell lawn and garden supplies, or posters about car care in local auto parts shops. You might also keep an eye out for poster contests about clean water.

- P2. **Door Hangers** – If you have been working in one small neighborhood, this is a great way to reach the local residents. Decide how many houses you should reach, and create enough door hangers to tell everyone about your watershed. You might also ask your local SWCD about templates they already use.

This project works well with stream monitoring, litter pick-ups and storm drain marking. Even if your local agency provides pre-printed door hangers, encourage the group to take a little time to personalize them with illustrations or a short message about what they have learned.

- P3. **River of Words** – Sometimes science won't do. Create a poem and a piece of artwork that express how you feel about clean water and/or pollution. Host an art gallery and coffeehouse with your group, and invite guests to see and hear your work. Be sure to invite local resource people and government officials so they know you care. Submit poetry to local conservation organizations, school newspapers, and literary magazines to see if you can get published. There is an international project, called River of Words that also collects artwork and poetry. You can find more details at [www.riverofwords.org](http://www.riverofwords.org).

- P4. **Design a Display** – Showcase what you have done. Many public buildings have display areas that you can use for a period of time. Develop an eye-catching and informational display about clean water, and highlight the things you think are most important for people to know.

Often space at area festivals and events is low cost or free for non-profit organizations. Also consider setting up a display for town meetings and school events. Encourage the group to focus on a message and identify who will be seeing their work and what that person needs to know about their message.



- P5. **Teach** – Start other people along your path. Develop a set of activities that teach about clean water. Share this with another group, and get them to start thinking about watersheds. You might even help them to become Stream Stewards
- P6. **Live Action** – Create a skit, performance, or reading that shows what you have learned. Arrange to perform in a talent show, at a community festival, or other public place. Be sure to make yourself available to answer questions afterwards.



# I'M A Stream Steward



I completed Activity #\_\_\_\_ and have **Discovered** this about stormwater, runoff, and non-point source pollution:



I completed Activity #\_\_\_\_ and my **Research** tells me:



I completed Activity #\_\_\_\_ and I did **Outreach** at \_\_\_\_\_ by doing this:



I completed Activity #\_\_\_\_ and brought **Publicity** to water quality issues by:

I am another **DROP** in a pool of people who know about clean water and what I can do every day to keep it that way.

My name is:

My group is:



# Away With Waste

By listening to a rhyming story about water pollution in one community, your kids can discover how pollution can affect waterways. They'll also discover that the waste we wash "away" can have harmful effects later on.

Before reading the story, ask the kids to name some of the ways they use water (for drinking, bathing, cleaning clothes and dishes, and so on). Then ask them what happens to the water that drains out of their washing machines and dishwashers or washes down their sinks. (Don't worry whether the kids know the answer at this point. You'll be discussing what happens to household water with them after they hear the story). Explain that many people never think about what happens to the water they use in the households each day. They also don't think about what happens to the water that runs off their streets and yards.



Now tell the kids you're going to read them a story about a town called "Away" and how people in the town polluted the nearby water in a nearby bay without realizing what was happening. Tell the kids to listen carefully to the story to find out just how the water in the bay became polluted. Also tell them they should listen for the

word "away". Each time they hear it they should make a "hitchhiking" motion over their shoulder with their thumb to represent something going away.



After you read the story, discuss it with the kids. Ask them if the waste from Away simply disappeared. What happened to the waste (it ended up in the bay). Then go over the verses in the first half of the story to be sure that the kids understood what was happening in each one. Use the information under "Where Did It Go?" below to help with the discussion.

Afterward, pass out crayons or markers and drawing paper and have the kids draw pictures of the story. They might draw the people in the town, the bay when it was polluted, or the bay when it was cleaned up again. If you're working with older kids, you might want to have them create their own picture books of the story. Pass out copies of the story and have the kids draw a picture to go along with the verse of the story. Then have them glue their pictures on sheets of construction paper, copy the words of each verse on the pages, and staple the pages together to make a "book".



# Away on the Bay

This is the tale of a town called Away  
A town that was built on the shore of a bay.  
A town where folks didn't think much about  
What they dumped in their water day in & day out.

For one thing, a sink was an excellent place  
To get rid of messes and not leave a trace.  
Cleansers and cleaners and yesterdays lunch  
Went away down the drain with a gurgly crunch.

At everyone's house there was laundry to do.  
Day after day, how those laundry piles grew!  
Load after load was washed, rinsed and spun  
Away went the water when each load was done.

On Main Street each day there were sidewalks to sweep.  
The litter and dirt were swept into the street.  
And then when it rained, everything washed away.  
Into drained in the roads that dumped in to the bay.

A mill there made "stuff" for the town folks to use,  
But a pipe from the mill churned out oodles of ooze.  
And the ooze, well it goosed from the pipes to the bay  
Where it bubbled and glubbed as is drifted away.

When the weather was warm, it was always a treat  
To sail on the bay and bring picnics to eat.  
But when folks were finished, they'd toss all their trash  
Overboard and away with a pop and a splash.

Then folks started seeing things that weren't quite right;  
The bay had become an unbearable sight.  
Beaches were covered with garbage and glop  
That rolled in with the waves-and the waves didn't stop.

The fish in the bay all seemed sluggish and sick,  
The algae was everywhere-slimy and thick.  
The birds near Away were all suffering, too,  
Cause the fish they were eating were covered with goo.

So a meeting was called to discuss the sick bay  
And townspeople came from all parts of Away.  
And during the meeting one person proclaimed,  
"I know who's at fault: We *all* should be blamed."

"For years we've washed chemicals, dirt and debris  
Down our sinks, off our streets and out pipes, so you see  
Although we all thought our waste went away,  
It all ended up going into the bay."



"Now the bay is a mess-full of trash, soap and goop,  
The water's turned green-like a bowl of pea soup.  
And all of our wildlife is sick from garbage and grime;  
The bay needs our help, right now while there's time."

The folks were all silent-they knew it was true.  
And they realized now what they all had to do.  
It was time to get busy, the bay couldn't wait.  
If they didn't act now, it might soon be too late.

So they signed an agreement that very same minute  
To care for the bay and stop putting in it  
The stuff that had made the back icky and ill,  
Like soaps that pollute and the ooze from the mill.

They also agreed to stop dumping their trash  
Overboard and away with a plop and a splash.  
And all of their efforts have been a success:  
Today the bay's clean and no longer a mess.

And that it's the tale of a town called Away  
A town where the people, to this very day,  
Remember a saying that simple and plain:  
**Nothing just goes away when it's washed  
down the drain.**



## A Fish Story

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### Overview:

Water pollution should be a matter of concern to all people. In one way or another, all people are affected by such pollution and must take responsibility for controlling, and hopefully, preventing it. In this activity students will take an imaginary trip down a river with fish to identify sources of pollution that affect fish and other living things. They will then discuss means of preventing, or at least, controlling point and non-point source pollution.

### Objectives:

After completing this activity, students should be able to:

Suggest ways for preventing or controlling water pollution

Distinguish between point and non-point sources of water pollution

### Motivator:

Show students a photograph of a fish kill, or some other obvious result of water pollution. An example might be a picture of water birds, covered in oil after an oil spill. Discuss the causes of such tragedies. Tell students that, in this activity, they will learn about some sources of water pollution.

### Background for teachers:

As we begin the 21<sup>st</sup> century, there is more and more concern than previously about our water supply. Fortunately, in Ohio, it appears that we will always have enough water, but the quality of that water is questionable. For decades waters have been used as convenient dumping grounds for waste. Sometimes wastes are dumped directly in a stream, river or lake through pipes or other easily traceable means (i.e. a pipe discharging from an industrial plant). This is called **POINT SOURCE POLLUTION** because the point or source where the pollution originates can be identified. **NON-POINT SOURCE POLLUTION** is much more difficult to trace and may be caused from a variety of sources from agricultural lands, subdivisions or neighborhoods or other broad sources that cannot be easily pinpointed.

### Materials:

Copy of A Fish Story

Large gallon jar filled  $\frac{3}{4}$  with water

Fish suspended from a string or wire  
(can be a lure, or cut from a sponge  
or from milk jug)

Handful of soil

Pancake syrup

Salt

Pieces of paper

Detergent

Cup of hot water

Red food coloring

Sand or vermiculite

Clump of grass or other plants



### Freddie the Fish

Imagine a river as it meanders through the countryside, past the farmer's field, widening into a lake, but narrowing again as it passes through the city. In this river lives a fish. (*Point to the fish in the clear water in the jar.*) **How does it feel to be Freddie?** (*allow for discussion.*)

The fish swims downstream past an eroding bank. When it rains, what happens to the stream bank? What if it rains a great deal? (*Put soil into the water.*) **How does it feel to be Freddie?**

Suppose part of the soil eroding into the water came from farmland. The farmer has just spread fertilizer on his fields. Instead of remaining on the fields and helping crops, the fertilizer "piggy-backs" on the eroding soil and makes its way to the river. (*Add soil AND sand or vermiculite into the water to simulate fertilizer.*) What effect will the fertilizer have on the plants in the river? If the plants grow too fast and the river can't continually support them and supply the necessary nutrients. They die, fall to the bottom, and start to decompose. Decomposing things use oxygen. What else in the river needs oxygen? (*Put plants in jar.*) **How does it feel to be Freddie?**

Farm fields aren't the only sources of fertilizer in rivers. Homes may also be sources. Where the river has widened into a lake, several families have built homes. Perhaps their septic tanks drain into the water or their lawn and garden fertilizers wash into the river. (*Add detergent to simulate soaps washed down the drain from the houses into septic systems.*) **How does it feel to be Freddie?**

As the lake narrows back down into a river, our fish continues downstream past the town and city. Even though these folks don't pollute the water directly, what they do in their own homes or subdivisions can affect the quality of the river's water. Have you seen the "rainbow" of oil that has leaked out of a car? Where does rain wash this oil? (*Put pancake syrup, representing oil, in the jar.*) **How does it feel to be Freddie?**

In the winter, what do we put on our roads to make them safer to drive? (*Put salt into the water.*) When you eat or drink something salty, what do you do? Can this fish get fresh water to drink? **How does it feel to be Freddie?**

Suppose the town has a park next to the river. People litter the park and some of it blows into the river. (*Put pieces of paper into the water.*) **How does it feel to be Freddie?**

As the river leaves the town, there are several factories along it. Although regulations are strict, perhaps some chemicals, detergents or heated water is discharged into the river (*Put powdered detergent and hot water into the jar.*) **How does it feel to be Freddie?**

The wastewater treatment plant for the city is also located along this section of the river. Sometimes rules aren't quite as strict as they are for factories and perhaps the treatment facilities aren't as thorough as they could be. The plant does its best but still puts some polluted water in the river. The river has such a large volume of water though and the plant only puts a small amount of pollution in it. It shouldn't cause too much of a problem, right? (*Put two drops of red food coloring in the jar.*) **How does it feel to be Freddie?**

**Go back though the story, deciding on ways that YOU can help solve some of these problems.**

