

Pond Station

Equipment:

Microscopes
White sorting tubs
Ice cube trays
Tables
Dip nets
Contact cases
Scopes, tubs, nets, Ice Cube Trays, 2 tables

Vocabulary

Macroinvertebrate
Watershed

Setup:

- Place two tables near the lake access on the asphalt trail
- Set up one table as a macro station with ice cube trays and identification keys
- Set up the other table as a microscope station with microscopes and contact lens cases

Background:

Location: *Valley Water Mill Lake* is a very old part of our drinking water resource in Springfield. The first dam was built in the late 1800's and water from this lake eventually ends up coming out of a drinking water spring on the other side of town. Lakes and Ponds may seem simple at the surface, but go deeper and you will find a world of living things. Some of these organisms are familiar, like fish, turtles, and plants. Some look completely alien, like water mites and diving beetles. Using our eyes, we can see the group of organisms called Macroinvertebrates.

Macroinvertebrates. What the heck is a macroinvertebrate? Well, what does macro mean? (If they don't know, tell them it's the opposite of micro. They will probably know what micro means). Macro means you can see it without a microscope! What is an invertebrate? (They usually know this). An invertebrate is an animal that has no backbone, or vertebrae. So, we are looking for creatures with no back bones that we can see with our naked eye!

Other organisms can be spotted with the naked eye, but we will need a microscope to see them clearly. Water mites, water fleas, and even an organism called a cyclops live in the water and are very small.

Today, we will use our eyes and our microscopes to find and sort these different organisms and figure out what a few of them are called.

By the time we are finished, you will never look at a pond the same way again!

Activity:

1. put half of the students at the macro table
2. Instruct them to sort and identify as many macros as they can
3. Put the other half at the microscopes
4. Help them locate organisms in the scope and try to identify a couple of them
5. Switch the groups around after about 7 minutes
6. If time allows, stand with the group closer to the lake and look for birds, muskrats, turtles, and fish. See if they can come up with a probable food chain in this lake.

Stream Station

Equipment:

Specimen containers
Key to Macroinvertebrate Life in the River
Specimen Cards
Stream Quality Worksheet
Kick net
Magnifying glasses
Pencils

Vocabulary

Groundwater
Karst
Sinkhole
Macroinvertebrate
Watershed

Background:

Location: *Sanders Branch* is a small stream that starts at a spring coming out of a bluff. Streams are a very important part of our natural environment. They move nutrients through different habitats, carry away damage from storms (dirt, trees, leaves), and provide clean water for plants, animals, and people. If you fish, swim, or drink water, you are probably connected and benefiting from clean streams. **Did you know** that a lot of our drinking water comes from streams and lakes? That's right, you bathe, cook, and drink with creek water!

This stream is fed by a spring. A spring is an opening in the bedrock that allows groundwater to come up to the surface. **Groundwater** is water that is found in the spaces between soil particles and pores in the bedrock below the surface. A spring is a type of **Karst** feature. A karst area is an area with springs, **sinkholes** (large holes in the bedrock), and caves where water dissolves the bedrock and creates these caverns and holes.

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These critters are very important to us. When we want to know if a stream is healthy or not, we see who is living in it. Fish can move to avoid dangerous things like pollution. Macroinvertebrates cannot. Plants can concentrate and sometimes get rid of harmful chemicals. Macroinvertebrates cannot. So, if we have a creek full of all kinds of macroinvertebrates, we have a very healthy stream. However, if there are only one or two critters in the creek, it probably isn't that healthy.

This is a kick net that we would use to collect living macroinvertebrates. To save some time, we have captured some macroinvertebrates for you to look at. We have preserved them so that many people can learn about them. There are many more living in the stream still.

Activity:

1. Divide students into 3 groups
2. Give each group a set of macroinvertebrates, a key, a worksheet, and a magnifying glass
3. Allow 10 minutes for identification

Wrap up:

1. Review with each group. Ask them to rank the stream as very clean, somewhat clean, or not clean. Have them show their favorite macroinvertebrates.
2. Tell them that many of these creatures become flying insects as adults and provide food for birds and other land animals.
3. Collect macros back into their correct containers
4. If time allows, let the students explore the stream bank and the stream itself.

Enviroscape/BMPs

<u>Equipment:</u>	<u>Vocabulary</u>
Enviroscape model	Point Source/Non-point Source Pollution
Spray bottle	Best Management Practices (BMPs)
3 shakers	Pervious/Impervious Surfaces
Stopper	Run-off and stormwater
	Erosion
	Riparian Buffer
	Rain Garden
	Watershed

Background:

Location: *The Watershed Center* was created to show people how we can build and live in a way that is sustainable, green, and generally healthy for the environment and people in the area. At the Watershed Center we worked hard to protect the lake throughout our development process. We don't want the lake that we are trying to protect to become polluted!

Pollution is anything that gets into our environment that changes the environment negatively, hurting plants and animals and us. Pollution can come directly from one source, like a pipe dumping sludge into a stream. This is called **point-source pollution**. Most of the time, however, pollution is carried from many different places by stormwater or **run-off**. This pollution that comes from many places is called **non-point source pollution**. In a natural watershed with a lot of grass and trees, we see mostly **pervious surface**, or ground cover that allows rain to soak in. In a city, we have mostly **impervious surface** which block water partially or completely from getting into the ground. Impervious surface causes more run-off. **Best Management Practices (BMPs)** are things that we can do to prevent pollution from getting into the streams and lakes around us.

This is a model of a **Watershed**. A watershed is the area of land that drains to the same place, like the land that surrounds a river or lake. We are in the Valley Water Mill Lake Watershed, which is part of the Little Sac River watershed, which is part of the Missouri River watershed, which is part of the Mississippi River watershed, which goes to the ocean!

Look at our model watershed and see where you think that pollution might come from.

Activity:

Work through the model one example at a time until you run short on time. You don't have to cover every example, but make sure to clearly distinguish between point source (the factory) and non-point source (sediment, nutrients, bacteria) pollution. These are the examples of pollution in no particular order.

1. **Factory:** Pour red powder into the roof of the factory. Ask what might come out of a factory. As the students respond, flush the powder out with water and watch the stream of pollution head down the river into the lake. **Key concept** the pollution can be traced to that one particular factory at that one particular pipe. This is the key to point source pollution.
2. **Sediment:** Ask students where sediment may come from. It is loose dirt and soil anywhere there is no vegetation to hold the soil in place. Use the farm, the construction site, and the stripped hilltop to demonstrate. Put brown powder on these three spots and use the sprayer to wash it downhill. Watch how it gets to the lake. The process of water carrying soil into the rivers and lakes is called **erosion**. How could we fix the problem? Let students think of solutions. Guide them toward the idea that plants have roots that hold the soil in place better than any wall or filter. Place green felt down along edges to represent **riparian buffers** (ie, where the farm meets the lake, the hill meets the stream, the construction site meets the street). **Key concept** plants are the answer, and sediment can come from many different sites, so it is non-point source pollution.
3. **Nutrients:** Ask students what we sometimes use to make plants grow. Get them to fertilizer. Fertilizers are nutrients that we add to the soil to help the plant grow. These nutrients are like what we get from food or

daily vitamins. Fertilizer is not bad. Since plants can help us so much with water and air quality, giving them help to grow can be good. The problem is that people use too much sometimes. Pour a bunch of green powder on the lawns and the farm. When it rains, the extra fertilizer runs off and gets into the water. The water should turn green. In real life, what is the green stuff that grown in and on the water. The students might say moss, seaweed, etc, but it is called algae. Algae can be very nasty. In the best case scenario, an algae bloom will block sunlight and prevent plant growth on the bottom, plus it makes fishing and swimming nasty. In the worst case, it can poison the water or suck all of the oxygen out, killing fish and making the water unsafe for any human use. How can we fix it? Our plants can help us again. They absorb extra fertilizer and keep it from getting to the stream. You can also use less or no fertilizer and get a soil test to see how much fertilizer you need. **Rain gardens** can also help prevent extra runoff pollution. **Key concept** is that fertilizer can come from agricultural or residential sources, which makes it non-point source pollution, and can be easily prevented from entering streams.

4. **Bacteria:** Put cows on the pasture by the stream. What type of pollution might cows contribute to the water? The kids might say poop, but try to get them to the idea of germs or bacteria is what we measure in the water and it comes from animal waste, including humans! How can we stop the cows from getting bacteria into the water? Fencing cattle out of the stream will help to keep bacteria out of the water and plants will start to grow along the stream bank when cows are prevented from walking over them and eating them. These plants will further protect the stream. Where else could bacteria come from? Dogs, cats, even leaky septic systems (people). All of these sources need to be prevented from entering the stream as much as possible. **Key concept** is that bacteria comes from many sources (non-point source) and that proper handling of animal and human waste is important for keeping our streams clean.
5. **Oil and gas:** What kind of pollution would come from cars? Gas and oil and other fluids build up on the asphalt between rain storms then it all gets washed into the streams and creeks when it rains again. Pour red or brown powder around the driveways at houses, along the roads, etc. Spray the bottle and watch the pollution wash into the stream. How can we prevent it? Rain gardens and riparian buffers will help, and so will vehicle maintenance and proper disposal of vehicle fluids. **Key concept** is that this gas and oil comes from all over the roads and from many cars and trucks (non-point) and can be stopped by making sure we properly maintain our vehicles and create space for rainwater to filter into the soil.

Nature Journaling

Equipment:

Nature journals
Pencils

Vocabulary

Wetlands

Background:

Location: *The Wetland* is an important part of the Watershed Center and the Valley Water Mill Lake Watershed.

Wetlands are areas of land that are wet for most of the time, but not all of the time. Wetlands act like a giant sponge that can filter runoff as it enters the stream or the lake. It also absorbs water and prevents flooding along major rivers and streams. Our wetlands are becoming more and more rare, so it is important to appreciate them and protect them in any way that we can.

Nature journaling can be an everyday activity that takes place at a park, in the forest, on the river, on a playground, or in your backyard. By practicing nature journaling, we can improve our observation skills and learn about the world around us.

Activity: The main idea in this activity is to empower kids to think and observe for themselves and to draw conclusions on their own. Your role is simply to guide their experience using prompts and questions. You don't need to teach them anything! Below are some prompts you can use to keep them working. Watch the group and when two or three kids seem restless, it is time to move to the next prompt. Model good behavior by speaking evenly and quietly and listening carefully. Encourage teachers and parents to participate. Remind them all that identification is not important, but they should try to describe what they are journaling about even if they don't know what it is. After every couple of questions, ask if someone would like to share one thing from their list. Keep it to one or two students each time you stop to let them share.

1. What do you see?
 - a. write down 5 things that you see (2 minutes)
 - b. Add a descriptive word to each of those things. Use color, movement, or whatever descriptive words will help you remember. (2 minutes)
 - c. Label each thing you wrote as living (a tree) or non-living (water, shadow, sunlight)
 - d. Pic one thing off of your list and draw it (5 minutes)
2. What do you hear?
 - a. write down three things that you hear (5 minutes)
 - b. Label each thing that you heard as natural or manmade (1 minute)
 - c. what kinds of animals do you hear (2 minutes)
 - d. How many different birds can you hear? (3 minutes)
3. What do you feel?
 - a. Close your eyes and try to write down everything that you can feel. Hints: Do you feel the sunshine? The wind? A piece of grass? The boards you are sitting on? (3 minutes)
 - b. Look around you and list three things that you are curious about what they feel like. (3 minutes)
 - c. Take a minute to go and touch one of the things you are curious about and then come back to your seat. (2 minutes, and only if the group is smaller and well-behaved)
4. How do you feel?
 - a. Sit quietly for a minute and reflect on how you feel right now. Are you happy? sad? excited? nervous? (1 minute)
 - b. Write down a few words that describe how you feel.
5. What do you think?
 - a. Write a couple of sentences about what you are thinking about right now.

Wrap Up: You can journal anytime, anywhere. Journaling helps us to see and hear and feel more when we are outside. It can also help us feel better or think through challenges. You can keep this journal and make more just like this very easily at home.