

Watershed Experience Lesson 7:

Watershed Bus Trip

ACTIVITY TYPE: *Field Trip – Data Collection*

AUDIENCE: *High School*

TIME FRAME: *4.5 hours*

SUMMARY:

In the classroom, students learned how humans interact with streams and affect water quality. They've met some people who work to protect water. This trip brings these concepts into real life by exploring a long stretch of your local river, starting in the upper watershed and moving downstream. Students see how land use and humans directly impact the stream in real time and space by making their own observations and collecting their own data.

MATERIALS:

- *Student Lab Sheet Packets*
- *Clipboards*
- *Pencils*
- *Water test kits*
- *Rubber ducks*
- *Measuring tape*
- *Meter stick*
- *Boots or waders for a few students*
- *First aid kit*

PREPARE AHEAD:

Before the day of the trip, familiarize yourself with the three sites you'll visit with the students. This will help you to orient everyone easily once you get there and be a practical safety check. Since you won't be in the classroom, triple check your equipment lists ahead of time and pack extra supplies.

You'll need to do some investigation to find sites. Use maps to delineate where the upper, middle, and lower parts of the watershed are and test the water to see if there are measurable differences. You may be able to reach out to a local watershed or environmental center for suggestions. Finding access areas that are safe for a large group of students can be challenging. If full stream access isn't possible, you can still do this activity by visiting the sites and testing a sample of the stream water you get with a bucket and bring out of the stream.

ENGAGE:

Get students excited – they're out of the classroom and on an adventure, collecting their own data. How much they learn and get out of this day is based on their level of observation and inquiry. As soon as they step on the bus, they should start paying attention. Tell them to notice what they pass as they go, to watch how the landscape changes. At the stream sites, they should question everything that they see. Why is the stream flow so high or low here? Why is the color different than it was upstream? What effect does an open tree canopy have on the organisms living in the stream?

Once you brief students on the plan, put them in groups of 4-6 (or into the number of groups that you have adults) for data collection at the stream sites.

PROCEDURE:

Students will collect data at the stream and on the bus. Give them their lab sheet packets and clipboards before boarding and briefly go over each page, so they know the plan.

Ride 1: Talk about the different kinds of data they will collect at the stream. Explain that groups

will rotate and do different tests at different sites and they will need to share their data. Take questions and remind them to keep their eyes open and brains questioning, even when they're not actively collecting data as a class.

Stop 1:

Water Chemical Testing

You need your water testing kit and waste disposal container. The most important tests are dissolved oxygen, nitrates, phosphates, salinity, turbidity, and pH. These are standard in many water testing kits. Depending on the number of students and their experience level with field testing, you can have them pair up or go solo. Make sure students record all the data at the end of the session.

Visual Assessment

Stream scientists use this formalized methodology to collect data on the condition of the stream and the habitat surrounding it. The lab sheets will guide students in what to look for. Tell them about the importance of each of the data points. We have a detailed outline on how to conduct a visual assessment with background information [on our website](#).

Water Discharge Data

Tying back to their lessons on stream hydrology, this data measures the amount of water discharging from the stream and the flow rate. Here is a video from Wild Earth Lab that shows how to do this <https://wildearthlab.com/2023/04/19/river-measurements/>

Ride 2: This is the first formal land use data collection time. Once they get on the bus, explain that they'll be playing land use bingo. Read the list of land use they might see. Ask them to mark their tally sheet whenever they see one of them. Start a timer and have them collect data for 10 minutes. Then ask them for any general observations. Allow them to chat until the next stop.

Stop 2:

Repeat the general observation introduction and data collection protocol.

Ride 3: *Same data collection protocol for the first 10 minutes of the ride.*

Stop 3:

Repeat the general observation introduction and data collection protocol.

Ride 4: *Same data collection protocol for the first 10 minutes of the ride.*

Wrap Up

You may return to the school without time to devote to this lesson, which works out fine as they have all their information on their sheets. Collect their data sheets and wrap up with some quick highlights as time allows.

If you have a few minutes to wrap up, have them pair and share about one of these questions, and then have a group share to conclude.

- *What is something totally new you saw or learned about your watershed?*
- *What differences did you notice about the land use at the different sites?*
- *What impacts do different kinds of land use and human activity have on the river?*

BACKGROUND:

Teachers will need some experience with chemical testing for dissolved oxygen, nitrates, phosphates, salinity, turbidity, and pH.

We use LaMotte kits. Here is a kit for high school level:

<https://lamotte.com/products/environmental-science-education/water-monitoring-kits/water-monitoring/water-quality-educator-and-monitoring-outfit-5870-01>

If cost is an issue, LaMotte offers the Earth Force kit. It is not as accurate and is generally used for lower grades.

<https://lamotte.com/products/environmental-science-education/water-monitoring-kits/water-monitoring/earth-forcer-low-cost-water-monitoring-kit-3-5886>

At The Watershed Institute, we prefer this Dissolved Oxygen test, as it is easier to use.

<https://catalog.aquaphoenixsci.com/products/testing-supplies/test-kits/k-7512-oxygen-dissolved>

Here is some background information about the tests we perform.

- How do salts, oxygen, and other chemicals get into the stream?
 - Oxygen: Oxygen comes from submerged plants and algae. It also dissolves into the water directly from the atmosphere. If there's a lot of mixing and splashing in the water, more oxygen will be dissolved. Also, it's important to note that colder water can dissolve more oxygen.
 - pH: The pH of surface water (lakes, rivers, and oceans) is slightly below 7 most of the time—meaning it's slightly basic. This is usually because of the surrounding rocks and land that erode and enter the water. However, because of the fumes humans put into the air with our vehicles and factories, rainwater can be slightly acidic and raise the pH of our streams. It's interesting to see how the pH changes after a big rainstorm!
 - Nitrates and phosphates: These chemicals can travel into the water through fertilizer runoff; when there's a rainstorm, fertilizers may wash away from grass and plants and find their way into a stream. Wastewater and animal waste can also contribute to higher levels of nitrates and phosphates.
 - Turbidity: Higher levels of floating algae, soil washing into the water, and human activity like dredging or recreational activities will reduce water clarity and therefore increase turbidity.
 - Salinity: Salts can enter the water naturally from the nearby rocks. Humans also increase salinity when we salt our roads in the winter. Rainwater carries salt into the streams.
- What is percent saturation?
 - Water is considered "saturated" with something when no more of a substance can be dissolved or combined. Percent saturation is a way to describe how close the water is to being saturated with dissolved oxygen. Colder water will dissolve more oxygen, however, which is why we must use the percent saturation chart.
- What happens when water's nitrate and phosphate levels are too high?
 - This can lead to eutrophication, which describes when a body of water has too many nutrients. This causes too many algae to grow in the area (a harmful algal bloom or HAB). When algae die, the bacteria that consume the algae end up depleting the dissolved oxygen in the water, meaning fewer creatures can survive.

- *What do ppm, ppt and JTU stand for?*
 - *We use ppm as the unit for phosphates, nitrates, and dissolved oxygen and ppt as the unit for salinity. Ppm stands for “parts per million” and ppt for “parts per thousand.” They are both concentrations; if the nitrate value is 1 ppm that means there is 1 mg of nitrate for every liter of water. A salinity of 1 ppt means 10 grams of salt per liter of water.*
 - *JTU stands for “Jackson Turbidity Units,” named for scientist Daniel D. Jackson. We use JTU to measure turbidity (water clarity).*
- *Is there such a thing as too much dissolved oxygen?*
 - *Yes, but it is rare. If the water becomes supersaturated with any gas, it can cause gas bubble disease, which makes bubbles form in eyes, skin, and gills.*