**My Backyard Stream**

**Alignment to Ohio Content Standards:**

[**Ohio Learning Standards for Science**](http://education.ohio.gov/Topics/Learning-in-Ohio/Science)**:**

**Grade 7 Life Sciences:** Pg. 84 7.LS.1: Energy flows and matter is transferred continuously from one organism to another and between organisms and their physical environments.

**Environmental Science:** Pg. 107 ENV.ES.1: Biosphere-Biodiversity, Ecosystems (equilibrium, species interactions, stability)

**Environmental Science:** Pg. 107 ENV.ES.5: Movement of matter and energy through the hydrosphere, lithosphere, atmosphere and biosphere. Biogeochemical cycles, Ecosystems, Climate

**Environmental Science:** Pg. 108 ENV.ER.3 Water and Water Pollution. Hypoxia, eutrophication

**Environmental Science:** Pg. 108 ENV.ER.5: Wildlife and wilderness. Wildlife and wilderness management

**Environmental Science:** Pg. 108 ENV.GP.2: Potable water quality, use and availability

**Physical Geology:** Pg. 110 PG.IMS.4: Ocean. Streams (channels, streambeds, floodplains, cross-bedding, alluvial fans, deltas)

**Physical Geology:** Pg. 111 PG.ER.3: Water. Water quality, Hypoxia, eutrophication.

**Science Inquiry and Application**

* Identify questions and concepts that guide scientific investigations
* Design and conduct scientific investigations
* Formulate and revise explanations and models using logic and evidence (critical thinking)
* Recognize and analyze explanations and models
* Communicate and support a scientific argument

**Lesson Length:**

50 to 60 minutes

**Lesson Overview:**

Students will test water samples of local streams or collect water samples from local streams to analyze water chemistry. Students will then share their results on “My Backyard Stream” (<http://watersheddata.com/Education/BackYardStreamCode.aspx>) as a citizen scientist.

**Lesson Objectives:**

The student will:

* Collect field data.
* Record detailed field notes.
* Analyze field data.
* Make inferences based on environmental field data.

**Materials needed:**

* [Field](http://watersheddata.com/Education/Document/If%20You%20were%20a%20Fish%20Student%20Handout.docx) Note Sheet
* [Example Field Note Answer Sheet](http://watersheddata.com/Education/Document/If%20You%20were%20a%20Fish%20Student%20Handout%20Answers.docx)
* [Water Quality Meter Calibration Training Videos](http://watersheddata.com/Education/video.aspx)
* Water Sample Collection Instructions
* Water Collection Bottles \*(if students collect samples from home)
* Access to “My Backyard Stream”

**Technology Needed:**

* Water Quality Meter

1. Engage the Learner

(5 minutes)

**Teacher (T):** Ask students about their experiences visiting rivers or lakes. Then ask them about their local streams.

**Student (S):** Share experiences in rivers or lakes, or their local waterways.

2. Explore the Concept

(15 to 30 minutes)

**T:** Introduce “My Backyard Stream” to students and discuss how they will be participating in

“My Backyard Stream” by acting as citizen scientists.

**Field Trip/Land Lab**

*If it is possible to bring students into the field for collection, follow these instructions. Students can also follow these instructions if they bring a water meter home to test their own stream.*

**T:** Explain to the students that they will be going out into the field as a class to collect water quality data. If using pre-created field note sheets, pass them out at this time, if not ask students to take out their field notebook.

**S:** Students should fill out their field notebooks with the following sections:

1. Date
2. Site ID/Name
3. Site Latitude
4. Site Longitude
5. Site Description
6. Weather Conditions
7. pH
8. Conductivity (μS/cm)
9. Temperature (ºC)
10. Oxidation Reduction Potential

**T/S:** If not already at field site, travel to field site.

**T:** Demonstrate how to calibrate water quality meters and how to use them to take measurements. Encourage students to ask for help during the experience if necessary.

**T:** Split students into small groups (3 to 4 students) and assign each a location along the field site. Tell students to record the site information in their field notebooks.

**S:** Before sampling, fill out the following in their field notebook:

1. Date
2. Site ID/Name
3. Site Latitude (may use phone’s GPS to get this information)
4. Site Longitude (may use phone’s GPS to get this information)
5. Site Description
6. Weather Conditions
7. A photograph of site (may use phone) or a sketch of the site.

**T:** Instruct the students to work together to take water quality samples. Each student should use the water quality meter at least once!

**S:** Use water quality meter to measure pH, conductivity, temperature, and oxidative reduction potential. Record these values in their field notebooks.

**T:** After students have collected their measurements, return to the classroom for discussion. Be sure to collect their data to be uploaded to “My Backyard Stream” on watersheddata.com!

**Independent Sample Collection**

*If it is* ***not*** *possible to bring students into the field for collection, follow these instructions.*

**T:** Explain to the students that they will be asked to bring a water sample from a local stream, which may be in their backyard or some other accessible place. Students will be given a bottle for water collection.

**T:** Pass out pre-created Field Note Sheets, or have students prepare a sampling page in their field notebook.

**S:** Students should fill out their field notebooks with the following sections:

1. Date
2. Site ID/Name
3. Site Latitude
4. Site Longitude
5. Site Description
6. Weather Conditions
7. pH
8. Conductivity (μS/cm)
9. Temperature (ºC)
10. Oxidation Reduction Potential

**T:** Demonstrate how to properly take a water collection sample and pass out water collection instructions for students to follow at home. Remind students to fill out the following information when they collect their sample:

1. Date
2. Site ID/Name
3. Site Latitude (may use phone’s GPS to get this information)
4. Site Longitude (may use phone’s GPS to get this information)
5. Site Description
6. Weather Conditions

Also, ask students to take a picture of the site if possible.

**S:** Take sample container to local stream and fill out site information in field notebook. Then fill container using proper sampling technique and write name and location on the container.

**S:** Keep water sample cold (refrigerated or on ice) until it can be taken back to the classroom.

**T:** After sample are returned, demonstrate how to calibrate water quality meters to students and how to take measurements. Then have students take measurements from their water samples.

**S:** Take water quality measurements using meter and record it in field notes. The measurements should include:

1. pH
2. Conductivity (μS/cm)
3. Oxidation Reduction Potential

**T:** After students have taken measurements, lead class discussion and collect field notes to upload to “My Backyard Stream” on watersheddata.com!

3. Explain the Concept and Define Terms.

(10 minutes)

**T/S:** Discuss the data, and have students compare data with other people in the class. Consider these questions:

* Were all the measurements the same or at least similar?
* If data was taken from multiple streams, how did they differ?
* What may have caused these differences?
* Would you consider the stream healthy from your measurements or would you need more information to decide its health? What other information would you need?
* What might factor the quality of the streams sampled?

4. Elaboration/Expansion of the Concept (remediation if needed)

(10 minutes)

**S:** Considering the data collected, write a paragraph describing what the data means for the health of the river. Decide if the river is polluted or healthy and explain why you think that. Also write about ways to improve the river’s health.

5. Evaluate Students’ Understanding of the Concept

* Teacher should make observations of student understanding during their exploration of the material (Explore) and during class discussion (Explain).
* Teacher should collect field notes (Explore) and conclusion paragraph (Extend) for additional proof of learning.

Additional Extension Ideas:

* Have students research causes of unhealthy rivers (Farm runoff, missing riparian zones, illegal dumping, acid mine drainage…) and have them create a PSA (can be video, poster, radio announcement…etc…) about how those activities harm local waterways.
* Have them write letters to the local farms, community members, or government about ways they could help protect the waterways and why it is important to protect them.
* Compare their water data to other data found on watersheddata.com. Look for similarities and differences and possible causes of the water quality in those areas. Research what activities may impair rivers around the sites that exist around them.

Additional Resources:

**Contact Jen Bowman (****bowmanj2@ohio.edu****) to borrow water quality meters.**

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