What's Happening in the Watershed

Activity Information

Grade Level

8-12

Time Required

4-6 hours

Topic

Water and Landforms

Water Chemistry

Estuary Concepts

- Watershed
- Water Quality
- Water Quality Parameters
- Run off
- Nutrients
- Scientific Method

Learning Objectives

- Describe what watersheds are.
- Locate the watersheds OWC is in, and what bodies of water our land drains into.
- Explain the process of scientific inquiry.
- Identify the processes occurring within our boundaries and how they impact the watershed.
- Observe and ask questions about their observations, and then how to translate those into a study of the watershed.
- Ohio State Academic Standards satisfied by this lesson plan (See page 7)

Overview

The purpose of this class is to create an understanding of OWC's watershed, how the processes operate within it, and how to ensure its water quality by providing the opportunity to observe, question and test water quality issues on property. Students will understand that our water flows into Lake Erie, and that the quality of our water directly impacts Lake Erie. Students will have the opportunity to observe and determine what questions should be asked and how to test those questions.

Teacher Background

A watershed is an area of land that drains to the lowest point like a stream, lake or ocean. Old Woman Creek Watershed drains into Old Woman Creek and then into Lake Erie. Old Woman Creek has an estuary at its mouth. An estuary is an area where two chemically distinct bodies of water meet and mix. In this estuary,

the two bodies of water are Old Woman Creek and Lake Erie. Lake Erie's water transport mechanism is seiche events, which is where wind is the primary mode of movement for water. When the water runs into one end of the lake, it sloshes on to the land and then back into the lake, rather like a bathtub. This is true for all the Great Lakes, but it is especially important for our estuary system. That is how lake water enters the estuary and is able to mix. Water movement is also how sand and substrate are moved in the lake. When the water moves from the East (ours is the southernmost point), it runs into the land and deposits the sand. The sand builds up and closes the mouth. On the other side, the water then starts to build up against the closed mouth. When it gets enough pressure, it breaks through the sand to open the mouth again. Old Woman Creek Estuary is a storm driven, dynamic system. This creates a unique ecosystem for plant and wildlife. The wetland area of the estuary is also very important.

When the mouth of the estuary is closed, water has time to spread out and slowdown in the wetland. Suspended material in the water then has time to settle out into the soil or be taken up by the plants, thus the wetland is filtering the water before it enters Lake Erie. The dominant land use in the Old Woman Creek Watershed is agriculture; 70% of our land is used for agriculture. Run off is one of the major contributors of water quality issues in our watershed. Our watershed is 27 square miles, and the Reserve property covers 573 acres. It is small system, where most of the mechanisms and variables are known, and that makes it a great outdoor laboratory because it is easy to design and execute a research project within the boundaries of either the watershed or the reserve.

Teacher Preparation

1.) Be familiar with macroinvertebrate species by reviewing this additional information to ensure you can help students identify the species that are found.
2.) Understand how water quality parameters are connected. Review Vital Signs: The Five Basic Water Quality Parameters, Water Quality Parameters, Parameters of Water Quality or Water Quality Parameters Information Sheet

Procedure or Activity Steps:

Introduction: (20 minutes)

1.) Introduce yourself to the group and have them do the same. Depending on time, play a name game with them so that you can learn their names.
   - Examples of connected name games are: what's your fav thing to do outside, fav thing to do in water, or fav living thing in Ohio.

2.) Take group over to the enviroscape. This age range is old enough to manipulate it on their own with directions from the instructor.

3.) Go through the enviroscape and how it works within a watershed. Define watershed for students and show them on the enviroscape.
   - A watershed is an area of land that drains downhill to the lowest point which could be a stream, lake or ocean.
   - Make sure that the students understand what people put on the land can end up in the water, and they need to understand what our large body of water is – Lake Erie.

4.) Once done with the enviroscape manipulation, ask the students how the problems we created for the enviroscape relate to Old Woman Creek and Lake Erie. Does Lake Erie suffer from any of these issues?
   - What are Lake Erie's issues?
     - Pollution
       - People
       - Waste water
       - Industry
       - Agriculture
     - Invasive species
     - Shoreline armoring
   - Which of these issues can we attempt to study here?

Materials Needed

- Enviroscape with supplies
- Notebooks and writing utensils
- Outdoor gear (muck boots)
- Flip chart and markers for brainstorming
- Chemical test kits
- Macroinvertebrate test kits
- ¼ square meter for plot
- Gloves
- Nets
- Containers for samples
- Adventurous spirits

5.) Explain to the students that we will go outside and take a hike. On the hike, they will have time to observe parts of our watershed. They should bring their notebooks and pencils so that they can write down their observations and questions that might arise from them on how we can help the water quality in Old Woman Creek and Lake Erie.

6.) Before heading outside make sure to let students use the restroom and get water if they need it. Also double check that they are prepared to be outside – shoes, outer wear, etc.

Activity 1: Observation Hike (60 min)

1.) Head outside with group and over to a map of the trails. Ask the group where the group should go in order to do some observations about the water quality of OWC. Let the students discuss and head to the spot they agree on, as long as the rationale is sound.
   - It could be the edge of the property where someone else's property is touching ours, indicating that what they do on their property affects ours.
   - It could be a tributary in the forest.
   - It will most likely be down to the estuary.

2.) Once in the vicinity of the chosen location, find a spot where the group can spread out and spend some time making observations.

3.) Let the students know that they have 20-30 min to sit, observe, record and come up with questions.

4.) Also let them know that there will be time to choose another location, so they should keep that in mind.

5.) Give them gentle time updates, and when time is up, refer to the map and pick your second location for observations and hypothesizing.

6.) Head to that location, try to help guide them to an area that functions differently from the first location.
   - So if they chose the estuary first, head to the forest or boundary area and vice versa.

7.) Repeat steps at second location.

8.) When the time is close to up, start to head back to the building.

Activity 2: Question Discussion and Refinement (30 min)

1.) Once finished with questions and returned to the vicinity of the building, gather the group to discuss their questions.

2.) This can be in the classroom, or it could be outside in an out of the way spot where everyone can still focus.

3.) As a group discuss some of the observations that the students made about the land, the water quality and how they are connected.
   - Ask them what some of their questions were based on their observations. What questions did they have that they thought might lead them to a solution for water quality issues?
   - Discuss what the different nutrients in the water are like phosphates, salts, nitrates, and other parameters that influence water quality like temperature, turbidity, and dissolved oxygen.
   - Discuss how these parameters are linked and how they each affect water quality.

4.) Inform the group that we would need to narrow down our questions to a couple of key questions that would get us to the heart of the water quality issues.
    - Help them work towards consensus.

5.) Once they have selected two or three questions that could be investigated on property, ask them to start to think about what materials or supplies they would need in order to get the answers to their questions.
    - Start to create a supply list. What will the group need to test the questions they have come up with?
    - In reality we can do water sample analysis, macroinvertebrate testing and biodiversity inquiries.

6.) Also ask them to think about what would make their results more reliable. If we took one sample in one location, would the results of that sample be enough to definitely say that we answered our question? Why not, so discuss making a couple stops.

7.) As a group determine where you will go to do your sampling/testing.

8.) Gather the needed supplies into a container or bag and head out to the locations selected by the group.

9.) Remember to ensure that the students are prepared to be outside, restroom break, water, etc.

Activity 3: Testing (60 – 90 minutes)

1.) Head out to the first testing site with your materials.

2.) Find the directions for the tests you will be doing.
    - These will be located with the supplies.

3.) Break the group into smaller groups, so that the students can get more hands of experience. You can have each group the same test to create multiple samples, or you can have each group a different test a couple times.

4.) Give the students adequate time to complete the tests as many times as they need and to record the results. Make sure they include site data like time of day, weather, etc

5.) Conduct the tests and gather the results.

6.) Collect belongings and move onto the second location for tests and repeat the previous steps.

7.) When tests have been done and data has been collected, head back to the visitor center.

Conclusion: (20-30 minutes)

1.) Gather back in a location near the visitor center.

2.) Have the students go over the results that they collected from their tests.
   - Have the comparison chart so that they can determine the relevance of the results – especially chemical and macroinvertebrates

3.) Have some place to display the results and engage the students in discussion about what they think the results mean in terms of our hypothesis.

4.) Given our results, what are some of their suggestions for actions that could be taken when dealing with the topic of water quality?

5.) What are the implications of our results for our watershed and for our bodies of water, OWC and Lake Erie?

6.) Have each student take 5-10 minutes to write a response to our day.
   - Ask them to think about their observations and questions.
   - Ask them to think about how their questions led them to their chosen tests.
   - Ask them to think about if they got the results they were expecting and what they think their results mean.
   - Ask them to think about what actions can be taken as a response to their results.

7.) Once they have written their responses, ask if anyone would like to share. This is purely voluntary, so hopefully someone will and the group can discuss.

8.) If there are any particularly good responses, ask them if you can make a copy, so that we can have a record of some of our outcomes. This is also completely voluntary.

9.) Thank them for their hard work and wish them well.

Ohio State Academic Standards that are satisfied by this lesson plan:

- High School
  - Science inquiry and application

Environmental Science

- Investigations are used to understand and explain the behavior of nature in a variety of inquiry and design scenarios that incorporate scientific reasoning, analysis, communication skills and real-world applications.
- Earth's resources
  - Water and water pollution
  - Soil and land

Biology

- Diversity and independence of life
  - Ecosystems

Chemistry

- Interactions of matter
  - Types of reactions
  - Acids/bases
- Stoichiometry
  - Solutions
  - Limiting reagents