

Stream Ecology in WI & PR

Summary: Students learn about the small proportion of our water supply that is used for drinking water, how land use changes water quality, and threats that face water quality and the effects of those threats on wildlife and humans. WI and PR students will compare their results and discuss possible reasons for similarities and differences between their results.

Background Information:

See attached PowerPoint presentation for Background Information.

Subject Areas for Infusion: Science

Standards:

Science
C.12.4, C.12.6, F.12.7, F.12.8, G.12.5, H.12.7

Environmental Education
A.12.4, A.12.5, C.12.1

Vocabulary:

Surface Water: all freshwater at Earth's surface that exists in the form of lakes, rivers, and streams

Groundwater: water that collects beneath Earth's surface, within 2.5 miles of the surface

Erosion: the wearing away of soil by the action of water, wind, or glacial ice

Bioaccumulation: the steady increase in concentration of a toxic contaminant within the tissues of living organisms

Grade Level: High school, but can be easily adapted to middle school

Goal: Water quality issues exist all over the planet.

Key Concepts: ecology, pollution, water quality, conservation, pollution

Objectives: Upon completion of this lesson, students will:

- 1) Identify different types of water and in what proportions they exist on Earth
- 2) Identify different parts of the water cycle and how they interact with each other
- 3) Learn the origin of their drinking water
- 4) Learn how land use changes water quality
- 5) Learn the effects of bioaccumulation

Teaching Location:
Classroom and outdoors

Lesson Time:

40 min. Ecology PowerPoint
10 min. Water Cycle Charades
40 min. Sum of the Parts
50 min. Video – Aquatic Habitats
60 min. Practice field tests
20 min. Video – Storm on the Horizon
90 min. Field day on water
90 min. Work time for student presentations
30 min. Student presentations
30 min. Test

Materials:

- computers
- data projector
- Project WET activity guide for “Sum of the Parts”
- paper
- markers and/or colored pencils
- miscellaneous supplies (see “Sum of the Parts”)
- video “Aquatic Habitats” by Discovery School
- video “Storm on the Horizon” by Kiap-TU-Wish chapter of Trout Unlimited
- Water Action Volunteers Stream Ecology packet (will have its own list of materials for field tests)

Set-Up:

- Setup data projector and computer – secure connections.
- Gather videos and prepare video guides (optional).
- Find a public or private stream to do data collection on.
- Arrange bus transportation, if needed.
- Prepare group packets for practice testing and field testing.
- Gather field equipment for students to practice in groups.

Procedure:

The instructor will teach students about water facts with a PowerPoint. Then students will then review the water cycle with a charades game. Students will participate in an activity called “Sum of the Parts” followed by a video on aquatic habitats. Prior to the field day, students will spend a day practicing how to do the field tests. After the field day, students return to class to analyze their data and compare it with students in Puerto Rico.

Introduction

Students will be introduced to the topic of water quality with the attached PowerPoint presentation.

Activity 1 – Water Cycle Charades

1. This activity is done to review the water cycle.
2. Students should be put into groups of 4-5 (5 is best).
3. Each group will have the terms of the 5 parts of the water cycle: condensation, evaporation, infiltration, precipitation, & transpiration.
4. The groups will be given 3-5 minutes to think of an action to go with their term.
5. The rest of the students will guess which term of the water cycle the student is acting out.

Activity 2 – Sum of the Parts

1. This activity is from the Project WET activity guide.
2. Students are land owners along a river, each owning a different waterfront property.
3. Students use markers and/or colored pencils and a piece of paper turned horizontally to draw their “dream” vacation home. They should draw in anything they desire to have.
4. The instructor then lines the pictures side by side and across from each other to form a river.
5. Starting with the most upstream property, students must place an object in the river for every item they drew that contributes to air or water pollution. Objects can include markers, pencils, pens, rulers, paperclips, etc.
6. Students see that by the time the water gets to the final property owners downstream, the water is very polluted. Students discover that we all are responsible for taking care of the water.

Activity 3 – “Aquatic Habitats” video

1. Students will view the 60 minute video, answering questions from the video guide at the end of lesson.

Activity 4 – Practice Field Tests

1. The instructor should have all materials and students divided into the same groups who will work together on a section of the stream the following day.
2. Students practice calculations on instructor-prepared “practice” worksheets – these worksheets have arbitrary values placed in key areas so as to have the students practice the calculations.
3. Students are guided by the instructor, but as a group, assign themselves various roles that need to be done on the field day. Throughout this process, the instructor will need to rotate around the groups to ensure proper calculations are performed.

Activity 5 – “Storm on the Horizon” video

1. Students will view the 20 minute video about a local stream – the Kinnickinnic River in River Falls, Wisconsin. This video focuses on water quality issues relating to stormwater runoff.

Activity 6 – Field Day

1. Prior to departure, check materials to make sure the instructor has all materials.
2. Using the Water Action Volunteers worksheets, students go to the stream site to perform tests.

Conclusion

1. Students take their data from the field day to analyze and compare with other sections of the stream done by their classmates and with PR students on their stream.
2. As the instructor, lead students to discover reasons why values may be similar or different along their stream and along a stream in Puerto Rico.

Assessment

1. Students will create a poster or PowerPoint presentation to display and explain their results.
2. Students use their learned knowledge during this unit to answer questions (see end of lesson for test).

Adaptations: This lesson could be modified to make it suitable for middle school students by shortening the PowerPoint and simplifying the vocabulary. The “Aquatic Habitats” video could be deleted, since it is presented at a high school level. Middle school students do very well with the field materials, as do students with special needs. The test may need to be modified for learning and cognitively disabled students.

References:

United States Environmental Protection Agency
www.epa.gov

Discovery School – “Aquatic Habitats” video
<http://teacherstore.discovery.com>

Kiap-TU-Wish Chapter of Trout Unlimited – “A Storm on the Horizon” video
www.lambcom.net/kiaptuwish/

Water Action Volunteers
<http://clean-water.uwex.edu/wav/index.html>

Name: _____

Video - Aquatic Habitats

Lake Habitat - Loch Ness

1. "Loch" is Scottish for _____.
2. What is unique about the water temperatures in Loch Ness? _____

3. Roundworms (nematodes) can be found almost everywhere in soil, oceans, and freshwater. They are valuable environmental monitors because they _____. When their environment becomes polluted, some species of roundworms _____ and others _____.
4. What will scientists use the data from Loch Ness for? _____

5. What is unique about the 23 species of nematodes found in the Loch's mud?

Wetland Habitat - The Everglades

6. The everglades are one of the only one of these on Earth - _____. They cover much of southern _____.
7. What is the depth range of water in the Everglades? _____ to _____ feet
8. Since the 19th century, much of the Everglades have been drained and reshaped to half of what they used to be, all for _____ and _____.
9. What mammal is also called the sea cow? _____. What does it feed on? _____.
10. Why has much of the manatee's habitat been lost? _____
11. The Florida _____ hunts white tail deer in the Everglades. Sadly, there are only _____ left in the wild - why? _____

Bay Habitat - The Chesapeake

12. The place where river water and sea water meet is called an _____.

13. Wetlands act as buffers, which remove _____, _____, and _____ before they enter the Bay.

14. Why is the Chesapeake so murky? _____

15. Sedimentation causes nitrogen and phosphorus to leach into water from fertilizers. These elements are bad because they cause _____ blooms, which do 2 things:

- _____
- _____

16. What is the main reason why the Chesapeake can't fight back against sedimentation?

17. Sadly, less than _____ the wetlands on Earth remain. Identify 3 reasons why wetlands are critical to our survival on Earth:

- a. _____
- b. _____
- c. _____

Test – Ecology of the Isabelle Creek

I. Multiple Choice – Choose the best answer to the following questions. Record your answer in the blank provided to the left of the question.

- _____ 1. Isabelle Creek is located in _____.
- a. Alma
 - b. Bay City
 - c. Ellsworth
 - d. Hager City
- _____ 2. Approximately ____ % of Pierce County is used for agriculture.
- a. 25
 - b. 50
 - c. 75
 - d. 100
- _____ 3. What is the source of drinking water for Pierce County residents?
- a. Groundwater
 - b. Isabelle Creek
 - c. Kinnickinnic River
 - d. Mississippi River
- _____ 4. The watershed of the _____ has the highest rates of soil erosion in Pierce County.
- a. Isabelle Creek
 - b. Kinnickinnic River
 - c. Rush River
 - d. St. Croix River
- _____ 5. Forest cover in Pierce County used to be at 96 %. Where is it at now?
- a. 5 %
 - b. 7 %
 - c. 9 %
 - d. 15 %

II. Completion – Fill in the blank with the most correct term to complete the sentence. Choose from the list below. You may use the terms *once, more than once, or not at all*.

- | | | | | | |
|-----|-----------------|--------------|--------------|---------------|---------------|
| 25 | bacteria | condensation | ground | ocean | sedimentation |
| 50 | bioaccumulation | erosion | icecaps | precipitation | stream |
| 75 | cancer | evaporation | infiltration | residential | surface |
| 100 | commercial | glaciers | lake | river | transpiration |

6. Nearly ____ % of the Earth is covered by water.
7. Of the 3% freshwater found on Earth, most is tied up in _____ and _____.
8. Two types of freshwater exist – they are _____ water in the form of lakes, rivers, and streams, and _____ water.
9. Runoff from Pierce County watersheds causes _____ of Nuggett Lake and the St. Croix and Mississippi Rivers.
10. High levels of _____ come from animal waste that enters watersheds.
11. _____ is the steady increase in concentration of a toxic contaminant within the tissues of living organisms with increasing levels in the food chain.
12. _____, one of the five steps in the water cycle, is the primary way surface water is replenished to lakes, rivers, and streams.
13. In the Village of Ellsworth, farmland is being converted into _____ land, where newer homes are being constructed.

III. Short Answer – respond to each question *completely, fully* using your knowledge of the subject represented in the question.

14. The following are contaminants we discussed in class that can leach into groundwater due to high rates of soil erosion. Describe 1 effect for each that the contaminant can have on humans.

	<u>Contaminant</u>	<u>Effect on Humans</u>
a.	Coliform	_____
b.	Atrazine (pesticide)	_____
c.	Alachlor (herbicide)	_____

15. Forests provide a great deal of benefits to the land they grow on. Identify 2 of the 3 effects we discussed in class that you would see when trees are removed from an area of land. Explain why these 2 effects would occur.

Effect

Explanation

a. _____

b. _____

16. Why is bioaccumulation such a problem?

17. What *physiological* (meaning *how is the body affected*) effects can nitrogen poisoning have on infants?

18. Why is a cloudy, slow-moving, warm river detrimental to aquatic animals?

19. Label the water cycle diagram below by placing the correct letter next to term.

Using Figure 1-1, match the appropriate label with the letter that represents that aspect of the water cycle or related concepts.

- | | | |
|--------------|---------------|---------------|
| condensation | infiltration | surface water |
| evaporation | precipitation | transpiration |
| groundwater | runoff | ocean |

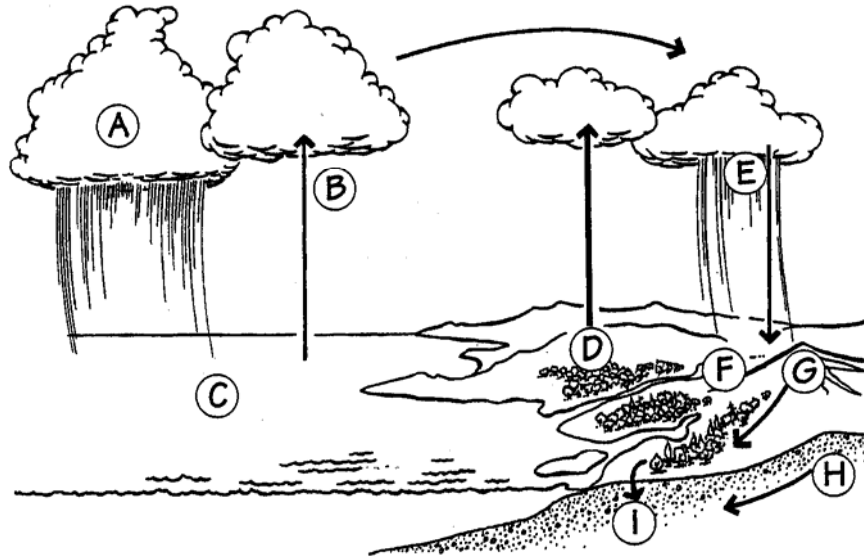


Figure 1-1: Hydrologic Cycle

20. Why should we protect and heal the Isabelle Creek Watershed?
