

WATERSHED WARRIORS

TEACHER LESSON PLAN | GRADES 9-12

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- Documentary Screening (13-26 minutes)
- Video Questions (5-10 minutes)
- Mussels: Nature's Water Filter Creatures Activity (50-90 minutes)
- Make It Local (50+ Minutes)



DOCUMENTARY SCREENING

13-26 MINUTES

Students should answer the grades 9-12 video questions while watching the *Watershed Warriors* documentary.

We recommend playing the video twice if time allows.



VIDEO QUESTIONS

5-10 MINUTES

Learning Objectives:

At the end of these video questions, students will:

- Be able to explain what the Friends of the Fox River does.
- Be able to define and list three macroinvertebrates.
- Be able to explain how humans impact water quality in the environment.

VIDEO QUESTIONS – CONTINUED

Discuss the following questions as a class:

Answer Key:

1. What inspired Jenni to paddle more than 200 miles of the Fox River?

A: Growing up near the river and playing in and along it as a kid.

2. What is the Friends of Fox River (FOTFR) organization?

A: It is a non-profit organization that teaches people about the Fox River and water quality health.

3. Water quality testing is all about analyzing river health. Why might water quality be important to track for the ecosystem as a whole and for public health?

A: Pollution flows downstream so if there is pollution going into the river upstream, those living downstream are affected.

4. What are three macroinvertebrates Gary looks for to analyze river health?

A: Any of the following: flies, aquatic worms, snails, leeches, and crayfish.

VIDEO QUESTIONS – CONTINUED

5. Fertilizers are known to pollute rivers by “runoff.” Where does Jenni say this happens the most and what could be changed to prevent it from happening?

A: Jenni says that fertilizer from the golf course can get into the river if there is no barrier between the edge of the golf course and the water. Constructing a barrier or leaving enough space between the edge of the golf course and the river’s edge would help prevent these chemicals from going into the river.

6. What evidence is there to show mussel populations are affected by dams?

A: Mussels cannot survive in the murky water above a dam. They need flowing water to filter feed.

7. What can we infer about human-ecosystem interactions?

A: Humans leave a big footprint behind in their use of natural resources. We often consume finite resources fast than they can be replaced by natural environmental processes.

8. “_____ science is crucial to how we all live. It adds value to our lives and adds value to the community.”

A: Environmental

VIDEO QUESTIONS – CONTINUED

9. What about today’s culture makes conservation efforts, like the work Friends of the Fox River does, difficult? What needs to happen for it to improve?

***A:** Gary says that the generations now seem disconnected from the natural environment. There’s no relationship and because there is no relationship, the current generation is more fearful of the natural world. To improve this relationship, opportunities for creating a connection between people and their natural environment need to happen.*

10. Explain why healthy rivers are worth protecting.

***A:** Answers may vary: Healthy rivers support biodiversity. Biodiversity is important for a healthy ecosystem to “survive and thrive.” Fresh water is also a natural resource necessary for life on Earth. All people and animals need it.*



MUSSELS: NATURE'S WATER FILTER CREATURES ACTIVITY

50–90 MINUTES

Learning Objectives:

At the end of this activity, students will:

- Be able to define a hypothesis.
- Be able to demonstrate how to order water tests based on turbidity.
- Be able to explain why a mussel is called a “filter feeder.”

MUSSELS: NATURE'S WATER FILTER CREATURES ACTIVITY – CONTINUED

Instructions:

1. Pass out the Mussels: Nature's Water Filter Creatures worksheet to students.
2. Place students in groups of two or three for this activity.
3. Show students where materials are located in the classroom and ensure each group has all supplies necessary for the activity.
4. Let students begin to construct the model.
5. Have students read the directions individually and ensure students understand the process of the experiment before allowing them to begin the tests.

Discussion Questions Answer Key:

1. In this model, what part represents the mussel gills? What represents the mussel's bivalve system?

A: Mussel gills are represented in the filtration material. The mussel bivalve system is represented by the tube.

2. The sponge, fabric, and cotton gauze change the water resistance on the intake side of the siphon. What does using different filtration materials model?

A: Each material demonstrates how a mussel's gill density changes their ability to filter feed. A mussel with dense gills will catch more food than a mussel with less dense gills.

MUSSELS: NATURE'S WATER FILTER CREATURES ACTIVITY – CONTINUED

Discussion Questions Answer Key:

3. Gravity and water pressure are important parts of how a siphon works. Fill in the blanks below based on how these forces affect filtration time

- a. If the height of the cup is **increased**, the average filtration time is expected to _____. This is because gravity pulls the water _____ from a greater height.
- b. If the height of the cup is **decreased**, the average filtration time is expected to _____. This happens because water moves _____ from a lower height.
- c. A **wider** tube might make the filtration time _____. This is due to the water pressure being _____ in a wider tube.
- d. A **thinner** tube might make the filtration time _____. This is because the water pressure is _____ in a thinner tube.

A: a. decrease/faster; b. increase/slower; c. increase/lower; d. decrease/higher

4. Compare the trial with sand to the average time for that same filtration material without the sand. Did the siphon stop before the water levels were equal or before the cup was empty? How does this trial model sedimentation in a river? How does sedimentation increase?

A: Expect the filtration material with sand to cause the time to increase. Water levels may vary. This trial shows the increased difficulty mussels face when sedimentation in the river increases due to human activity, such as construction.

MUSSELS: NATURE'S WATER FILTER CREATURES ACTIVITY – CONTINUED

Discussion Questions Answer Key:

5. What might happen to a river's health if mussels disappear from the ecosystem?

***A:** The water quality will decrease because of too many microorganisms in the water, depleting essential nutrients other organisms rely on.*



MAKE IT LOCAL 50+ MINUTES

Learning Objectives:

At the end of Make It Local, students will:

- Be able to list three local water-related environmental issues.
- Be able to locate and develop a project proposal.
- Be able to explain a plan with the supplies needed for a water-related environmental issue to be improved or resolved.

The instructor may assign the Research Essay portion of the activity for students to complete as a homework assignment or have the students complete it independently during class.

MAKE IT LOCAL – CONTINUED

Whether at home or in class, students need to have access to the internet via iPads/tablets/Chromebooks/laptops to complete the research portion. The Make It Local activity may be duplicated and assigned electronically in Google Classroom or printed out for students.

To extend the activity, the instructor may have students prepare to share their completed Make It Local plans in small groups and prepare a presentation to the class via PowerPoint or Google Slides.

Introduction Script:

Towards the end of the documentary, Gary says “Environmental science is crucial to how we all live. It adds value to people’s lives individually and adds value to the community.”

Through speaking with the public at Friends of the Fox River educational events like “Fox River Day” Gary and Jenni encourage people to join in evaluating river water quality and provide experiences to connect with the Fox River. They hope to inspire people to care for the river ecosystem through personal experiences like water quality testing with macroinvertebrates and activities like kayaking.

During this final activity, we will learn about issues affecting our local environment, determine and present the issue of importance, and research current solutions for this issue and propose a plan of action to implement this solution in your local water source.