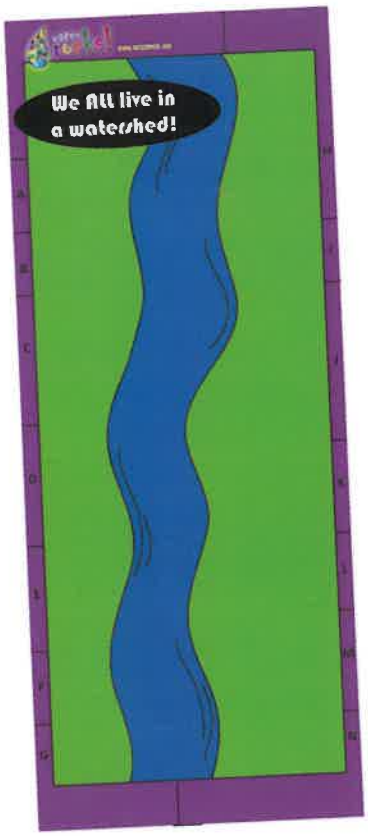
water rocks!

WE ALL LIVE IN A WATERSHED
ACTIVITY KIT

Recommended for Grades 3 - Adult
(Most effective with groups of 30 students or less)



Kit Contents:

- Vinyl watershed banner
- 15 Velcro-backed foam core puzzle pieces
- Clear plastic gallon jar
- 30 wet erase markers in pencil case
- Sediment (cocoa)
- Fertilizer (green drink mix)
- Pesticide (lemonade mix)
- Human/Animal Waste (crushed cookies)
- Bacteria (rice)
- Shampoo/Personal Care Products (purple drink mix)
- Oil (soy sauce)
- Wet wipes

Additional Supplies Needed:

- 15 cups (can be disposable, plastic, or glass)
- 6 spoons (metal or plastic)
- 1 gallon water
- Kitchen/food service gloves (recommended for keeping hands clean when wiping off puzzle pieces)
- Cloth or paper towels (recommended for drying off puzzle pieces after cleaning)

Instructions:

1. Discuss with students the definition of a watershed: an area of land that drains to a common water body. Just like dogs shed their fur or snakes shed their skin, water also sheds off the land when it rains!
2. The human hand is a great, simple visual to help students better understand the concept of a watershed. Ask each student to hold out a hand in front of them like a cup, with their fingers 'stuck' together tightly. Imagine rain drops falling on your hand. Where will the water go?
   In the cupped hand, all water flows down to the lowest point, e.g. the palm. This is the same thing that happens out in the environment around us; water flows across the land, moving from the highest point(s) to the lowest point within a watershed.
3. Divide the class into pairs for the "We All Live in a Watershed" activity and lesson.
4. Distribute one puzzle piece (piece of land) and two wet erase markers to each group.
5. Prompt the students: If you had $5 million to do whatever you'd like on your land, what would you do? What would you build? How would you spend the money?

6. Working together in pairs, give students 5-10 minutes to illustrate on their puzzle pieces how they would spend their $5 million. Encourage students to get creative – draw pictures, use words, etc. to show the class how they would use their money.
7. While the students are drawing on their puzzle pieces, fill the clear jar approximately ⅓ full with water.
8. Fill cups (enough for one per group) approximately ⅓-½ full with water.
9. After the designated 5-10 minutes is up, collect all puzzle pieces and markers from the students. Velcro each puzzle piece on to the vinyl watershed map in its appropriate location, as noted by the alphabet letters on the back of each piece and corresponding letters on the borders of the vinyl watershed map.

10. Students are often VERY curious about what all of their classmates built on their respective pieces of land! It works well for the teacher to quickly go piece-by-piece, summarizing what was built on each land parcel.
11. Discuss the concept of water quality. Show students the water in the clear plastic jar, indicating this is what the water in the river may have looked like before anything was built on the land. Poll the class – How many students would swim in that water? How many would drink that water?
12. Ask students if and how the water quality might change as a result of everything that was built in the watershed. Remind them of the concept of a watershed; all the rain that falls in the watershed eventually ends up at one common point, i.e. the river.

13. Discuss the differences between point source and nonpoint source pollution (see sidebar). Ask students what pollutants might be transported to the water as a result of their land development choices. Trash is usually suggested right away, but we want to challenge students to dig deeper. Some additional possible pollutants include:

    a. **Sediment:** Another word for sediment is soil. Iowa has some of the richest soil in the world! However, when soil is bare or unprotected, wind and water can easily pick it up and move it, in a process called erosion. This can happen in farm fields, gardens, and even construction sites. Did you know? Sediment is Iowa's #1 pollutant.

    b. **Fertilizer:** Fertilizer is food for plants. However, what happens if fertilizer is applied right before a rainstorm? The plants haven't had a chance to use all of the fertilizer, so it can easily get washed away into streams, rivers, and lakes, where it becomes food for algae!

    c. **Pesticides:** Pesticides are chemicals that are used to get rid of pests, including unwanted insects or plants (e.g. weeds, dandelions, etc.). Like fertilizer, these chemicals can also easily wash off the land into rivers, streams, and lakes.

    d. **Human/Animal Waste:** It's a fact of life… everybody poops! Human waste is treated by septic systems and wastewater treatment plants, but animal waste is not. Think about the waste from dogs, cats, geese, deer, cows, and pigs… And Human/Animal Waste is a BOGO (Buy One, Get One Free) opportunity, because whenever you have human/animal waste, bacteria comes 'free.'

    e. **Bacteria:** Bacteria occurs naturally in the guts of humans and warm-blooded organisms. However, elevated bacteria levels (e.g. certain kinds of E. coli) in the environment can lead to beach closings and restrictions on water use.

    f. **Shampoo/Personal Care Products:** Think about the products you use every day – soap, shampoo, toothpaste, mouthwash, and more – where do these things go once they go down the drain? All of our water systems are connected. What does this mean for the fish and other aquatic life? What does this mean for humans?

    Optional: For older students, you may also want to bring up such items as caffeine and medications. Excess caffeine and medications (e.g. ibuprofen) are excreted from our bodies, go down the toilet and down the drain, entering the water supply. Wastewater treatment plants cannot effectively remove all of these complex chemicals, so while they're present at very low levels, they are slowly building in our water supplies. One example of these 'emerging contaminants' is that scientists have found elevated levels of caffeine in several Iowa water bodies!

    g. **Oil:** Oil can come from many sources, such as factories and industry, and can be a particular challenge in urban settings. Think about the big parking lots that you'd find at WalMart or Target or at a football stadium – there's a lot of potential for oil and gas to leak from all those cars! (Many students are familiar with oil as being detrimental to water quality after the extensive media coverage of the 2010 Gulf of Mexico oil spill.)

Point Source Pollution: Pollution from a known stationary location, such as waste discharge from an oil refinery.

Nonpoint Source Pollution: Pollution coming from many diffuse sources across the watershed. Rainfall and snowmelt moving across the land and through the ground can pick up and move sediment, nutrients, bacteria, and more.

14. Ask each group of students to determine at least one type of pollution that would be coming from their land as a result of what they built.
15. Invite one representative from each group to come up to the front of the room. Give him/her one cup of water and add a small amount of the appropriate "pollutant(s)" to their glass.
16. Just as all water flows to a common point in a watershed, remind students that all of the water from each piece of land in our watershed eventually flows into the same river. One-by-one, have students pour their glass of water into the large "river" jar and see how the water quality changes!
    *For the most effective lesson, start with students who have minimal pollution, such small amounts of sediment or human/animal waste, and work your way up to those that have highly colored/polluted waters, adding the fertilizer and personal care/shampoo cups last.
17. Introduce the "cumulative effect" concept. Each of us makes a seemingly small amount of pollution, but when it's added together with everyone else in the watershed, collectively it can have a pretty big effect. It all adds up – that's what the cumulative effect is all about.
18. Once all of the students have added their contributions to the river jar, you will likely have a pretty gross-looking chemical cocktail! Poll the class again – How many students would swim in the river now? How many would drink the water?

19. We know that most of our water bodies do not look quite like this, so how does our water get cleaned? Discuss the ways in which our water is cleaned, filtered, and purified, including but not limited to:
    a. The water cycle (Water molecules are cleaned as they evaporate, condense, and fall as precipitation)
    b. Passing through plants and other organisms
    c. Soaking (infiltrating) into the soil – soil is an amazing filter!
    d. Passing through wetlands
    e. Human-made systems, including water and wastewater treatment systems
20. Finish the lesson by reviewing key terms including watershed, point/nonpoint source pollution, cumulative effect, and different types of pollution. Conclude by discussing action items – what students can do to best protect our water resources!

Clean up: Carefully dispose of the "polluted" water in your river jar. Ideally, dump it outside in a grassy area; if an outdoor location is not available, carefully dump it down a well-draining sink. Rinse and dry the jar. Clean the puzzle pieces using wet wipes.
*It is highly recommended to wear disposable gloves to keep your hands relatively clean in the process! Dry puzzle pieces with a cloth or paper towel to reduce streaking and get the most possible uses out of your kit.

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