Lesson Twelve - Water Quality

Objective: Students learn about the importance of clean water and see the effects of pollution using the watershed model and Fairy Shrimp.

Time: 45 minutes

Key words: wastewater, urban runoff, storm drains, pollutants, fertilizers, pesticides, antifreeze

Materials:
Watershed model
Spray bottle and food coloring
9 live Fairy Shrimp
3 petri dishes for Fairy Shrimp, labeled "Soap," "Oil," and "Control"
1 drop liquid soap
1 drop cooking oil or motor oil

Advanced Preparation:

- Set up materials for experiment.
- Make copies of Student Pages titled "Wastewater and Runoff" and "Keeping Our Water Clean" and Worksheet titled "How You Can Keep Runoff Clean."

Procedure:

1. In small groups, have students discuss and define water pollution. Share with class.
2. Bring out the watershed model. Drip red food coloring on the valley floor (to simulate pesticide). Spray valley with water (rain). Discuss movement of pesticide to other parts of the watershed via runoff.
3. Pass out and read the Student Pages "Wastewater and Runoff" and "Keeping Our Water Clean." Add to portfolio.
4. Pass out and read the City of Sacramento water pamphlet.
5. Pass out and review the "How You Can Keep Runoff Clean Worksheet." Use the pamphlet for information.
6. Set out 3 petri dishes containing the same kind of bottled water used to grow the Fairy Shrimp. Label the petri dishes: Soap, Oil, and Control. Do not use covers.
7. Add 3 Fairy Shrimp to each container. Add one drop of common liquid soap (to simulate washing cars) to the petri dish labeled "Soap." To the "Oil" dish, add a drop of cooking oil or motor oil (to simulate illegal dumping of waste engine oil into storm drains). Add nothing to the Control container. The purpose of the Control is to test if the Fairy Shrimp can survive in clean water during the test period without exposure to pollutants. Keep and feed the Fairy Shrimp under the same conditions as in the Fairy Shrimp growth habitat pan.
8. Ask the students what they expect to happen to the Fairy Shrimp. Record the condition of each batch of Fairy Shrimp at two-hour intervals during the first two days. If they are still alive after two days, you can add another drop of pollutant to each dish. Record your results for two more days and share them with Splash scientists.
9. Discuss the effect of the concentration of a pollutant on aquatic life.
10. Return any live Fairy Shrimp to the habitat pan and continue to care for the shrimp.

Evaluation/Extension:

- Students complete the Worksheet and add it to the portfolio.
- Discuss impact of pollution on critters and their food web.
- Offer extra credit to students who complete the "Lab Report" Worksheet from Lesson 4 to report on this Fairy Shrimp Experiment.

Water Quality

Wastewater and Runoff

There are two kinds of "used water" that affect water quality. The water we use indoors is one. It flows from our sinks, bathtubs, showers, toilets and washing machines into underground pipes that make up our Sacramento sewer system. Once this indoor water enters the sewer system, we call it **wastewater**. Imagine what would happen if we dumped wastewater in the river!

The second kind of "used water" is runoff. Runoff from towns and cities like Sacramento is called **urban runoff**. Urban runoff carries pollutants washed from our houses, yards, cars, and driveways into street gutters and down the **storm drains**. From here another set of underground pipes takes it straight to our streams. Even small amounts of **pollutants** in urban runoff are enough to pollute the streams.

Urban runoff happens year round, even in dry weather. If people over water their lawns and gardens, the runoff spills into the storm drains. This sends **fertilizers** and **pesticides** into our streams. When people wash their cars, the dirty, soapy water ends up there too. Some people even use the storm drains to illegally dump paint, oil, and **antifreeze**. They do not know or do not care how their actions pollute our streams and impact our water quality.

Water Quality

Keeping Our Water Clean

Less than 100 years ago, people used streams as their sewer system. Wherever there were people, streams were polluted by wastewater. The wastewater smelled bad and killed almost all the plants and animals living in the streams. The streams carried diseases in the wastewater from one community to those downstream of it. People got sick and died just from drinking the water.

Today the quality of the water in our streams is much better than it was just 50 years ago. Almost all communities now treat their wastewater to remove pollutants before it is sent back to our streams. The Sacramento Wastewater Treatment Plant cleans our wastewater. The cleaned water is put back into the Sacramento River so people downstream of us can use it safely.

Although we have succeeded in cleaning up most wastewater, we still need to clean up our urban runoff. Because there is so much runoff, we cannot send it to a treatment plant. The best way to protect streams from polluted runoff is to keep pollutants from getting into runoff in the first place. You and your family can help to keep runoff clean by doing some simple things to reduce your contribution to pollution.

When you reduce your pollution contribution, you are helping thousands of aquatic species that depend on clean water for life in our streams, lakes and wetlands.

Name:_____

How You Can Help Keep Runoff Clean Worksheet

Would you like to help keep our water clean? Read the brochure your teacher has for you then answer these questions.

Show What You Know

The table below lists some of the sources of pollutants that contaminate runoff. Can you think of ways that you and your family could reduce your pollution contribution? Put your ideas in the third column. Share this information with your family!

Urban Runoff Sources	Pollutants	Your Ideas for Reducing Pollution
Gardens & Lawns	**Pesticides** **Fertilizers**	
Homes	**Paints** **Soap/Detergents**	
Cars **Roads** **Parking lots**	**Oil** **Gas** **Car exhaust** **Tire wear** **Anti-freeze**	
Pets	**Pet wastes**	
Other Ideas:		