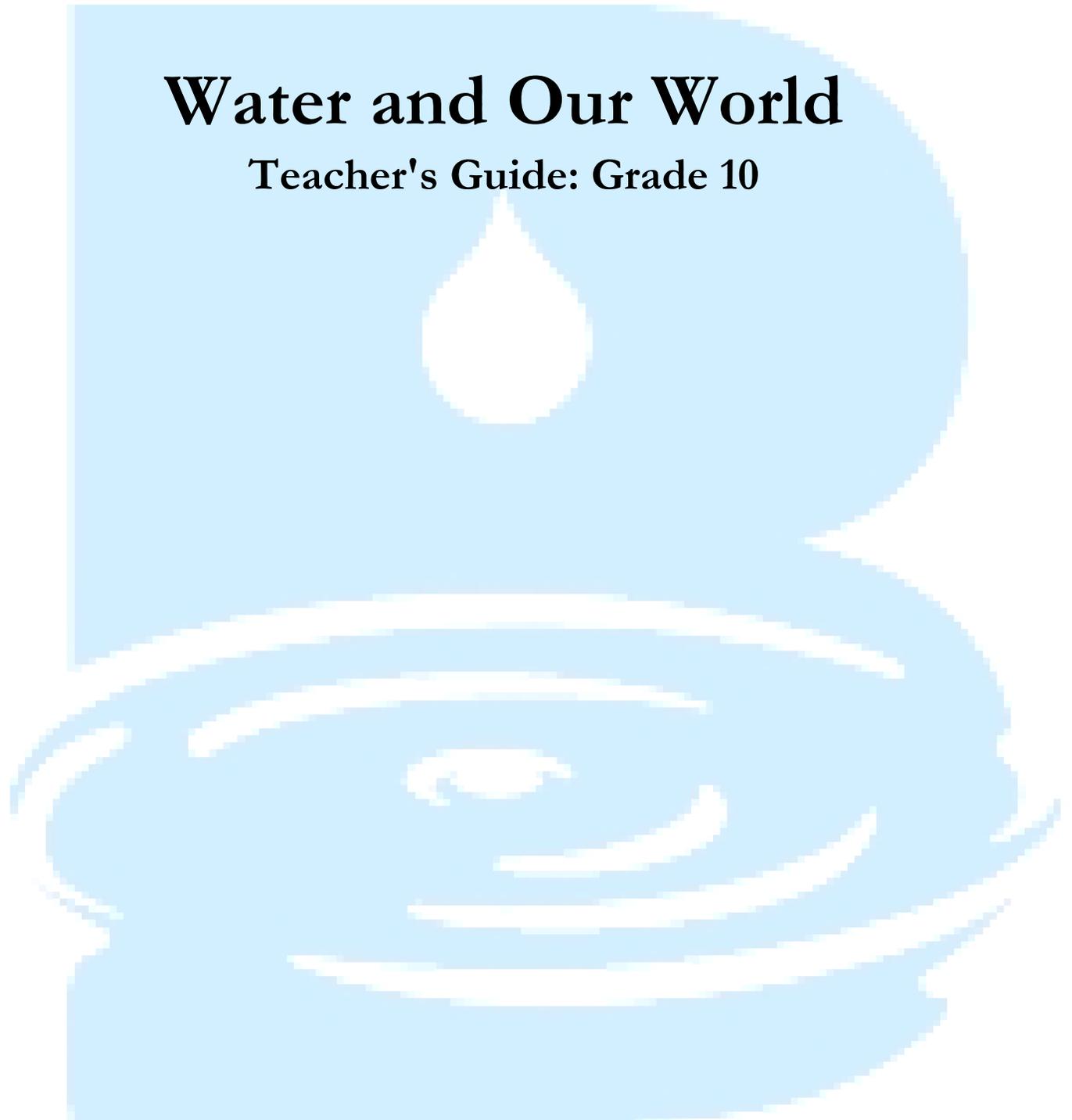


Water and Our World

Teacher's Guide: Grade 10



Beaver **Water** District

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Lesson 2: Chemical Testing of Water

Purpose

Students will measure and analyze nutrient levels in water to determine types of pollution present. Information learned from the field investigation will allow students to think about possible sources of pollution upstream.

Objective

- The students will be able to design an experiment.
- The students will investigate water quality and nutrient levels in surface water and learn possible sources of pollution found.
- The students will learn what each chemical test (nitrate, phosphate, chlorine, dissolved oxygen, ammonia, pH) is identifying as a possible source.

Arkansas Framework Correlation

Science

10th Grade

PD.1.ES.11 Describe the physical and chemical properties of water

PD.1.ES.19 Describe the cycling of materials and energy:

- nitrogen
- oxygen
- carbon
- phosphorous
- hydrological
- sulfur

BD.2.ES.9 Explain how limiting factors affect populations and ecosystems

SP.3.ES.3 Explain common problems related to water quality:

- conservation
- usage
- supply
- treatment
- pollutants (point and non-point sources)

NS.4.ES.1 Collect and analyze scientific data using appropriate mathematical calculations, figures and tables

NS.4.ES.2 Use appropriate equipment and technology as tools for solving problems e.g., microscopes, centrifuges, flexible arm cameras, computer software and hardware)

Problem Question

How do pollution sources affect a stream?

BACKGROUND INFORMATION

Teacher: There are several water quality monitoring test kits available. You can purchase inexpensive kits like the testab kits or really expensive, more technical kits from Hach. The inexpensive testab kits are easy and student-proof. It is a great way to introduce the topic. The kits give background and detailed information on each nutrient.

Websites for ordering test kits:

<http://www.h2ou.com/L1980.pdf>

<http://www.flinnsci.com/store/Scripts/prodView.asp?idproduct=21605&noList=1>

<http://www.amazon.com/Mini-Oxygen-Test-Freshwater-Saltwater/dp/B0002ARBBO>

<http://www.lamotte.com/pages/edu/tablet.html>

Good sources for this topic:

www.bwdh2o.org

www.epa.gov

www.agfc.com

<http://www.k12science.org/curriculum/waterproj/index.shtml>

Students: No background is needed if you want to do a true inquiry lab. If you want to have a guided lesson, then inform students about sources of these nutrients:

- Nitrate – animal waste
- Phosphate – soaps, fertilizers, wastewater
- Ammonia – decomposing organic waste
- Chlorine – treated water, city water
- Dissolved Oxygen – amount of free oxygen present in water
- pH – acidic/basic

Keywords

- Chemical testing
- Nitrate
- Phosphate
- Chlorine
- Ammonia
- Dissolved oxygen
- pH

Timeline

This lab can be performed in one class period. Student presentations would be another period.

Materials

- Lamotte water quality monitoring kit or Testab individual nutrient kits
-

Teacher Preparation

Very little preparation is needed. We suggest identifying your water location to be tested. How easy is it to get to the water? How long does it take to get there? You can also collect some water from your location and have it in the classroom to be tested.

Additional Resources

Resources for materials not included:

UA Center for Math & Science Education

<http://www.uark.edu/~k12info/>

479.575.3875

Northwest Arkansas Education Co-Op

<http://starfish.k12.ar.us/web/>

479.267.7450

Beaver Water District

www.bwdh2o.org

479.717.3807

Know of other resources? Please let us know!

education@bwdh2o.org or 479.756.3651

7E's Chemical Testing of Water

Elicit

Look for stories of local water quality problems. Watch the “Troubled Water” video or other news stories about water quality. Propose to students an investigation is needed about a problem in the water. Use the test kits to try to identify the possible source of the problem.

Engage

Have the students investigate local water quality problems. Look at previous investigations and solutions. Develop teams in class and have them discuss their pre-investigation.

Explore

Have the teams of students assigned to one chemical test each. Each team reads the instructions in the kit. Have the students move to their class lab station and begin test on collected water or move students to the testing location outside. Students will then perform their chemical test with several repetitions and return to the classroom for analysis.

Explain

Have the students groups display their findings and explain possible sources of pollution upstream. Have students use Powerpoint, graphs, or other media to explain.

Elaborate

Students can explain possible urban and agricultural sources of pollution.

Evaluate

Evaluation can be performed for field study and lab techniques, display of information, and unit test.

Extensions

Further investigation could be performed throughout the area or in their neighborhood. Evaluate city or local water source problems. These test kits are very easy and inexpensive so the students can take them home.