Water Quality

4th-6th Grade Lesson Plan, BLM Campbell Creek Science Center

Big Ideas: Systems, Interconnectedness, Stewardship

Enduring Understandings:

- Humans and other living things depend on healthy waterways to survive.
- Human actions impact water quality in negative (e.g., urban runoff, development, dog waste, etc.) and positive (e.g., water treatment, greenbelts, etc.) ways.
- Scientists use observation, traditional knowledge, and water quality tests (e.g., temperature, dissolved oxygen, etc.) to evaluate the health of waterways.

Module Questions:

- Why is water quality important?
- How do scientists measure water quality?
- How can people's actions impact water quality?

Standards:

Science

4-ESS2-1 Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

English Language Arts

CCSS.ELA-LITERACY.RI.4.5
Describe the overall structure of events, ideas, concepts, or information in a text or part of a text.

CCSS.ELA-LITERACY.RI.4.7
Interpret information presented visually, orally, or quantitatively and explain how the information contributes to an understanding of the text in which it appears.

CCSS.ELA-LITERACY.W.4.8
Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.

CCSS.ELA-LITERACY.RI.5.3
Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.

Mathematics

CCSS.MATH.CONTENT.3.MD.B.3
Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs.

CCSS.MATH.PRACTICE.MP3 Construct viable arguments and critique the reasoning of others.

CCSS.MATH.PRACTICE.MP4 Model with mathematics.

CCSS.MATH.PRACTICE.MP5 Use appropriate tools strategically.

Activities:

I. Module Introduction: What Is Water Quality?
II. Lesson 1: Water Temperature
III. Lesson 2: Dissolved Oxygen
IV. Lesson 3: Human Impacts
V. Lesson 4: Healthier Waterways
VI. Module Reflection: Design a Watershed

Assessments:

- Lesson reflections
- Module reflection
- Module pre- and post-assessment

Learning Activities:

Module Introduction: What Is Water Quality? (30 min.):

Objective: After learning about water quality in the introduction, students will make logical predictions about how their community evaluates water quality.

Materials:

- science journal or a piece of paper
- pencil (or something to write with)

Procedure:
Read the information about water quality on the slides and learn about the factors that scientists use to determine water quality. When prompted, write down at least five ways you use water in your daily life.

Reflection:
In your community and culture, how do you determine if water has healthy water quality?

Extension Activity:
Ask an elder or someone in your family why healthy water is important to them.

Lesson 1: Water Temperature (60 min.):

Objective: After practicing how to create and analyze a bar graph during the lesson, students will accurately draw a bar graph representing average water temperature data and use the graph to correctly answer questions about the data.

Materials:

- graphing paper and/or science journal or a piece of paper
- ruler (or a straight edge)
- pencil (or something to write with)

Procedure:
Follow the slides through a step-by-step example of interpreting water temperature measurements, including how to read a table and draw a bar graph.

Reflection:
Maddy recorded the average water temperature in another waterway in Alaska each August for four years. Here is what she found:

Average August Water Temperature in the Raven River

Year	Average Temperature (°F)
August 2019	60
August 2020	60
August 2021	67
August 2022	75

Draw a bar graph of the information in the table.
Use the graph to answer the following questions:

- What was the **coldest** average water temperature Maddy measured?
- What was the average water temperature in **2021**?
- In what two years was the average water temperature the **same**?
- Which bar on your graph is the **tallest**?
- How do you think the water temperature might have affected **salmon** in the Nerka River in August 2020?

Lesson 2: Dissolved Oxygen (60 min.):

Objective: After evaluating water temperature and dissolved oxygen in the lesson, students will accurately compare the temperature and dissolved oxygen in two rivers and determine which river has healthier water quality for fish.

Materials:

- science journal or a piece of paper
- pencil (or something to write with)

Procedure:
Read through the slides to learn about dissolved oxygen. Then, follow the slide directions to “choose your own adventure” for testing water quality in two example waterways.

Reflection:
A hydrologist wanted to find out about the water quality in two waterways in Alaska: River A and River B. She tested the two rivers for temperature and dissolved oxygen.

- River A had a water temperature of 48°F. A water sample from River A turned dark blue, which means a high amount of dissolved oxygen was present.
- River B had a temperature of 75°F. A water sample from River B turned light blue, which means a low amount of dissolved oxygen was present.

In which river would you expect to find more fish, River A or River B? Why? Explain your answer.

Lesson 3: Human Impacts (60 min.):

Objective: After using tour to explore human impacts in the Campbell Creek Watershed, students will describe at least one way people affect waterways and logically hypothesize how urban runoff might impact downstream areas of a watershed.

Materials:

- science journal or a piece of paper
- pencil (or something to write with)

Procedure:
View the lesson slides to explore human impacts on the watershed. Students will answer the questions in the slides in their journal.

Lesson 4: Healthier Waterways (60 min.):

Objective: After using a tour of the Campbell Creek Watershed to explore solutions to human impacts in watersheds, students will brainstorm at least one action they can take to improve water quality in their watershed.

Materials:

- science journal or a piece of paper
- pencil (or something to write with)

Procedure:
View the lesson slides and follow along on the tour to learn more about solutions to human impacts in watersheds.

Reflection:
Be a steward of your watershed! A steward is a person who takes care of the land and

the natural environment.
What is one thing you can do to make sure your watershed has healthy water quality?

Module Reflection: Design a Watershed (60 min.):

Objective: After completing the lessons in Module 2, students will design and describe a model watershed and logically analyze the water quality in their model.

Materials:

- Available items to build a model watershed. Some suggestions:
  - a large container or baking sheet
  - material that you can mold into a watershed (snow, sand, playdough, flour, etc.)
  - cardboard
  - figurines or small toys
  - paper, pens, markers, or crayons (if you want to draw your model watershed)

Procedure:
Use knowledge gained in the module and creativity to design a watershed with healthy water quality. Your model can be two- or three-dimensional. As you design, think about how to include human developments, such as roads and houses, while minimizing pollution, urban runoff, erosion, and other impacts to the land and water.

Feel free to include some or all the following features in your watershed:

- plants and animals
- your home
- your school
- roads
- greenbelts
- wetlands
- a dog park or dog yard
- a water treatment system

Reflection:
Describe your watershed.

- How did you decide where to put all the features?
- Why does your model watershed have healthy water quality?