

Lesson Plan

Grade: Grade 5
School: Fair Hill Nature Center
Subject: Outdoor Education
CCPS Lesson: Water Quality Assessment
Season: Fall 2016

Time Frame: 3.5 hour lesson

STEM Approach: Science, Social Studies

Overview:

Students will investigate water quality by conducting their own water quality assessment. They will be collecting physical, chemical, and biological data that will be uploaded into FieldScope, National Geographic's citizen-science mapping database. Students will explore and discuss the concept of a watershed. They will be introduced to microscopes and talk about the consequences of micro-plastics. Students will use a Scavenger Hunt to assess physical water quality.

Introduction: Discuss the term "watershed" and use the EnviroScape to illustrate the connections that exist between the land, groundwater and rivers/lakes. Have the students name the 5 rivers in Cecil County and ask them the name of our watershed. Explain "water quality assessments" and explain that we will be splitting up into teams to conduct our own assessments. *Define: watershed, runoff, pollution, nutrients, erosion, groundwater*

Biological Testing- Macroinvertebrates: Hunt in the creek for macro-invertebrates. Discuss aquatic insect lifecycles. Discuss stream life as an indication of stream health, how scientists use biological data to draw conclusions. Discuss creek food chain (bacteria, plankton, macro-invertebrates, insects, tadpoles, fish, birds, snakes). Observe the day's catch and discuss what it indicates about our stream. *Define: aquatic insect, lifecycle, indicator species, plankton, pollution.*

Biological Testing- Microinvertebrates: In partners, have the students collect pondwater samples in test tubes. In the laboratory, each student sits at their own microscope. Explain the parts of the microscope, how to focus it, how to make a slide, and how to find the moving plankton. Show the students the plankton diagrams and explain phytoplankton vs. zooplankton. Allow the students to hunt for plankton, provide assistance as needed, and use the stereoscope for group viewing. *Define: microscope, slide, specimen, phytoplankton, zooplankton, and identify specific creatures students may find. Important: This is the first time CCPS students are using microscopes, take your time, be thorough*

Physical Testing: Students will make physical assessments of the Big Elk Creek: turbidity (Secchi disk), temperature, color and odor. Other physical data points will be collected with the Scavenger Hunt. *Define: turbidity (clarity/cloudiness), Fahrenheit vs. Celsius, the importance of temperature, color and odor.*

Chemical Testing: At the Pavilion, orient the students to what chemical qualities we will be exploring in the Big Elk Creek. Ask the students what pH is and show them the pH Scale/Periodic Table diagram. Define dissolved oxygen, ask the question- Do we want oxygen in our water? Does any aquatic animal need it? Discuss what adds oxygen to water/what removes oxygen from water. Define conductivity and what can increase/decrease the conductivity in the water. Have the students predict the desired parameters for a healthy creek. At the creek, take turns using the Probeware and recording the data.

Microplastics: Have the students observe the bird seed for 10 seconds, and ask them if it looked funny. Point out the plastic beads and ask them where plastic comes from. Show the students the images of animals affected by plastics and discuss ways that we can keep plastics out of our waterways.

Closing: Bring class back together to discuss their Water Quality Assessments. How clean is Fair Hill’s water? How clean is water in their neighborhood? *Take home words: watershed, plankton, indicator species, pH, turbidity, conductivity, dissolved oxygen, water quality.*

Essential Questions and Enduring Understandings:

What is a watershed?
 Why is water quality important?
 How do scientists measure water quality?

Contents (X)	Science	Technology	Engineering	Math	ELA	SS
	X					X

Standards Addressed in Lesson:

Science

Maryland Environmental Literacy Standards (MELS)

Standard 7: Topic A: Environmental Quality

Indicator 1: Investigate factors that influence environmental quality.

Topic B: Individual and Group Actions and the Environment

Indicator 1: Examine the influence of individual and group actions on the environment and explain how groups and individuals can work to promote and balance interests through:

Topic C: Cultural Perspectives and the Environment

Indicator 1: Investigate cultural perspectives and dynamics and apply their understanding in context to:

Topic D: Political Systems and the Environment

Indicator 1: Understand how different political systems account for, manage, and affect natural resources and environmental quality.

Standard 8: Topic A: Intergenerational Responsibility

Indicator 1: Understand and apply the basic concept of sustainability to natural and human communities.

Topic E: Limits of Ecological Systems

Indicator 1: Investigate and make decisions that demonstrate understanding of how the dynamics of ecological systems affect the sustainability of social, cultural systems and economic systems.

NGSS

4-ESS3-2 Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans

Reading

RI.4.7 Integration of Knowledge and Ideas - Interpret information presented visually, orally and quantitatively and explain how the information contributes to an understanding of the text for which it appears.

Materials/Resources:

- EnviroScape Watershed model
- Buckets, nets, boots, creature peepers
- Test tubes, plankton nets
- Microscopes
- Plankton diagrams
- Scavenger Hunt/Water Quality Assessment
- Secchi disk, thermometer, bucket/rope
- Verneir Probeware- pH, conductivity, temperature, dissolved oxygen probes
- Diagrams: turbidity, pH/Periodic Table, Temp, DO
- Bird seed/microplastics

Know	Understand	Do
<p>The definition of:</p> <ul style="list-style-type: none"> ● Watershed ● Water quality ● Biological, physical, chemical ● Macro/microinvertebrates ● Phytoplankton, zooplankton ● Indicator species ● pH, dissolved oxygen, conductivity 	<ul style="list-style-type: none"> ● A watershed is the area in which all water flows to one point (Chesapeake Bay). Rain, rivers, lakes, groundwater. ● Humans affect the watershed with our daily actions. ● Scientists study the quality of the water by testing the biological, chemical and physical parameters. ● The presence of certain aquatic insects show us that a stream is healthy. ● Underwater plants and animals need oxygen. ● Turbidity is the measurement of clarity/cloudiness. ● Conductivity is the measurement of total dissolved solids (hidden pollutants). 	<ul style="list-style-type: none"> ● Complete a Water Quality Assessment/Scavenger Hunt ● Hunt in the stream for aquatic insects. ● Collect plankton samples and view them under microscopes. ● Measure the physical parameters of the Big Elk Creek. ● Measure the chemical parameters of the Big Elk Creek.

Assessments: (Evaluation)

- Water Quality Assessment results
- Teacher evaluation forms
- Post field trip discussion

STEM Careers:

- Environmental Engineer
- Watershed Management
- Department of Public Works
- Aquatic Scientist