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8th Grade Science**



<p>Unit Title</p> <ul style="list-style-type: none"> • <i>life issue</i> 	<p>Are Boone County Creeks Healthy?</p>
<p>Targeted Standards</p> <ul style="list-style-type: none"> • <i>the content and process skills taught in the unit that are assessed</i> 	<p>Life Science Academic Expectations: 2.2 Patterns of Change, 2.3 Systems, 2.4 Scale and Models, 2.5 Constancy, and 2.6 Change Over Time</p> <p>The Interdependence of Organisms</p> <p>SC-H-3.5.1 Atoms (e.g., carbon, nitrogen) and molecules (e.g., water) cycle among the living and nonliving components of the biosphere.</p> <p>SC-H-3.5.2 Energy flows through ecosystems in one direction from photosynthetic organisms to herbivores to carnivores and decomposers.</p> <p>SC-H-3.5.3 Organisms both cooperate and compete in ecosystems. Often changes in one component of an ecosystem will have effects on the entire system that are difficult to predict. The interrelationships and interdependencies of these organisms may generate ecosystems that are stable for hundreds or thousands of years.</p> <p>SC-H-3.5.4 Living organisms have the capacity to produce populations of infinite size. However, behaviors, environments, and resources influence the size of populations. Models (e.g., mathematical, physical, conceptual) can be used to make predictions about changes in the size or rate of growth of a population.</p> <p>SC-H-3.5.5 Human beings live within the world’s ecosystems. Human activities can deliberately or inadvertently alter the dynamics in ecosystems. These activities can threaten current and future global stability and, if not addressed, ecosystems can be irreversibly affected.</p>
<p>Essential Questions</p> <ul style="list-style-type: none"> • <i>set of questions that guides the direction of instruction and learning by focusing on the organizer</i> 	<ul style="list-style-type: none"> • What are abiotic and biotic factors? • What biological communities are in our streams? • What are the physical characteristics of streams? • What are the components of stream chemistry? • How are these abiotic and biotic factors related?
<p>Evaluation: Culminating Performance Event or Product</p> <ul style="list-style-type: none"> • <i>a complex task (or set of tasks) which allows students to demonstrate learning of the content and the processes and skills of the unit</i> 	<p>Students must submit <u>one</u> of the following:</p> <ul style="list-style-type: none"> • Brochure: (tri-fold) Students create an informative brochure that explains and summarizes quantitative and qualitative data collected throughout the unit, includes tips for preventing stream and river pollution, is visually appealing and provides a list of resources. The brochure should be grammatically correct and have no spelling errors. • Letter to the Editor: Students write a letter to the editor of a local paper (<i>The Boone County Recorder, The Kentucky Enquirer, or The Kentucky Post</i>) convincing the reader to agree with his/her conclusion about the quality of one of Boone County’s

	waterways. The writer must include qualitative and quantitative data to support his/her conclusion. The letter should be grammatically correct and have no spelling errors.
Scoring Guide <ul style="list-style-type: none"> criteria for assessing the quality of a student's culminating performance event or product 	SEE APPENDIX FOR RUBRIC
Ongoing Assessment: <ul style="list-style-type: none"> an inventory of assessments that will be performed to determine student understanding/mastery of particular concepts/skills 	1A: Stream Hike Journal: Biotic and Abiotic Factors 1B: Read and Respond: "Kentucky Stream Pollution" 1C: Watershed Map 1D: ORSANCO Guest Speaker (Pre and Post Test) 1E: Sanitation District No. 1 Guest Speaker (Pre and Post Test) 1F: Stream Scroll: Stream Order Classification 1G: Gunpowder Creek Water Quality Project Graphs 1H: Aquatic Food Web 1I: Stream Chemistry Lab Report
Enabling Knowledge and Process Skills <ul style="list-style-type: none"> the content, processes, and skills students must know and apply to successfully complete the performance event or product 	<ul style="list-style-type: none"> Students should be able to identify and distinguish between the properties and chemical compositions of clay, limestone, and shale. Students should be able to describe how sedimentary rock forms. Students should understand that atoms can combine in various ways to form compounds. Students should know and understand the chemical formulas for the following molecules, compounds and ions: carbon dioxide, water, phosphate ion, nitrate ion, sodium chloride, chlorine ion, sodium ion, magnesium ion, calcium ion, glucose, and carbonate. Students should be familiar with designing an experiment and be able to apply the concepts of control, independent variable, dependent variable, and constant. Students should know how to make a graph with the independent variable on the x-axis and the dependent variable on the y-axis. Students should know how to interpolate and extrapolate data from a graph and analyze trends in a graph. Students should be able to measure distance, volume of liquids, mass of solids and liquids, temperature using the metric system.
Instructional Assessment Activities <ul style="list-style-type: none"> on-going classroom activities that prepare students for the culminating performance/product and allow teachers to measure student progress 	1A: Stream Hike Journal: Biotic and Abiotic Factors <ol style="list-style-type: none"> In the classroom, review procedures and policies that need to be strictly adhered to while traveling to the park and hiking at the park. Students need to bring their journals and pencils. Have a variety of field guides available for student use and a whiteboard with marker. Have 7 disposable cameras available—1 per team of 4. (10 minutes) Students are transported to Gunpowder Nature Park. (Transport each class of students—about 28 in number—on separate days.) (30 minutes including loading and unloading) Students hike a 1.23 mile trail in which limestone, shale and clay deposits are exposed and visible. Encourage students to stop along the way to identify and/or photograph flora and fauna. (45 minutes) After the hike, students are to make a list (in their journal) of their observations throughout the hike. Enforce a silent time of no less than 20 minutes for students to then reflect and respond to the question, "Is Gunpowder Creek healthy?" in their journals. (25 minutes) Randomly call on at least 4 students to recite their list of observations. On whiteboard record the abiotic factors on one side

and the biotic factors on the other. Do not yet explain the rationale for sides but elicit student responses as to the commonalities of the items on one side and how they are different from the items on the other side. Elicit responses from at least 3 more students. Write the title, "ABIOTIC" on its corresponding side and "BIOTIC" on the other side. Ask students to define each term based on the examples of each term. (10-15 minutes)

6. Return back to the classroom and collect journals. **{ASSESSMENT 1A}**
7. During "Planning Time" read the journal entries and type sample excerpts from some of the journals (to disguise handwriting). The excerpts should include common beliefs, unusual beliefs, and any misconceptions.

1B: Read and Respond {Homework}

1. Students read the transcript of a July 31st, 2003 Channel 9 I-Team Newscast, "Kentucky Stream Pollution."
2. After reading the article, students should fold a page of their journal in half lengthwise and label the left side, "THEN" and the right side "NOW."
3. After reading the article students should record each observation and inference in its respective column.
4. Students then write 5 questions that the article has sparked. For example, "How does the glycol—de-icing fluid—gobble up the oxygen in the water?"
5. Students phrase 1 of their questions in such a way that it could be the problem statement for an experiment.
6. Collect and assess journals. **{ASSESSMENT 1B}**

1C: Watershed Map Making (Adapted from the Children's Discovery Museum)

1. Show the students the following maps of Kentucky: flat map, topographical map, and a relief map.
2. Discuss the possible uses of each type of map and the specific information each type conveys.
3. Model: Crumple a piece of 8.5" x 11" paper into a ball and then open it. Do not smooth it out flat. Have the students repeat this step.
4. Model: With a brown CRAYON, trace the "ridges" of the "mountains" starting at the tallest "peaks."
5. Model: With a blue CRAYON, trace the lowest points between all the ridges. This is where the creeks and rivers flow. At the lowest point where several creeks meet draw a freshwater lake.
6. Allow students time to perform task 5 and 6 on their own papers.
7. Model: Add green CRAYON along the riparian zone. Allow students time to do this step.
8. Allow students time to add human structures such as houses, farms, riding stables, roads, etc.
9. Discuss the term **watershed**. A watershed is the entire land area around a stream from which all runoff ends up in that stream. Ask students to point to a boundary of a watershed. Circulate and ask to what students are pointing. On one side of the ridge, the water ends up in one creek, and on the other side of the ridge, the runoff ends up in another creek. The ridge is the boundary between the watersheds of the two creeks.
10. Ask students to outline the watersheds in red CRAYON and predict what would happen if it rained on their mountain ranges. Are any houses, farms, industries, etc. on floodplains?
11. Hand out pipettes and small beakers of water (1 pipette per student and 1 beaker of water per team of 4) and make it rain. Hold the pipettes up above the maps so the water is not sprayed onto them

but falls from above. Watch carefully and examine and share results.

1D: ORSANCO Speaker: Erin Overholt

Arrange a guest speaker from ORSANCO to bring along portable models of groundwater contamination and surface runoff

1. Discuss the following during the program:
 - a. What is groundwater?
 - b. How does soil type affect groundwater (and contaminant) flow?
 - c. What are aquifers?
 - d. What is a well?
 - e. What factors affect runoff?
 - f. What are major contaminants in runoff?
 - g. Does groundwater quality affect surface waters?

1E: Sanitation District 1: Guest Speaker

Arrange a guest speaker from the Sanitation District.

1. Discuss the following during the program?
 - a. What is runoff?
 - b. What is storm runoff?
 - c. How does runoff affect water quality?
 - d. How is our sewer system related to river/stream water quality?
 - e. What has northern Kentucky done recently to prevent sewage overflow?
 - f. Does Cincinnati have a valid concern with the new wastewater treatment plant for Alexandria being upstream from Cincinnati's drinking source flow?
 - g. How efficient is the new stormwater basin at the Cincinnati/Northern Kentucky International Airport?

1F: Stream Scroll: Stream Order Classification

1. Teacher Prep: Read ***Small Stream Ecosystem Teacher's Guide***. Type the characteristics of streams of various sizes onto index-sized cards. Make 7 sets of cards—1 set per group of 4 students.
2. Distribute 1 copy of pages 6-13 of ***Stream Ecosystem Teacher's Guide*** to each pair of students and have students read the information in pairs. This can be done silently or quietly aloud.
3. When students complete the reading, they should classify the characteristics on the cards as those of a stream of order 1-3, 4-6, 7-11, or 12+. Students should show their classification system to a teacher to check for correctness prior to moving on to making the Stream Scroll. In groups of 4, students make a **Stream Scroll**. **{ASSESSMENT 1F}** Student 1 will be responsible for describing the flow and depth, Student 2 will be responsible for describing the plants, Student 3 will be responsible for describing the invertebrates, and Student 4 will be responsible for describing the fish of each section. The Stream Scroll should visually show how each of the characteristics change from an order 1 stream to a stream of order 12+. Students may choose to use pictures, graphs, flow charts, or concept maps but as the paper is rolled open, it should show the changes from an order 1 to order 12+ correctly.

1G: Gunpowder Creek Water Quality Project

1. In the classroom, prior to any of the water quality testing field trips, demonstrate and/or explain how to perform the field tests.
2. Visit the Gunpowder Nature Park and perform water quality tests including, but not limited to: latitude and longitude, pH, dissolved oxygen, flow rate, air temperature, water temperature, turbidity, biological index, habitat assessment, fecal coliform and

conductivity. (Transport each class of students—about 28 in number—on separate days during the same month. Each group of 4 students will have a separate task on each visit.) Allow ample time for demonstration of test processes on prior days. Turbidity can be demonstrated using milk of various dilutions. Dissolved oxygen can be performed using classroom aquariums. Train 4 chaperones ahead of time in field testing techniques; specifically dissolved oxygen, flow rate, biological index and habitat assessment. Monitor student testing. Students will continue to photograph using the disposable cameras.

3. Upon return to school, all students will record all data for each visit.
4. Using a computer/overhead system, demonstrate how to input numbers to create a table and then subsequent graph using the excel spreadsheet program.
5. Using the excel program, students enter and graph the data over time. Collect any 2 graphs (hard copies) of the student's choice.
{ASSESSMENT 1G}

1H: Aquatic Food Web

1. Students study the posters, *Kentucky Fish. Small Stream Ecosystem*, and *The Big River Ecosystem*.
2. Students choose 2 fish, one from the Ohio River ecosystem and one from a stream ecosystem. Students draw food webs for each of the fish. Each food web must show a minimum of 5 organisms.
{ASSESSMENT 1H}

1I: Stream Chemistry

1. Working in groups of 4, students develop an experimental design to test one of the following questions:
 - a. What is the effect of temperature on dissolved oxygen?
 - b. What is the effect of turbulence on dissolved oxygen?
 - c. What is the effect of living things on dissolved oxygen?
 - d. What is the effect of soil composition on pH?
 - e. What is the effect of excess phosphate on plant growth?
 - f. What is the effect of excess nitrate on plant growth?
2. Collect the experimental designs and check to ensure that the experiment has an independent variable and other variables are controlled. Check for exact quantities and materials. Check for a safe procedure that also meets safety guidelines when working with living organisms. Also initial/check the hypothesis, making sure it has a cause and effect portion, answers the problem statement, and can be tested.
3. Distribute back to students and conference with each team to double check that each member understands their experimental design and that each member has a task to perform.
4. Allow students to perform experiment.
5. When data has been collected—this could take several days or weeks depending on the experiment—students will write a formal lab report.
6. The formal lab report should include a problem statement, hypothesis, experimental design, data table, graph, and conclusion with analysis of data, summary of results, experimental and human errors, and a statement about the status of the hypothesis.
{ASSESSMENT 1I}

1J: News Article Discussion

1. Each student in the team of four is responsible for reading a different article related to Boone County streams. Each student is then responsible for conveying the information in the article to the other 3 members of the team. The articles are as follows:

	<p>a. “Airport Pollution Spreads 3 Miles”; Kentucky Enquirer; 5/9/01</p> <p>b. “De-icing Agent Found in Creek—Cause of Spill Still Unknown;” Kentucky Enquirer; 8/19/02</p> <p>c. “Waterways Join Polluted List;” Kentucky Enquirer; 8/19/02</p> <p>d. “Polluted Water Runs Through Kentucky’s Creeks;” Kentucky Enquirer; 7/11/01</p> <p>2. Students work as a team to identify facts from the article as leading to either an inference that Boone County’s streams are healthy or an inference that the streams are unhealthy as of today.</p> <p>3. Enforce a silent time of no less than 30 minutes for students to reread their initial response to the question, “Is Gunpowder Creek healthy?” and respond again to the same question. As a class, discuss what constitutes “healthy” and have students share and defend their ideas and question others’.</p> <p>4. Introduce and explain the summative evaluation options:</p> <p>Brochure: (tri-fold) Students create an informative brochure that explains and summarizes quantitative and qualitative data collected throughout the unit, includes tips for preventing stream and river pollution, is visually appealing and provides a list of resources. The brochure should be grammatically correct and have no spelling errors.</p> <p>Letter to the Editor: Students write a letter to the editor of a local paper (<i>The Boone County Recorder, The Kentucky Enquirer, or The Kentucky Post</i>) convincing the reader to agree with his/her conclusion about the quality of one of Boone County’s waterways. The writer must include qualitative and quantitative data to support his/her conclusion. The letter should be grammatically correct and have no spelling errors.</p> <p>1J: Camp Campbell Guard Overnight and Fishing Trip In the Fall, students will be attending Camp Campbell Guard’s Environmental Education Program. During this time students will have the opportunity to canoe and fish in the Great Miami River and private YMCA lake.</p>
<p>Resources</p> <ul style="list-style-type: none"> • supporting materials needed for the unit 	<p>Small Stream Ecosystem Teacher’s Guide; Kentucky Department of Fish and Wildlife</p> <p>Kentucky Fish. Small Stream Ecosystem, and The Big River Ecosystem posters from the Kentucky Department of Fish and Wildlife</p> <p>Gunpowder Nature Park: Sperti Woods south of Burlington in Hanover Park subdivision; outdoor classroom; 334-2117</p> <p>ORSANCO The Ohio River Valley Water Sanitation Commission (ORSANCO) Erin Overholt: Education Specialist 5735 Kellogg Avenue Cincinnati, OH 45228 Phone: (513) 231-7719</p> <p>Sanitation District No. 1 of Northern Kentucky Sara Zepf 1045 Eaton Drive Ft. Wright, KY 41017 859-578-7450 pziegler@sdl.org</p> <p>YMCA Camp Campbell Guard campstaff@ccgYMCA.org (513) 867-0600</p>

(877) 224-9622 (toll free)
(513) 867-0127 fax
Camp Campbell Gard
P.O.Box 122
Overpeck, OH 45055

1A: Stream Hike

Supplies per Class: 7 disposable cameras, variety of field guides, extra pencils, magnifying lenses, whiteboard, whiteboard marker

1B: Read and Respond {Homework}

Supplies per Class: 1 transcript of a July 31st, 2003 Channel 9 I-Team Newscast, "Kentucky Stream Pollution" per student

1C: Watershed Map Making

Per student: 1 pipette, sheet of 8 ½" x 11" sheet of paper

Per team of 4: blue crayon, green crayon, red crayon, brown crayon, and beaker of water

1D: ORSANCO Guest Speaker:

Groundwater contamination model; surface runoff model

1F: Stream Scroll: Stream Order Classification: 7 sets of stream order classification cards, class set (30 copies) of pages 6-13 of **Small Stream Ecosystem Teacher's Guide**, 11" x 17" paper for scrolls, various markers, crayons, colored pencils, and graph paper

1G: Gunpowder Creek Water Quality Project:

4 chaperones/volunteers

pH test kit, dissolved oxygen test kit, conductivity meter, CBL and temperature probe, GPS, 10 meters of string marked off every meters, stopwatch, ping pong ball, habitat assessment rubric laminated chart, small basins for caught macroinvertebrates, nets to catch macroinvertebrates, classification chart of macroinvertebrates, biological index chart, turbidity tube, sterile Petri dishes and fecal coliform media, cooler with ice, computers and excel program; printer

1H: Aquatic Food Web:

Kentucky Fish. Small Stream Ecosystem, and The Big River Ecosystem posters

1I: Stream Chemistry

The supplies for this activity will vary depending upon the materials students require.

1J: News Article Discussion

The following news articles:

"Airport Pollution Spreads 3 Miles"; Kentucky Enquirer; 5/9/01

"De-icing Agent Found in Creek—Cause of Spill Still Unknown;" Kentucky Enquirer; 8/19/02

"Waterways Join Polluted List;" Kentucky Enquirer; 8/19/02

"Polluted Water Runs Through Kentucky's Creeks;" Kentucky Enquirer; 7/11/01

APPENDIX



Brochure Rubric.htm