

**WATER QUALITY SURVEY: MONITORING THE SUSTAINABILITY OF
PIGEON CREEK**

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Earthwatch Live from the Field Fellow

Mammals of Nova Scotia Team 6: September 21- October 4, 2008

Water Quality Survey	Monitoring the Sustainability of Pigeon Creek (may substitute for any local watershed in your area)
Grade Level	Appropriate for Grades 9-12
Content Area(s)	Environmental Science, Biology, History (Students study the history and significance of watersheds) and Economics
Time Allotment	One period lecture (45 minutes); One period internet research (45 minutes); One day at a local watershed (canoes recommended-5 hours)
Academic Standards	Academic standards covered in this activity for the state of Indiana are as follows (please refer to the standard list included at the end of this lesson plan): 1.1, 1.2, 1.3, 1.4, 1.8, 1.9, 1.10, 1.11, 1.12, 1.14, 1.15, 1.28
Abstract	This lesson plan involves an in-depth study of a local watershed. Students will research the history of the watershed (Pigeon Creek in Southern Indiana) and discuss the significance of such riparian habitats. Discussions will include but not be limited to: riparian habitats, food chains and food webs, sustainability issues of aquatic habitats, the importance of field sign surveys, water quality measurement techniques, the economic importance of waterways, the history of the local watershed, as well as identification of the plant and animal life (including non-native species).
Goal	The goal of this interdisciplinary lesson plan is that students will be able to understand the significance of a watershed, how an ecosystem functions, and the role that humans play in altering the sustainability of any natural ecosystem.
Performance Indicators Objectives & Measurements	➤ Students will be able to perform the following field tests: pH testing; nitrates and phosphates measurements; and dissolved oxygen sampling.

	<ul style="list-style-type: none"> ➤ Students will be able to recognize field signs such as tracks, dens, nests, scat, etc. ➤ Students will be able to identify macro-invertebrates using a dichotomous key. ➤ Students will relate the history of the waterway to the economic importance of the waterway. ➤ Students will be able to identify native plant and animal species. ➤ Students will be able to identify the invasive zebra mussel and describe how non-native, invasive species disrupt an ecosystem. ➤ Students will identify the major pollutants of the creek and determine if human interference is necessary or if human interference is to blame. ➤ Students will be able to relate their actions on a local level to ecosystem destruction on the global level (discussions involve the hypoxic zone in the Gulf of Mexico).
Background Information	<p>Students will study the ecology unit prior to conducting the field survey. Students will complete a research survey of the history of Pigeon Creek (substitute for your local water way) before conducting field research. Lectures and discussion will focus on ecosystem functions and sustainability issues of riparian habitats.</p>
Materials	<ul style="list-style-type: none"> • Pigeon Creek Survey Worksheet (per teacher; may substitute for any local watershed) • Litmus paper and laminated pH scale • Plastic test tubes for testing • Dip nets • Magnifying viewer • Macro-invertebrate dichotomous key • Field Guides for Southern Indiana • Thermometer • Canoes, life jackets, paddles • Low Cost LaMotte Water Monitoring Kit Code 3-5885
Technology	<ul style="list-style-type: none"> • Internet access • MS Excel or word for graph making • LCD projector

	<ul style="list-style-type: none"> • Digital Camera
<p>Instructional Procedure</p>	<p>1) <u>Introduction:</u> Introductory material includes materials from the ecology chapters in the textbook. Lectures include power point notes on terrestrial and aquatic ecosystems, field signs and water monitoring. Students will spend one class period researching the history of Pigeon Creek (or any local waterway). Discussions will focus on sustainability issues of the watershed such as: silt and sedimentation, invasive species, longevity studies, human interference, and field procedures and expectations. See the survey of Pigeon Creek Worksheet at the end of this lesson plan.</p> <p>2) <u>Activities will include the following:</u></p> <ol style="list-style-type: none"> a) Field trip to Pigeon Creek b) Students will canoe approximately a 5 mile course of the 41 mile creek. c) Students will use dip nets and dichotomous keys to identify the macro-invertebrate species collected. d) Students will use magnifying viewers to clearly see and identify macro-invertebrates. e) Water temperature testing will be conducted at different points along the 5 mile canoe route. f) pH, dissolved oxygen, nitrate and phosphate testing will be conducting at various points along the 5 mile route g) Field sign investigation will include looking for tracks, nests, dens, feathers, scat, etc. along the bank of the riparian habitat h) Students will identify wildlife species along the canoe route using local field guides. i) Identify erosion and construction mismanagement j) Data will be collected and the information will be compiled using MS Word and Excel.

	<p>3) <u>Closure:</u> After the trip, students will work in groups to compare data. The groups will convene for a debriefing and discuss field findings. The students will be able to make connections and understand how their individual actions (such as fertilizing their lawn) can directly affect local watersheds. Students will discuss how the levels of silt and sedimentation in the creek are directly related to the removal of the vegetation and how construction mismanagement can lead to more erosion. Students will be able to make connections to the problems in the Gulf of Mexico.</p>
<p>Assessment</p>	<ol style="list-style-type: none"> 1) The History of Pigeon Creek internet survey will be graded for correct answers. 2) In the field, students will have to demonstrate proper field techniques by correctly following sampling procedures. 3) Students write a brief 2 page paper on how their actions are directly altering the local waterways. Students will include data and direct evidence discovered while on the creek.
<p>Connection to Other Content Areas</p>	<ol style="list-style-type: none"> 1) <u>Biology/Environmental Science/Chemistry:</u> Students must possess knowledge of living organisms, organic molecules and ecosystem structure in order to perform field testing. 2) <u>Economics:</u> Students will make connections concerning the purpose of a waterway and how rivers and waterways are crucial forms for transporting goods. Students will understand the rules of supply and demand and how commerce depends on waterways. 3) <u>History:</u> Students will uncover some local mysteries and learn about life in the 1800's in Southern Indiana. We will learn why cities and towns developed along waterways and how crucial those waterways were to the survival and establishment of the towns.

Extension	<p>The extension to this activity involves visiting another local riparian habitat and performing similar tests. The second habitat that I use is the Blue River in Marengo Indiana. Students collect data and make comparisons to the Pigeon Creek data. Another example of an extension activity is to have students actively involved in helping to clean up the creek. Students can volunteer to work on a river clean-up team. This promotes stewardship and environmental activism.</p>
Acknowledgements	<ul style="list-style-type: none"> ➤ www.wesselmannaturesociety.org (Canoe Evansville) ➤ www.pcgreenway.org ➤ http://www.doe.in.gov/standards/docs-Science/2006-Science-EnvScience. ➤ Volunteers at the Wesselman Nature Society Canoe Evansville

The Pigeon Creek Greenway
Southern Indiana
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Name _____

Answer the questions below using the following websites:

www.pcgreenway.org

www.wesselmannaaturesociety.org

(Canoe Evansville)

1. What is the ultimate goal of the Pigeon Creek Greenway Passage?
2. List five benefits that the Greenway system offers to the community.
3. How did it get the name, Pigeon Creek?
4. When did Pigeon Creek become incorporated with the Evansville Parks Department?
5. In what year was the first attempt made to establish a bike trail?
6. In what year was the first section of the Greenway Passage completed?
7. Where was wetland area constructed in the year 1998?
8. Approximately how many trees were planted along the Passage in 1998?
9. List two project goals for continuing development set forth in 2002.
10. What are the three trailheads (or access points) for the Greenway?

11. What is the significance of the coal mine mural?
12. What factors contributed to the demise of the passenger pigeon during the 19th century?
13. Who is Thomas Garvin? List five accomplishments from his lifetime.
14. Where is Thomas Garvin's home located? What has it been restored as?
15. When was the land for Garvin Park acquired?
16. When was Garvin Park placed on the National Registry for Historical Places?
17. How does Pigeon Creek contribute to the overall economic health of the community?
18. What is the American Discovery Trail? How long is it?
19. What are some distinct environments that are encompassed by the Greenway passage?
20. List four ways your donations are used to assist with the maintenance and development of the Passage.
21. What role did Hugh McGary Jr. play in developing the city of Evansville?
22. How did the city of Evansville get its name?
23. In what year was Warrick County formed?

24. What tragedy struck the McGary family in 1822?
25. When was Hugh McGary Jr. finally honored for his contributions to establishing the city of Evansville and how was he honored?
26. How much is a student membership for support of the Greenway?
27. How many miles is Pigeon Creek and through which counties does it flow?
28. What percentage of the watershed is used for local farming?
29. What percentage of the creek is considered urban?
30. How many acres does the Pigeon Creek Watershed encompass?
31. What is the major responsibility for Pigeon Creek?
32. What percentage of the creek remains wetlands?
33. Approximately what percent of the creek is forested land?
34. How has the creek been altered since the 1800's?
35. What type of wildlife can one expect to see on the creek?
36. What is a riparian habitat?
37. How can nature preserves sustain healthy populations?