

Inquiry Activity on Biodiversity

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- I. **Title:** Investigating the Biodiversity of the Baldwin Woods Nature Reserve Habitat and Fuller Preserve.
- II. **Lesson Summary:** Ecology students will make detailed observations of the tree species that inhabit Baldwin Woods, a remnant of the Black Swamp landscape of the 1800s. They will also make observations of the trees of Fuller Preserve, a mature woody forest patch occupying land cleared in the 1800s. Students will have the opportunity to experience and ask questions about the tree biodiversity of these two habitats. After observing types, numbers, and relative distributions of tree species, students will ask one or more specific questions based on their observations, and then formulate testable hypotheses from which they can draw reliable conclusions.
- III. **General Goal:** This exercise is intended to have students demonstrate understanding of the ecology of one of the last remaining parcels of near virgin Black Swamp forest in Northwestern Ohio and how it may have changed due to human interaction.
- IV. **Duration:** Two half-day field sessions, the second session two or three days after the first, three 50 minute class periods.
- V. **Specific Learning Objectives:**
 - Content Goals:
 1. Students will be able to describe the types, numbers, and distributions of tree species within the Baldwin Woods habitat.
 2. Students will be able to describe the types, numbers, and distributions of trees within the Fuller preserve habitat.
 3. Students will be able to make a general statement about how species diversity may be affected by human disturbance.
 - Process Goals:
 1. Students will develop skills in making observations of natural phenomena.
 2. Students will develop skills in recording and organizing data.
 3. Students will develop their ability to write one or more testable hypotheses based on their observations.
 4. Students will develop skills at designing and implementing experimental procedures to test their hypotheses.
 5. Students will learn to analyze and draw conclusions from data collected during their inquiry.
 6. Students will present their findings to the class in groups, communicating their initial observations, the hypothesis, experimental design, results, and conclusions. Students will use a variety of visual and auditory vehicles in delivering their presentations.

The learning objectives listed for this activity align with the following program objectives outlined for the Ecology curriculum by Bowling Green City Schools:

Program Goal A: Objectives 1,2,4,5, 6

Program Goal B: Objectives 1,2,4

Program Goal D: Objectives 1, 4, 5

VI. Prerequisite Knowledge/Skills: Students will have already been introduced to the concept of biodiversity, the role biodiversity plays in maintaining stable ecosystems, classification of organisms, definition of species, plant identification, canopy and understory relationships, the proper implementation of the scientific method, sampling methodology, and proper graphical representation and interpretation of data. Students also need to be able to work effectively independently and in small groups.

Key Terms: Ecosystem, Biodiversity, Species, Dominant Species, Disturbance, Canopy, Understory, Succession

VII. Background Information:

Baldwin Woods Nature Reserve is a 124 acre parcel of land comprised of approximately one-half grassland (formerly farmland) and one-half near virgin black swamp woods. The Great Black Swamp was formed 20,000 years ago upon the retreat of the last glacier and consisted of a mucky mass of water covered with an almost impenetrable forest of oak, sycamore, hickory, walnut, ash, elm, maple, and cottonwood. Expansive wetlands of thick brush and tall marsh grasses made travel nearly impossible. A few prairie areas existed where the presence of underground limestone restricted timber growth. Today, prairie-like conditions are maintained by bi-yearly controlled burning of an area next to the woods. Beginning in the 1840s, farmers drained the swamp by building shallow, open ditches around agricultural plots, drastically altering habitat and the ecology of Northwestern Ohio.

VIII. Preparation for Lesson:

Materials: Rulers, metric tape measures, sampling markers, field guides, 1m by 1m PVC squares, pencils, journals, tree guide, light meters, compasses, maps

IX. Instructional Strategies:

1. At the beginning of the first half-day session, naturalists from the Wood County Park District will lead students on a walk through the Baldwin Woods reserve. Emphasis will be placed on tree identification and natural history of individual species as opposed to pointing out major differences between the two habitats (Baldwin Woods vs. Fuller Woods). Naturalists will also address the topic of human activity in Northwestern Ohio since the 1800s, without revealing too much information about the overall changes that occurred as a result of that activity.

2. The second half of the first outdoor session will be spent in allowing students to work in groups of four to make and record as many observations about the trees found in first Baldwin Woods reserve, and then Fuller Woods. These woods are about 15 minutes driving time apart. (Each student is responsible for keeping a detailed journal with drawings and written observations.) Students will be required to check in with a teacher periodically to discuss their observations. During this check-in time, teachers can hopefully direct or guide students into making further observations about the nature of the relationships among species or patterns that they see in the biodiversity of the area. By using questioning techniques that prompt students to ask questions about the trends or relationships that they think they see, teachers can help jumpstart the inquiry process.

3. After the first half-day session, students will spend the next day in class comparing their observations with members from other groups. (Two students from one group will be rematched with two students from another.) The class as a whole will be presented with the hypothesis that there is no difference between the two wooded areas. The new blended groups will then work to come up with one central question arising from their collective observations and develop a testable hypothesis and

experimental procedure to run upon their return to Baldwin Woods the next day. Hypotheses and experimental procedures will be presented to teachers for critique and approval. Students will then gather/make all equipment necessary to test their hypothesis.

4. The next day classes will return to Baldwin Woods/Fuller Woods to collect data.

5. During the next two or three 50 minute class periods, students will work on group presentations that will answer the following questions about their field work:

- a) What were some of your initial observations?
- b) What questions arose as a result of these observations?
- c) What is your hypothesis?
- d) How did you test your hypothesis?
- e) What types of data did you collect?
- f) How did you organize your data?
- g) How did you analyze your data? Is the analysis appropriate for the data?
- h) Does your data support or refute your hypothesis?
- i) Are you effectively communicating your findings to the rest of the class?
- j) What did you learn overall as a result of this project?
- k) What would you change about your project and why?

Hopefully, students will be gently guided to ask many different types of questions about the biodiversity of the Baldwin Woods reserve, resulting in student awareness of the composition of the original Black Swamp forest and the effects that human interference has had on Northwest Ohio's ecology. In the process of making observations, students may also set the stage to learn about changes in biodiversity resulting from edge effects, invasive species, canopy conditions, and natural disturbances. Students can use any materials/methods they like in making their presentations. Creativity is encouraged.

X. **Assessment:** Individual field journals and the group presentation to the class will serve as the assessment for the activity. Journal and project rubrics will be used in determining the degree to which activity objectives are met.

XI. **Comments:** Kim Knepper's biology classes will be doing a companion project investigating other components of these two wooded ecosystems. Members of her class will join the ecology class and present their findings on these two habitats as well. After this lesson, further library and web research into how the landscape of Wood County was changed by clearing forests for farmland and creating a vast network of ditches to drain the swamps might also enhance student understanding of the past and present biodiversity of Northwestern Ohio. A follow-up project looking into the biodiversity and ecology of drainage ditches in Northwestern Ohio could be pursued.