



MONO: A Diverse Experience; Biodiversity Lesson

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Overview

This lesson discusses the significance of the diversity of experiences that MONO offers to visitors. It then introduces youth to the biological concept of biodiversity and concludes by discussing the importance of biodiversity, especially within MONO.

Learning Objectives

- Understand the three levels of biodiversity: genetic, species, and ecosystem
- Identify the diversity of experiences that MONO offers and their significance
- Explore the benefits of biodiverse biotic communities within parks/MONO

Materials Needed

- Paper/a notebook and writing utensils for each group of youth

General Outline

1. Introduction to Theme

Youth will be introduced to the diversity of experiences that MONO offers (i.e. historic structures, rural landscapes, recreational experiences, commemorative atmosphere, etc.) and the significance of these experiences.

2. Biodiversity Exploration Activity

Youth will be introduced to the levels of biodiversity and assess the species richness in an area of the park.

3. Biodiversity and MONO/park Discussion

Through a discussion, youth will explore the benefits of biodiversity, especially related to the experiences it provides MONO/park visitors.

Background (for park employee benefit)

The term biodiversity has no set definition, and many definitions have been proposed to capture it. One of these simpler, yet very good, definitions states biodiversity is “the structural and functional variety of life forms at genetic, population, community, and ecosystem levels.” (Sandlund et al. 1992) Because biodiversity refers to variety within different levels of biotic organization (i.e. in an individual **and** between species), biodiversity is further categorized into three levels: genetic diversity, species diversity, and ecosystem diversity.



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Genetic diversity refers to variation in DNA, or genetic material, between individuals, populations, and/or species. Two robins with different versions of a gene represents genetic diversity between two individuals, for example. The differences in the gene pools of two distinct populations of the same species also represents genetic diversity (between populations). Species diversity refers to the variety among species. Species diversity includes species richness, or the number of total species within a given area, and species abundance, or the relative abundance of individuals of a species in an area. Lastly, ecosystem diversity refers to the variety of functions within ecosystems that species perform; it also refers to the variety in ways that species interact with other species and their physical environment.

Biodiversity is significant due to the benefits it provides ecosystems. For example, there have been demonstrated positive relationships between increased tree diversity in forests and forest functioning (Ratcliffe et al., 2017). Forest functions refer to the processes that naturally occur in forests, like photosynthesis, growth rates of trees, disease resistance, nutrient cycling, etc. Biodiversity is also especially important to MONO, as it bolsters the recreational opportunities the park provides. With healthy, biodiverse biotic communities, activities like fishing, birding, hiking, and photography are supplied to the public. Hence, biodiversity in MONO contributes to the diversity of experiences that the park provides.

Procedure

1. Introduction to the Theme

- a. Begin by asking all youth: “Can anyone share with me what they think the word ‘diversity’ means, or what you think of when you hear the word?”
 - i. Field all responses.
- b. Next, tell youth: “Take a moment to think about any ways in which diversity is represented here in the park (at MONO).”
 - i. Allow time to think.
- c. Ask youth: “Can anyone share what they came up with?”
 - i. Field all responses.
- d. Explain to youth:
 - i. “One way in which diversity is represented at MONO is through the variety of experiences offered to visitors:
 1. The park is home to 52 unique historic structures, many unchanged, which offer glimpses into how people lived during the Civil War era.



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2. MONO houses rural landscapes including forested areas, agricultural fields and farmsteads, and stream/river corridors which have changed little since the Civil War.
 3. Recreational experiences including hiking, birding and other wildlife viewing, photography, fishing, and running are abundant throughout the park.
 4. Visitors can learn about the historical events regarding the inhabitation of the area, the events that occurred during the battle of Monocacy, and events that occurred in the Civil War era through the parks Museum collections and archaeological resources.
 5. Through its monuments and memorials, guests can reflect upon and commemorate the important, historical events of the battle.”
- e. Explain: “This diversity of experiences highlights the significance of MONO: the many, unique experiences provided are enriching to visitors, and opportunities for such experiences are becoming rarer in increasingly urbanizing landscapes, like the NCR.”
 - f. Transition to next section: “Another way diversity is reflected in MONO is through the living organisms and ecosystems it houses. This type of diversity is called *biodiversity*.”

2. Biodiversity Exploration Activity

Youth will be exploring a natural area of the park with biotic communities in this portion of the lesson. Group sizes can be adjusted as fit.

- a. Divide youth into an even number of groups, 2-4 per group (or whatever appropriate).
- b. Inform youth: “Biodiversity is defined by: ‘the structural and functional variety of life forms at genetic, population, community, and ecosystem levels’. As a result, biodiversity is defined on different levels: the genetic level, species level, and the ecosystem level.
 - i. Genetic diversity refers to the variation within the DNA code of organisms. For example, two robins that each have a different copy of a gene represents genetic diversity.
 - ii. Species diversity refers to the number of species in a given area (called species richness) and the relative abundance of each of those species.



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- iii. Ecosystem diversity refers to the variety of functional processes that organisms perform within ecosystems through interacting with other biota and the environment.”
- c. After explaining biodiversity as above, explain to youth the activity they will be doing:
 - i. “In your groups, you will all assess the *species* diversity in a natural area of the park. Specifically, you will be assessing the species richness, or number of species in the area. Explore the area of the park, writing down observations of unique species you find. Record general descriptions of each of the species you identify (for example: 2-inch-long, reddish, multi-legged insect), as well as a description of the location you found the specimen. Lastly, record the total number of species you identify.”
 - ii. Allow youth to perform activity. After completed, have everyone reconvene.
- d. Ask each group: “How many total species did you all identify?”
 - i. Field responses.
- e. Next, ask all youth the following questions, fielding responses between each:
 - i. “Do you think you identified every species within the park?”
 - ii. “What might have allowed you to identify more species within the park?”
 - 1. After fielding, respond: “sampling in a different area (closer to the river/streams for example), or more detailed sampling techniques/equipment like a microscope could have allowed you to identify more species.”
 - iii. “Do you think all of the species you found perform similar functions in the environment, or different ones?”
 - 1. After fielding, respond: “Organisms perform different functions within the environment of the park due to their different biological characteristics. For example, an oak tree performs nutrient cycling functions, photosynthesis, and holds soil in place with its roots whereas a honeybee pollinates flowers and creates honey.”
- f. Transition to next section: “Having a diversity of species that perform unique functions in the environment can provide benefits to those ecosystems.”

3. Biodiversity and Visitor Experience Discussion

- a. Inform youth: “Research has demonstrated that in the Eastern United States, where MONO is located, forests residing within NPS lands tend to house a greater diversity of tree species than other natural forest areas.”



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- b. Next, ask youth: “Can anyone think of a possible explanation for this increased tree diversity in park lands?”
 - i. Field responses. Inform youth of the likely explanation: “Forest lands in national parks tend to be managed in ways to benefit those ecosystems. Additionally, NPS forests are predominately protected from tree cutting activity. These factors can promote a diversity of tree growth over time.”
- c. Inform youth:

“Some studies have also shown that greater tree diversity in forests translates to greater overall ecosystem functioning. Ecosystem functions include processes carried out by trees and other organisms that naturally occur in forests; for example: nutrient cycling, photosynthesis, and tree growth rates. Additionally, greater tree diversity can support a greater diversity of organisms that rely on different tree species.”
- d. Next, ask youth: “How do you think the greater diversity in national park forests, like those at MONO, impacts visitor experiences at parks?”
 - i. Field all responses.
- e. Conclude lesson by informing youth:

“The greater biodiversity in national park lands like MONO entails a greater diversity of birds for people to search for, fishes for visitors to fish for, and overall wildlife for visitors to enjoy. Hence, through preserving and managing MONO’s lands and biodiversity, so too are a great diversity of experiences preserved for visitors to appreciate.”



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