Making Conservation Decisions with Ant Community Assessment

Ohio Learning Standards:

- Scientific Inquiry, Practice and Applications
  - Use appropriate mathematics, tools, and techniques to gather data and information.
  - Develop and communicate descriptions, models, explanations and predictions.
  - Think critically and ask questions about the observations and explanations of others.
  - Communicate scientific procedures and explanations.
  - Apply knowledge of science content to real-world challenges
- Science is a Human Endeavor
  - Scientists often work in teams.
  - Science affects everyday life.

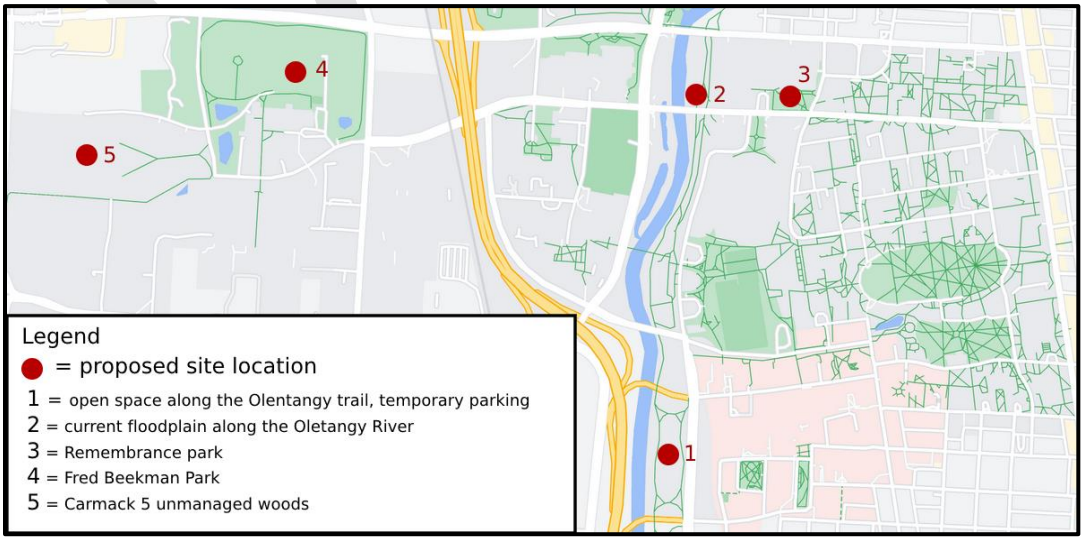
What is Biodiversity?

A Comparison of Ant Neighborhoods

Created by Kyle Sozanski (The Ohio State University, Columbus, Ohio)
Modified from James P. Gibbs (SUNY-ESF, Syracuse, New York) and Ian J. Harrison & Jennifer Griffiths (Center for Biodiversity and Conservation, American Museum of Natural History, New York)

Introduction: Ants are really important bugs in nature, and there are a lot of different species! They help keep ecosystems healthy. In our project, we're going to look at five ant neighborhoods and figure out how many different kinds of ants live there. Then, we'll use that information to decide how to help protect them. We made sure to collect the same number of ants (25) from each neighborhood and put them in order so we can study them easily.

Your goal / The Situation! As OSU continues to grow, so does need for more buildings and roads. But we also have to think about nature! The OSU Board of Directors (the big bosses at OSU) want to build a new medical science building, but here's the twist: some students don't want them to mess up any green areas, so we've got to find a balance. That's where you come in! You are part of a cool team of scientists who are going to figure out where to put this new building. The boss of your team, Dr. Rachelle Adams, thinks ants are great at telling us how healthy an area is, so you're going to check out some spots where they might build. After checking out the spots, you and your team will come back together and help decide which spot is best to build on and which ones we should keep safe. You will do this by figuring out which neighborhood is the most biodiverse – meaning you will compare and contrast those neighborhoods. Below is a map of the potential places for the new building.



Part 1. Identifying ant species!

The first step in your project is to figure out which ants live in each neighborhood! Places might have the same or different species, and some might even have unique species not found anywhere else. Identify different species of ants by describing unique body parts and combinations of body parts. Give them a number and easy to remember name so you can communicate with the rest of your team. **Work together** – do not try to identify species from each plot separately since there might be some overlap!

Table 1. Species descriptions. Note: not every row needs to be filled.

Species # and Name	Description

15, Big Chungus	Dark colored ant with gaster much larger than head, one petiole node, no spines or hairs on body

Part 2. Contrasting ant neighborhoods using math!

One way your science team will compare each neighborhood is using a biodiversity index. This helps you easily compare different places by counting or calculating biodiversity. Calculate three different measures of diversity which you can utilize to base your conservation decisions:

- Species richness within each collection site.
- Species diversity within each collection site.
- The similarity of ant communities between collection sites.

Glossary:
Biodiversity—the variety of life on Earth at all its levels, from genes to ecosystems, and can encompass the evolutionary, ecological, and cultural processes that sustain life.
Richness—a measure of the number of different kinds of organisms (species) present in a particular area.
Evenness—relative abundance of the different species making up the richness in a given area; compares the similarity of the population size of each of the species present.

Part 2a. **Species richness** is simply the tally of different ant species at each neighborhood.

Count the total number of different species for the five neighborhoods and record the number of each species in Table 2. ***Tally these using the actual ant site pages***: directly count the number (#) of each ant species in each neighborhood.

- Total # ants for each neighborhood will = 25
- You will use Table 2 throughout the entire exercise, make sure you fill it in completely.

Table 2. Species richness. Note: There may be more species listed than you identified.

	Site 1	Site 2	Site 3	Site 4	Site 5
Species 1					
Species 2					
Species 3					
Species 4					
Species 5					
Species 6					
Species 7					
Species 8					
Species 9					
Species 10					
Species 11					
Species 12					
Species 13					
Species 14					
Species 15					
Total # species					
Total # ants					

✓ Here we only have one sample, but in a real situation you would need to take **many** samples as you might have missed a species when looking once.

- -

Part 2b. **Species eveness** is a more complex concept. After all, how could you fairly compare a neighborhood with lots of ants of one species to a neighborhood with a lot of species. To do this, we will use a biodiversity index that the American Museum of Natural History in New York uses, which divides the number of species by the total number of organisms. The numerator will be the number of species and the denominator will be the number of ants (in this case, always 25). For example, Dr. Adams calculated this in her backyard:

$$\frac{5\ speces\ (numerator)}{25\ ants\ (denominator} = \frac{5}{25} = \frac{1}{5}$$

So Dr. Adams has a species eveness of $\frac{1}{5}$ in her backyard.

Using the data from Table 2, Calculate the species eveness for the 5 neighborhoods

Table 3. Species eveness values.

Neighborhood #1	Neighborhood #2	Neighborhood #3	Neighborhood #4	Neighborhood #5

✓ Make sure you have a way to easily compare the fractions!

Part 3. What do your results say?

1. How would your group rank the 5 sites based on conservation priority? Justify why you ranked them in this order.

2. The primary site to be conserved is _____. Why is this site your first choice for conservation?

3. The secondary site to be conserved is _____. Why is this site your second choice for conservation?

4. The least important site to be conserved is _____. Why is this site your least important for conservation?

5. What additional information would you like to have to make a final decision? How would you obtain this information?