Biodiversity Investigation

Adapted from AFWA's
Schoolyard Biodiversity Investigation Educator Guide

Grades 6-9

Students conduct a field investigation and use data they collected themselves to estimate and compare plant biodiversity between two survey plots.

Materials:

- Tape measures
- Flagging tape
- Eight flagging sticks (wooden garden stakes, chopsticks, wide popsicle sticks)
- A clipboard per student
- Biodiversity Investigation Data Collection Sheet, TWO per student
- Student Instructions Sheet, one per team
- Air thermometer
- Post-it notes
- Pens or pencils
- (Optional) Calculators
- (Optional) Box of disposable gloves

Preparation:

- Go to maeoe.com/mipines and use the MiPINES Map to find a nature space to visit. Get prepared to take your students off-campus. Set clear and firm expectations for being safe and smart outside.
- Plan the size of the two survey plots your students will create. A 33-inch by 33-inch square for each plot is suggested, but you may choose a smaller or larger study area depending on the amount of time you will have at the site.
- Tie flagging tape to the top of eight flagging sticks.
- Print copies of the Data Collection Sheet and Student Instructions Sheet. Note that each student will need two Data Collection Sheets.

Procedure:

1. Group students into Team A and Team B. If working with a group of more than 20 students, four teams may be preferable.
2. Ask teams to discuss the word “biodiversity”. What does biodiversity mean? Each team should prepare a definition to share.
3. Next, provide students with a variety of definitions of biodiversity or have each team research online. Students can revise their definition of biodiversity as needed.
4. Have each team share their definition with the class by posting on a board or sharing out loud. Highlight similar phrases, words, and concepts between the student’s definitions. Specify that there are different types of biodiversity, such as genetic diversity in a species, species diversity in a habitat, and habitat diversity in an ecosystem. Ask students to describe why biodiversity is beneficial, and discuss.
5. Next, introduce students to the field investigation portion of this activity. Inform students of the safety expectations and appropriate behaviors when outside at the study site. Remind students to bring weather-appropriate clothing on the day you will be traveling to the study site. Long-sleeves, pants, and gloves are suggested to prevent skin irritation and mosquito bites.
6. Hand each student a copy of the Biodiversity Investigation Data Collection sheet. Review the data collection process with students and how they will fill out this sheet during the investigation.

Travel to the survey site. At the site:

1. Ensure each student has TWO copies of the Data Collection Sheet and a clipboard.
2. Help each team select a general area to set up their survey plot. Encourage teams to select survey spots that are in different locations. Then, hand each team four flagged sticks, tape measures, copies of the Student Instructions Sheet, a Post-it, and calculators (optional). Students work in their teams to follow the Student Instructions Sheet and complete their vegetation survey.
3. Teams may need assistance using the air thermometer at each survey plot.
4. After both teams have finished their surveys, explain and guide students in calculating SDI.

Calculating a Simplified Diversity Index (SDI):

Once both teams have completed their vegetation surveys, each student will use the data they collected to calculate a Simplified Diversity Index for each survey plot. SDI is calculated as follows:

$$SDI = \frac{\text{Total Number of Different Species}}{\text{Total Number of Plants Found}}$$

The SDI calculation should fall between 0 and 1. Typically, a higher SDI indicates a higher level of diversity (or species richness). A lower SDI may be due to a large number of the same species in an area (or species evenness). Species Richness can be described by counting the number of different species in an area. Species Evenness can be described by counting the total amount of individuals per species in an area.

Students should be able to describe which location (Plot A or Plot B) had greater species richness or species evenness using their SDI calculations and their Species Richness and Species Evenness counts.

Questions for Discussion

- If a predator that preferred to eat grasses was introduced to the study site, how might this affect biodiversity in each of the survey plots? Would the effect on each survey plot be the same?
- How different was the SDI for Plot A from the SDI for Plot B? Were the types of species found in each plot similar or different? Why do you think these differences/similarities exist?
- What are some limitations or problems with using random sampling to calculate diversity?
- Based on the data you collected and observations you made, do you think the overall biodiversity at this park is high or low? How could you improve this study to test your hypothesis?

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Student Instructions Sheet

Materials:

- TWO copies of the Data Collection Sheet
- Clipboard & pencil
- Four flagged sticks
- Tape measure
- Post-it
- Air thermometer (ask for this from your teacher during step 6)

Procedure:

1. With help from your teacher, select the area for your survey plot. Place one flagged stick far enough into the soil that it can stand on its own.
2. Make sure each team member has read this Student Instructions Sheet or have one team member read it out loud to the rest of the team.
3. Have a team member hold one end of the tape measure at the base of the flagged stick while another team member pulls the tape measure taut. Place another flagging stick exactly at the 33-inches mark.
4. Repeat steps 2-3 until you have created a square plot with each corner marked by a flagging stick. Be careful: you want your square to be as perfect as possible.
5. If you are Team A, write “Plot A” on your Post-it note. If you are Team B, write “Plot B”. Stick your Post-it to one of the flagging sticks. You have created and labelled a survey plot.
6. Label one of your Data Collection Sheets as “Plot A” and the other as “Plot B”. If you just created Plot A, fill out the top of the data sheet labelled Plot A, and vice-versa for Plot B.
7. Now search the survey plot for grass. On the appropriate Data Collection Sheet, tally the different species of grass. Estimate the number of individual grass clumps.
8. After tallying grasses, look for flowers. If so, mark each type in the **Tally of Different Species** column, and tally total the number of each species in the **Tally of All Plants Found** column. You do not need to know the name of each plant: just observe the differences and similarities between each individual plant to group them by species.
9. Repeat step 8 for Ground Cover, then Thick Brush and Bushes, Loosely Spread Out Shrubs or Bushes, Trees, and Fungus, Mosses, and Lichens.
10. Be sure to tally BOTH the number of different species and the number of plants per section.
11. Once both teams have finished surveying the plot they created, swap survey plots. Use your second Data Collection Sheet and repeat steps 7-11 for the new survey plot.
12. After both vegetation surveys are complete, wait patiently for your teacher to bring the class together.

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Data Collection Sheet

Name: _____

Date: _____

Plot: _____

Temp: _____ °F or °C

Circle all that apply:

Clear
Scattered Clouds
Complete Cloud Cover
Rain

Wind:

Calm
Breezy
Gusty

Plant Type and Description		**Tally of Different Species**	**Tally of All Plants Found** (OR percentage of area covered)
Grass	Mowed lawn/grass		
	Meadow or tall grass		
Flowers (growing individually, annuals or perennials, not bushes or trees)			
Ground Cover (outer edges less than 12" apart and less than 12" tall)			
Bushes or Shrubs (more than 12" tall, but typically less than 15 feet tall)			
Trees (mature trees more than 15 feet tall)			
Fungus, Mosses or Lichens (can be found growing on trees, logs or the ground)			
TOTALS (Numbers)			

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Example Data Collection Sheet

Name: Junie Jones
Date: 04/18/2022
Plot: B

Temp: 62 °F or °C

Circle all that apply:

Clear
Scattered Clouds
Complete Cloud Cover
Rain

Wind:

Calm
Breezy
Gusty

Plant Type and Description		Tally of Different Species	Tally of All Plants Found (OR estimated number)
Grass	Mowed lawn/grass	𝍸	estimated 33 clumps
	Meadow or tall grass	|	0
Flowers (growing individually, annuals or perennials, not bushes or trees)		||	Species A: 𝍸 | Species B: || |
Ground Cover (outer edges less than 12" apart and less than 12" tall)			
Bushes or Shrubs (more than 12" tall, but typically less than 15 feet tall)		|	Shrub Species A: 1
Trees (mature trees more than 15 feet tall)			
Fungus, Mosses or Lichens (can be found growing on trees, logs or the ground)		||	Species A: (Moss) est. 3 clumps Species B: (Fungus) |
TOTALS (Numbers)		ll Species	45 plants