HANDS-ON LAB

Independent Inquiry

Field Investigation of Plant Quantity and Diversity

TIME REQUIRED Small groups Three 45-minute class periods

LAB RATINGS Easy 1 2 3 4 Hard

Teacher Prep–3
Student Setup–2
Cleanup–1

Materials

For each group:

- field notebook
- map of local area
- plant identification key (optional)
- wire square quadrat, 30 cm × 30 cm

For each student:

- protective clothing suitable for field study

3D LEARNING OBJECTIVE

Asking Questions and Defining Problems

Students will conduct a field study of plant quantity and diversity in two areas. They will develop a question to ask about plant diversity and will use their lab results to draw conclusions about possible external influences.

SAFETY INFORMATION

Remind students to review all safety cautions and icons before beginning this lab. This lab requires outside activity. Because this lab involves outside activity, students should be cautioned to use care when moving about natural areas that may be uneven or slippery. Be sure students are aware of harmful plants they might encounter and advise students to avoid all contact with them.

TEACHER NOTES

In this activity, students will observe differences in plant quantity and diversity between two different local sites. Areas such as lawns, golf courses, nature reserves, parks, city lots, or agricultural land may be used. Students will work in groups to assess the plant diversity and quantity present within a standard area of 30 centimeters (cm) × 30 cm. The group will determine what kinds of sites to investigate and how many samples are needed to get a representative sample of the number of different types of plants growing in the sampled area. At each of the sites, students will:

- Count the number of plant species present.
- Estimate plant cover versus bare ground for each sample.

Students will determine a plan for collecting data by developing their own data tables before heading out into the field. Students will develop their own procedure and make their own conclusions based on their results. Wire squares (quadrats) can be made by bending coat hangers into a 30 cm × 30 cm square. Students will compare the two sites and suggest ways to increase the diversity of plants at one site based on their observations about the other.

Tip This lab requires three full class periods to complete. Some time needs to be allowed for students to get to the sites they have chosen for study. One option is to limit their choices to areas within close walking distance of your school.
Student Tip How can the wire square help you to find as many plant species as possible in a specific area?

MODIFICATION FOR DIRECTED INQUIRY

Provide students with pre-selected sites to study. (A larger space may be necessary for study, depending on the space available at your school.) Also provide them with data tables to use as they conduct their field study. You may also wish to provide them with separate keys for different types of plants.

PUTTING THIS LAB IN CONTEXT

Encourage students to consider this activity in a larger context. Biodiversity describe the variety of species found in Earth's ecosystems. Why is it important to understand and study biodiversity? What can the biodiversity of an ecosystem tell us about its health? How is the long-term functioning and health of ecosystems influenced by human societies?

ANSWER KEY

ASK A QUESTION

1. Accept all reasonable answers. Students should base their question on their discussion. **Teacher Prompt** Consider the ways humans use land and how that may affect the different kinds of plants that grow in a particular area.

FORM A PREDICTION

2. Accept all reasonable answers. Students should develop a prediction/hypothesis as a group. **Teacher Prompt** What types of events would have a negative impact on plants growing in an area, and who is responsible for causing those events?

MAKE A PLAN

3. Accept all reasonable answers. Students should provide a general description for each study site. They should also estimate the level of human impact in the areas. **Teacher Prompt** How are your sites used by people?

4. Accept all reasonable answers. Students' data tables should include space for repeated sampling. Approve the students' data tables. A sample table is shown below:

		Data and Observations			
		Trial	**Number of plant species found**	**Plant cover**	**Observations and notes**
Type of land use	Lawn	1			
		2			
		3			
		4			
	Vacant lot	1			
		2			
		3			
		4			

ANALYZE THE RESULTS

11. Accept all reasonable answers. Students should include a basic table summarizing their results collected from each of the two sites. **Teacher Prompt** Have you thought about calculating an average?

DRAW CONCLUSIONS

12. Accept all reasonable answers. Students should compare their results and explain how they are different. Be sure that students' conclusions are consistent with the data they collected.

13. Answers will vary, but students should demonstrate that they recognize that many other environmental characteristics are affected by human activities.

Name: Date:

HANDS-ON LAB

Field Investigation of Plant Quantity and Diversity

In this activity, you will choose two different outdoor sites to study. You will observe how much plant cover is associated with each site. You will also observe how many different species of plants are present at each site. You will use the data you collect to draw conclusions about what types of external influences may affect plant quantity and diversity.

Materials

For each group:
- field notebook
- map of local area
- plant identification key (optional)
- wire square quadrat, 30 centimeters (cm) × 30 (cm)

For each student:
- protective clothing suitable for field study

PROCEDURE

ASK A QUESTION

STEP 1 Within your group, consider the following types of areas: farm, field, park, golf course, parking lot, and nature reserve. Discuss the differences between these areas in terms of the variety of plant species that might be present and the total number of plants present. Develop a question to ask based on your discussion.

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FORM A PREDICTION

STEP 2 Within your group, discuss your thoughts on the answer to your question. Write your prediction/hypothesis below.

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MAKE A PLAN

STEP 3 Find two different study sites on a local map. Characterize each site with a general description (for example, lawn, golf course, park) and your estimate of the level of human impact (heavy, medium, light, none). Write down the sites you find.

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STEP 4 Read through the procedure you will follow. Work as a group to develop appropriate data tables to use during your field work and enter them in the space below. Obtain your teacher's approval of your data tables before you continue with the activity.

MAKE OBSERVATIONS

STEP 5 Travel to one of the sites you identified in Step 3. At the site, use the wire square to identify an area in which to look for plant species. One way to make sure you are not introducing bias into your sampling is to gently toss the wire square onto the area, without aiming for a specific location.

STEP 6 Count the number of different plant species within the wire square. Also determine whether each species is native or introduced. Record the information in your data table.

STEP 7 Count the number of individual plants of each species within the square. Record this information in your data table.

STEP 8 Estimate the proportion of plant cover and record. Do this by estimating how much of the square is covered by plants compared to how much is bare ground, cement, or asphalt.

STEP 9 Repeat Steps 5 to 8 until you have obtained a representative sample of the different kinds of plants in the site. You will know that you have a representative sample when you are no longer finding additional species each time you use the square. Use this random sampling process to obtain several samples at each site. This is important to ensure the maximum number of plant species is obtained for each site.

STEP 10 Repeat Steps 5 to 9 for your other study site.

ANALYZE THE RESULTS

STEP 11 **Analyzing Data** You sampled each site repeatedly. Work with the other members of your group to decide how to analyze these numbers. Make a summary table below to show your results for each of the two sites you studied.

DRAW CONCLUSIONS

STEP 12 **Evaluating Data** Compare the results you obtained for the two sites. Are they different? Do you see any relationship between the amount of human activity at a site and the quantity and diversity of plants present there? Explain.

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STEP 13 **Applying Concepts** Do you think that human impact affects other aspects of the natural environment in addition to any that you noted from this investigation? Explain.

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