FORESTRY

Ecosystem Exploration iNaturalist Activity
Student Guide

SUMMARY

In this activity, you will take to the field to explore four different ecosystems with diverse plant communities. Using iNaturalist, you will make observations and identify plant species at each site, taking note of species abundance. You will explore why certain species occur in certain areas, and you will hypothesize the effects of disturbance on your study ecosystems.

TIME

About 40 to 60 minutes per site, depending on number and diversity of plants

MATERIALS NEEDED

- Camera (smartphone camera preferable)
- Access to iNaturalist (mobile app or desktop website)
- Membership with NCFE iNaturalist Project
- Measuring tape of at least 5 meters (about 16 feet)
- Field guides for identifying plants
- Forestry Ecosystem Exploration Site Data Sheet
- Forestry Ecosystem Exploration Site Comparison Sheet
- *Optional:* metersticks for percent cover

ACTIVITY PART A: SITE OBSERVATION AND INVENTORY

Identify four different plant communities that can be used as investigation sites that are easily accessible. Examples of different communities could be: a pine forest, a hardwood forest, a mixed stand, an open field, edge habitat, a marsh, a meadow, a swamp, a desert, a rangeland, a tundra, et cetera.

For each site:

1. Designate a circular sample plot with a radius of 5 meters (about 16 feet) in each location.

2. Observe the ecological factors found in the plot. Conditions to note include:
- What are the biotic and abiotic factors affecting this ecosystem?
- How much sunlight is there (direct, indirect, full sun, shaded, partial)?
- Is there water nearby (stream, pond, ephemeral source)?
- Are the plants crowded together or spaced out?
- How open is the canopy?
- Are there different layers of vegetation?
- What is the texture of the soil?
- Is there leaf litter or other organic matter?
- What name would you give this type of ecosystem?

3. Note any evidence of disturbance at the site (such as fire, erosion, human development, et cetera).

4. Identify and record the Species Richness of the site by identifying the plant species found in the plot. *You may use a field guide to help in your identifications*. You will then need to:
- Upload your observations to the NCF-Envirothon iNaturalist Project using a mobile device or take pictures to upload using a desktop later.
- For larger plants (like trees and shrubs) one observation should be made for each individual.
- For smaller plants that serve as groundcover, one observation can be made per patch of the same species (for example, one patch of clover).

- Be sure to take multiple photos to capture all the major identifying characteristics of a species!
- The **total number** of plant species identified is the plant Species Richness of that site

5. Record Species Abundance of the site. You will:
   - Perform a rough population survey for the plot.
     - For larger plants (like trees and shrubs), tally each individual.
     - For smaller plants (like grasses and clover), an approximate percentage cover of the plot area will suffice (for example, the 10-meter diameter plot is covered in approximately 40 percent broomsedge). A sampling quadrat of known size (1 meter by 1 meter) can be used to help estimate percent cover. The quadrat does not need to be fancy – four metersticks taped together to form a square will suffice. **Percent cover = area covered by a species / total plot area**
     - *See this video for an overview of Percent Cover*

6. Record Species Evenness of the site. Answer the following:
   - Do all species present have roughly the same number of individuals, or do certain species dominate the landscape? Which species? Why do you think this is?

7. Using the information collected and recorded about each site, answer the following questions:
   a. Using your knowledge of all the species found in your sample plot, explain why these particular species occur here.
   b. What adaptations do the most common species have that make them successful in this ecosystem?
   c. Are there any species that you found that you did not expect? Why do you think these species are present?
   d. What are some types of disturbance that you might expect in this ecosystem (both natural and human-caused)? What effects do you think these disturbances would create in the ecosystem?
   a. Write down any other observations that you have about this ecosystem.

8. Repeat the above steps for each chosen site.

PART B: BRINGING IT ALL TOGETHER – SITE COMPARISON

Review all of the information gathered from your different sites. Make connections between your observations and the Envirothon learning resources. Discuss the ecological themes and principles present in your observations with your advisor and teammates.

Use the following open-ended questions to explore the relationships and trends that you noticed among their different ecosystems. You may answer on your own or work together as a team:

1. Which of your sites were the most ecologically similar based on observed biotic and abiotic factors?
   a) Between your most similar sites, which ecological factors varied the least?
   b) Which ecological factors varied the most?

2. Which of your sites were the most ecologically different based on observed biotic and abiotic factors?
   a) Between your most different sites, which ecological factors varied the most?

KEY TERMS (CONTINUED)

Disturbance – Any change, natural or human-caused, that impacts an ecosystem, particularly through the removal of organisms or alterations to available space. *Examples of natural disturbances include: hurricanes, natural fires, and flooding. Examples of human-caused disturbances include: habitat destruction, pollution, and erosion from roads.*

Diversity – A measure of difference between communities that incorporates Species Richness and Species Evenness.

Ecological Factors – The combination of biotic and abiotic factors that shape the structure and function of an ecosystem.

Ecosystem – The collection of all living species (communities) in a region and the abiotic factors that influence them.

Generalist Species – A species which does not have strict habitat requirements and can be found in many different types of ecosystems. Generalist species are also typically adaptable to new environments.

Percent Cover – The area occupied by a particular species relative to the total area of a given sample plot. *Percent Cover = Area of Species / Total Plot Area*

Population – The collection of all organisms of a particular species.

Quadrat – A sampling tool (usually rectangular) of a specific area. *For example: a 1-meter by 1-meter square.*

Specialist Species – A species with very specific and narrow habitat requirements, such as diet or shelter. Specialist species have often coevolved with their habitat or food source, and have difficulty adapting to new environments.

b)   Which environmental factors varied the least?

3. What do you think are the top three ecological factors that helped you to easily differentiate one ecosystem from another? Why are these three factors important?

4. How did the similarities and differences among your different sites affect which species were found there?

5. What species were found at multiple sites?
   a)   Were there species found at every site?
   b)   Why do you think these species were so common?

6. Were there any species unique to only one site?
   a)   What factors do you think limited the range of this species?
   b)   What are its habitat requirements?

7. Define the terms generalist species and specialist species. Using your answers from Questions 5 and 6 above, answer the following:
   a)   Which species identified were generalists?
   b)   Which were specialists?
   c)   Which species were in-between?

8. What adaptations were common among species in the similar sites?
   a)   Why do you think organisms with these adaptations thrive in these ecosystems?

9. Which site had the greatest plant species diversity? Why do you think this is?

10. Which site had the least plant species diversity? Why do you think this is?

11. Which ecosystem was your favorite, and why?

12. What was something unexpected that you observed?
   a)   *(Optional)* Independently research the unexpected observation and share with your teammates why you think you observed it during your investigation.

Species Evenness – The relative abundance of species in an area or ecosystem as compared to each other.

Species Richness – The number of distinct species found in an area or ecosystem.

Species Abundance – The number of individuals of a particular species found in an area or ecosystem.