An Interview with a Forest: Interpreting the Biome

Essential Question: How can one observe and interpret the clues that forests provide to understand the ecosystem?

Introduction/Background

All forests tell stories. A snapshot of organisms that live there can reveal a great deal about the events that led to the current ecosystem dynamics. This activity is designed to give you skills to assess the past history of the forest while looking at its present. Once you've completed the activity, you may even be able to predict the future for your local forest using ecological theory.

Natural communities change over time. This is known as "succession." When a new island emerges or an area is cleared by natural or human forces, new organisms ("pioneers") move onto that land. They often grow quickly, changing the abiotic and biotic conditions around them. After some time, other species might be better adapted to live in the changed area.The process continues until a stable community is established. In New England, mature (old) forest species found in these changed or "climax communities" might be beech, sugar maple, or white birch.

Sometimes the climax community depends on soil. If the soil is sandy and dry (known as xeric soil), the mature forest will have oaks and hickory as its climax species. If the soils are wet (known as hydric soils), the mature forest will have sycamore, muscle wood, or red maple trees as its climax species. If the soils are moderately wet – not dry or soaking wet – the climax species will be beech, sugar maple, and white birch. In this "climax" community, the energy relationships are firmly established, and the community may remain the same for many years. Soil specific tree species are known as "Edaphic Species."

National Science Education Standards

Unifying Concepts and Processes: As a result of their activities in grades 5-8, all students should develop an understanding of:

- Systems, Order, and Organization.

Content Standard A: As a result of their activities in grades 5-8, all students should develop an understanding of:

- Understandings about scientific inquiry.

Content Standard C: As a result of their activities in grades 5-8, all students should develop an understanding of:

- Populations and Ecosystems.
- Diversity and adaptations of organisms.

Student Learning Objectives

As a result of these activities, students will:

- define natural succession.
- draw inferences from aerial photos.
- draw inferences from first-hand observations.
- compare and contrast areas at various stages of succession.
- recognize the time frames in which certain observed changes occur.

Materials List

- Field guides (listed in Resources/References)
- Field notebook
- Pencil
- Canopy densitometer (optional)
- 20 meter transect tape
- Metric ruler

Procedure

Choose a representative, 50-meter portion of a trail or section of forest. Along this section, you will be observing, estimating, and taking notes on the items below.

Begin a field journal.

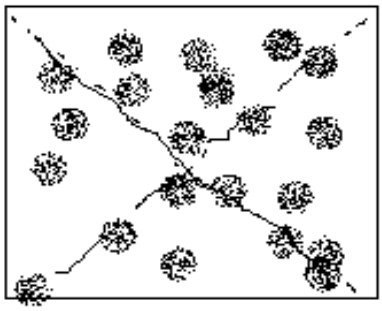
The headings in your field journal should include: Date, Location, and Weather Information.

Be as quantitative as possible as you address each of these topics.

I. Abiotic Factors:
   A. Altitude
   B. Ambient temperature
   C. Relative humidity
   D. Day length (time between sunrise and sunset)
   E. Annual precipitation at this site
   F. Current season
   G. Latitude/longitude

II. Forest Structure:
- A. Measure the leaf litter depth at 10 points along the trail
- B. How dense is the understory?
  - at two meter height
  - at ground level

(To calculate canopy density walk two diagonal transects in a 20 meter by 20 meter quadrat at one meter intervals. Using the densitometer, record + (indicating cover) or 0 (indicating you see sky). The percent (%) cover = number of + / total points you observed walking the two diagonals.)



Aerial View:
20M by 20M
Quadrat

- C. Describe the following adaptations (and any others you observe)
  - common leaf shapes
  - texture of tree bark (flaking or peeling? Soft pencil rubbings can be used.)
  - plant defenses (hairs, spines, thorns, etc.)
  - epiphytic growth (plants growing upon trees/shrubs)
  - flower shapes and colors (What might pollinate them?)
  - presence of seeds or fruits (How might they be dispersed?)
- D. Describe general tree shapes (i.e., straight trunk, rounded top, etc.)
- E. Are there vines? (describe them)
- F. How would you characterize the forest? (dry, moist, young, old, deciduous, evergreen)
- G. Approximate age of forest overall? What is your evidence?
- H. What cultural factors have led to the forest's current state? Was it cleared? How can you tell?

III. Forest Diversity
- A. How many different tree species?
- B. Shrubs?
- C. Herbaceous plants?
- D. Mammals?
- E. Reptiles and amphibians?
- F. Insects?

G. Birds?

IV. Tree profile—using the following directions, draw a vertical profile of your tree

- Draw a X/Y axis in your field note book. The X-axis is tree height (estimate) and the Y-axis should be 20 meters in length.
- Forest Floor: low light, humid, very warm (Label 1 on Vertical Y-Axis).
- Shrub Layer: similar to forest floor, trees & shrubs usually have elongates crowns that are defined (height) by the angle of "sunfleck"

light. Leaves may have a "swollen" joint (pulvinus) at base that is sensitive to light and rotates leaf toward sun. Younger leaves are brightly colored. Pigments act as sun block for immature leaves. (Label as 2 on Vertical Y-Axis).

- Canopy: 20-30 meters; leaves are dark green, bright light, extreme temperature changes, and lower humidity (Label as 3 on Vertical Y-Ax is).
- Emergent Layer: bright light, drying winds. Leaves are smaller in surface area (some trees have two distinct leaf sizes). Seeds are often dispersed by wind (Label as 4 on Vertical Y-Axis).

Data

In your field note book summarize your notes, observations, and research on your site with respect to the questions posed in the Procedure. Include your vertical profile and canopy density recordings.

Conclusions

Now that you've "interviewed" your forest, use the data you've collected to answer the following questions:

- "How old is your forest?" How much time has existed since this forest has been cut or disturbed? (Remember, there may not be a single answer. Some parts of your area may have been disturbed, while others were not. But in general, the older the trees and the denser the canopy, the older the forest.)
- "How stable is your forest?" Is there evidence that new or exotic plants are moving into the forest? Is there evidence of change?
- "What stresses might be changing this forest community?" Did you find evidence of invaders? Pollution? Human use? Animal use?

At the end of any interview, the interviewee is almost always given the chance to add new information. What surprises you about your forest?

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Adaptations/Elaboration

If different groups have surveyed different areas, ask them to compare and contrast their "interviews."

Evaluation

Rubric for evaluation:

	Acceptable	Good	Excellent
Safety Precautions	Generally followed	Strictly Followed	Helped others follow
Date, location, weather and other details are included	Name and Date	All three present	All include accurate measurements
Field journal is legible	Generally	Easily read	Easily read, nice formatting
Field journal questions	A few areas addressed	Most areas addressed	All areas addressed

Resources / References

Eastern Forests – Peterson Field Guide Series; Kritcher
Reading the Forested Landscape; Wessel