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## Unit 4 Plant Ecology

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### Unit Overview

In this unit students will investigate the role of plants in natural ecosystems. They will investigate how plants serve as indicators of environmental conditions ranging from soils to disturbance events. Students will collect and analyze data in lab and in the field to learn how biologists quantify natural communities.

### Objectives and Skills Attained

- Plants as indicators of ecosystem parameters
- Collection and presentation of data
- Competition between plants in the natural community
- Plant succession in disturbed communities
- Factors that limit plant growth
- The role exotics play in natural plant communities
- Field techniques used to determine plant density

### Motivation:

The main theme of this unit is that plants, more than anything else, are what characterize a natural community. We don't hear biologists describe a region as a mule deer ecosystem. They are most likely to characterize it as a pinyon-juniper ecosystem. To the practiced eye, a cursory examination of the plants that inhabit an area tells one much about its soil, climate, past geologic history and its animal life. Knowledge such as this brings a great deal of enjoyment to our relationship with the natural world.

### Day 1 (Class Notes 4:1 ~ Plants as Indicators)

#### Homily:

In the western United States, mule deer hunting is quite popular. Experienced hunters start glassing mountainsides before sunup. The best place to look for muleys is the cold slopes where the sun does not hit right away. Bitterbrush and mountain mahogany that provide food and shelter for these animals offer the greatest promise. Sometimes they can be seen bedded down under a manzanita bush or watching patiently from a mountain slope where black sage provides scant cover but good camouflage. The hunter selects this spot because its plant life tells him it is a promising place to look. These plants spell "mule deer habitat."

## Unit 4 Plant Ecology Daily Lesson Plans

**Procedure:** Students will learn in this section that plants are the foundation of all natural communities. Because of this one can know a great deal about that community just by examining the plants that live there, especially the dominant plants. You can supplement this section by bringing local plant communities into the discussion. How do plants in your area indicate stressed conditions? What plant growth indicates water is nearby? What plant community would, say, deer be found in and give local examples of local plant communities where this animal would not be found.

Merriam's Life Zones are mentioned in this section of notes. Even though botanists no longer find the concept of life zones to be all that useful, it is a good way to cause students to reflect on the fact that different plants grow in different areas and that climate and elevation / latitude are oftentimes important. Students usually find this concept interesting and, thus, it is helpful.

### Day 2 (Class Notes 4:2 ~ Data Collection, Storage and Presentation)

#### Homily:

If there is any one, single thing that makes science unique from all other enterprises, it is the careful consideration scientists give to observation. All observations must be carefully made, recorded and then presented for the scrutiny of others. These observations must also be recorded in the form of numbers – in the form of data. This is the only acceptable way scientists can quantify and document their observations.

**Procedure:** Insertion of this section of notes at this juncture might, at first, seem a departure from the lessons in botany we are engaged in. It is important and appropriate, though, at this point to make several things clear to your students. First, man has and is impacting the environment. While many people are uneasy with or hostile to this notion, it is well-documented fact. "So how do we know these things," students will ask. The answer is that scientists have documented these observations over the years. It is crucial that students realize where this body of knowledge came from and why, from time to time, conclusions are modified to fit new observations. Secondly, botany is science, and there is little reason why we should study it further without learning more about the processes scientists follow to learn about the natural world.

### Days 3 and 4 (Lab 4:1 ~ Plants As Indicators of Soil)

#### Homily:

As a small boy I remember my grandfather, who was a farmer, pointing out places in our valley where alfalfa would grow and prosper. I was always amazed that he could predict soil fertility and the position of the water table by simply looking at the native vegetation that grew there. It wasn't until I was able to study things such as this myself in the formal setting of university classes that I truly came to appreciate what one can read into the land if he just knows something of the plants that grow there. As the notes point out, there is a good reason why biologists name ecosystems after their plant communities.

## Unit 4 Plant Ecology Daily Lesson Plans

Materials List: [required per group]

- Compass (to determine direction of slope)
- 2 meter sticks per group
- small jar ½ filled with water
- rubber band
- soup (or similar) can with both ends cut out
- 2 gallon milk containers filled with water (should do the entire class)
- stop watch (or watch with a second hand)
- soil test kit Available from Wards Natural Science (20W7858) or Carolina (ER65-3201)
- Identification guides for plants and tracks (optional)

**Procedure:** Before doing this lab it will be necessary for you to locate two different plant communities for students to study. Oftentimes this can be accomplished right on campus. Other times the class might have to travel to two different localities. Try to find natural (unplanted by man) communities and do not pick disturbance areas such as roadsides as we will study these in a further lab.) These do not have to be extensive areas. Sometimes, for example in a park, one can find a natural area without trees and another where trees grow. This would do just fine. Select cultivated sites only as a last result. When you select these study sites, attempt to find an area that has at least some slope.

Make it clear to students they are looking at two different plant communities. To save time you might want to have half the class study one community and the other half study the other community. They will have to share data once they return to the classroom. Emphasize it is important everyone collect the same observations, otherwise they will not be able to contrast the two communities.

The objective of this lab is to try to demonstrate to students that different plant communities usually have different growing conditions to which members of the community are well adapted to flourish in.

### Days 5 and 6 (Class Notes 4:3 ~ Competition, Adaptations and Succession)

#### Homily:

Sometimes, as happened in Yellowstone National Park in 1988, vast expanses of forest burn. This has been deemed to be a bad thing as evidenced by Smokey Bear's message over the years. Scientists have learned, however, that fires are not all bad. Sure, they change the landscape and, for a while at least, convert it into what many consider to be one that is less aesthetically appealing, but they also rejuvenate the land. Allowed to stabilize and stagnate, many plant communities become less and less productive. Sometimes biodiversity actually increases in waves of succession as one temporary community replaces another in the process of eventually, once again, establishing the climax community.