Grasses, mowing, and ecological impacts

or To Mow or not to Mow: An Experiment in Plant Response to Environmental Factors

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Introduction

In this experiment you will be taking some field measurements and observations to understand how grasses and other plants commonly found in your yard are influenced by a rather extreme limiting factor –mowing. If you stopped mowing your yard for even one season, what differences do you think you would find in the types of organisms that live there -- let's see what you find!

Why investigate mowing the grass?

Many of the things that happen in wild nature -- animals and plants competing for resources; animals grazing on plants and preying on other animals; organisms reproducing, growing and dying, and even populations evolving -- is also happening in places where people have changed the environment. There might be no better example than the many environments with abundant grasses -- not only in wild meadows and grasslands, but in the "turf grass" of yards, sports fields, and parks, and in the domesticated varieties of grass such as wheat, corn, sorghum, and rice.

In each of these environments, species are competing for space, light, nutrients, and water. Even in extreme examples of human influence on grasses, such a baseball field made up of just one evenly cut species of grass, other species of grasses and plants such as dandelions and clover may gradually gain a foothold. What traits have these species evolved that allow them to infiltrate even a carefully manicured lawn (or other human environments)? If a lawn isn't cut or a farmer's field is allowed to grow wild, other organisms with traits suitable for a non-mowed environment may take over.

Studying ecology is one aspect of studying how organisms become adapted to their environments. How have species come to have the particular set of traits to do well in a particular environment? In order for any organism to be **successful** as a species, the individual must pass their genetic information on to the next generation. Their genes (DNA) contain all the information from all their successful ancestors to help their offspring in turn be successful in a changing environment. Success in a natural environment means that the individual survives long enough to reproduce. Sexual reproduction provides the opportunity for an individual to combine some of its **genetic information** with another individual's genetic information to increase the offspring's chances for survival. This is the foundation of **evolution.** Organisms that are successful enough in their environment to reproduce can pass their successes on to their offspring.

The changing environment in which any individual spends their life has a great influence on the success of that organism. **Charles Darwin** called the ability of an organism to be reproductively successful **"Survival of the Fittest".** The environment that any organism lives in (their **habitat**) is the main influence on how fit or successful an organism will be. These influences or obstacles are call **limiting factors**. Limiting factors may be thought of as **biotic** or **abiotic**. Biotic factors are influences that are based in things that are living or once were. For example: the size of the **population** of a particular species of grass in your yard may interfere with the growth of another species. Abiotic factors are influences that are not living or never were. For example: the availability of rain (water) will influence how well a grass in your yard will grow. If one organism out competes or is more successful than another organism in a particular environment, it may have **adaptations** that are relatively effective in that environment. Adaptation takes many generations of genetic change and successful reproduction; therefore, evolution takes some time.

Part 1: Taking Observations-Become One with Your Lawn

Materials:

- **Core sampler 4-in. (a bulb planting core works great!)**
- **Any small stone**
- **Device for pictures**
- **Recording materials**
- **Weeds and grasses field guide**
- **Magnifying glass**

Procedure:

1. Taking a **random sample**: Find a representative location in the lawn you are going to be exploring (you may also use the example quadrat images in Part 2).
2. Find a small stone or other small object and throw it over your shoulder, so it lands in a random spot in the sample area.
3. Using the core sampler collect a 2-inch-deep sample of the lawn where the stone landed.
4. Remove the core samples and place them each on their own small paper plate for examining-don't forget to label the samples on the plate.
5. Take a photo of each core sample (or draw a picture in your field journal)
6. Repeat these steps 3 more times for a total of 4 samples.
7. Examining your samples: Use the table below to guide you in your examination of each sample.
    a. GENERAL OBSERVATIONS: Look over the entire sample and record here what stands out to you.
    b. **DOMINANT** PLANT: Pick the one species that covers the most area in each sample. Take a sample of a complete plant of this dominant species.
    c. Complete plant: Anatomy of a Grass
    d. DOMINANT PLANT DESCRIPTION: Describe the dominant plant specifically enough that someone else could pick it out of a group of other plants.
    e. OTHER PLANT DESCRIPTION: Briefly describe any other species you find in your sample. In addition, record any other findings in this space-animals, human impact, exposed soil.

Core sampling device

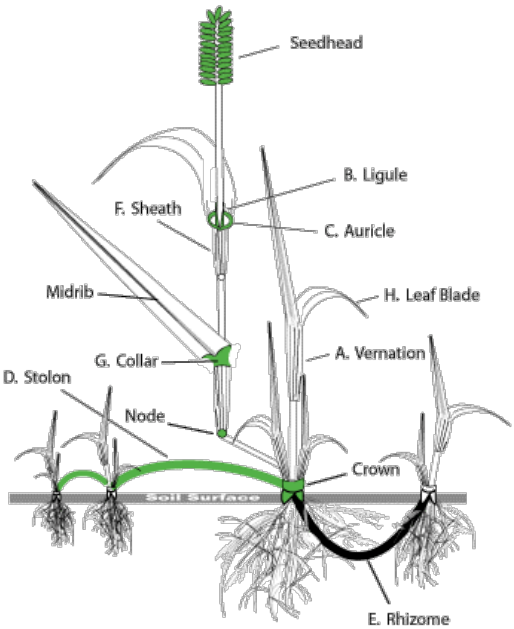


Table 1: Lawn Observations

CORE SAMPLE NUMBER	GENERAL OBSERVATIONS	DOMINANT PLANT	DOMINANT PLANT DESCRIPTION	OTHER PLANT DESCRIPTIONS (any other finds)
1				
2				
3				
4				

8. Now compare the four samples you took and briefly describe the similarities and differences among the samples.

-What is your hypothesis for why the dominant plant was so successful?

-Why do you think the differences you found are there?

-Do you feel your lawn sample is biodiverse? Why or Why not?

-What other organisms did you find living in this habitat?

Part 2: Biodiversity: Percent Cover Experiment

Materials:

- **Meter stick (or yard stick)**
- **4 pencils and string to make a quadrat**
- **Data sheet**
- **Device for picture**
- **Area of mowed lawn and unmoved lawn or provided "Example Quadrats"**

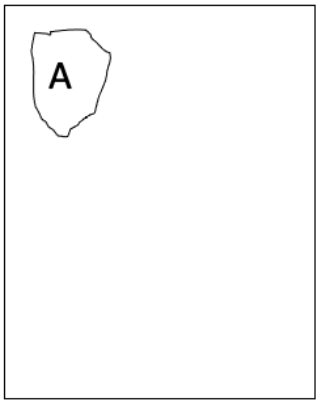
EXAMPLE QUADRATS:

MOWED

UNMOWED

Procedure:

1. Find a field site to examine. This can be in your school yard, a park, or in your backyard, or you may want to use the example photos provided below.
2. You are looking for two areas: an area of lawn that has been consistently mowed and an area that was once mowed but is no longer mowed (see example pictures).
3. Set up your quadrat in the mowed area first. Note: choose an area that is FREQUENTLY MOWED.
4. Record the location of this area in your field journal or on your data sheet and take a photo of the area.
5. Now fill in the Mowed Diagram and the first two columns of Table # 1. Look over the entire area you are sampling and give the first plant a letter designation (like A) and record it on the diagram anywhere you see this plant in the quadrat area-there is no need to identify the plants yet.
6. Fill in the first row of Table 1 for this plant.
7. Take a photo and collect a representative sample — you will need these for your description of this plant later. You may want to draw a picture of this plant in your field journal or on your data sheet as well. SEE EXAMPLE BELOW:

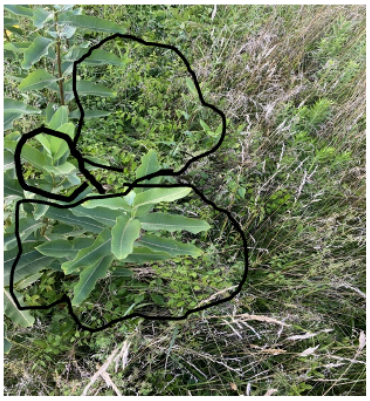


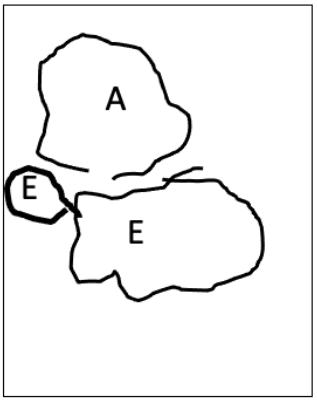
8.

LETTER	%COVER	BRIEF DESCRIPTION
A	2%	

Continue this process for each of the plants you see in the quadrat — you may want to leave the plant that covers the most area last.

9. Now place a second quadrat in the area that has been left unmowed for several seasons (see example "unmowed" photo).
10. Look over the area you just marked off and see if there are any plants in that area that you also found in the first quadrat. Be sure to use the same letter designation for these plants in the unmowed data table. Give a new letter designation to any new plants you find. SEE EXAMPLE BELOW:
11. Use Data Table 2 to record the information you gathered.

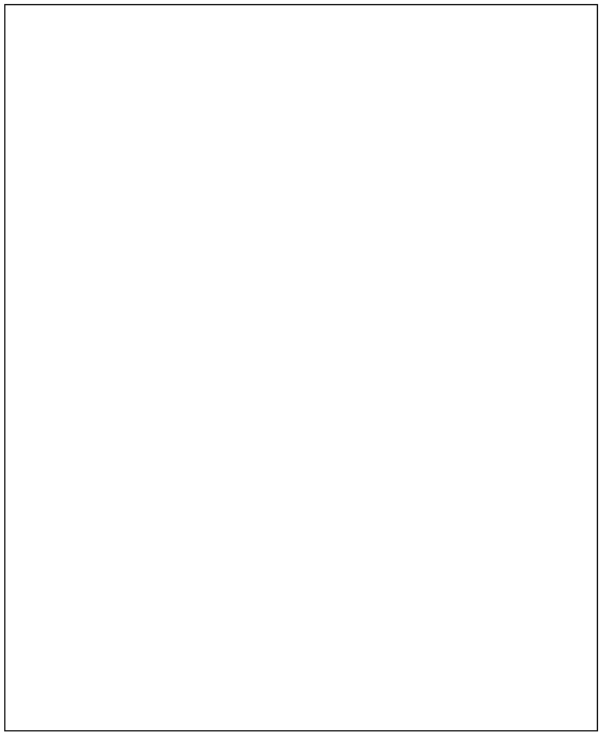




LETTER	%COVER	BRIEF DESCRIPTION
A (same as mowed)	12%	
E (new plant)	15%	

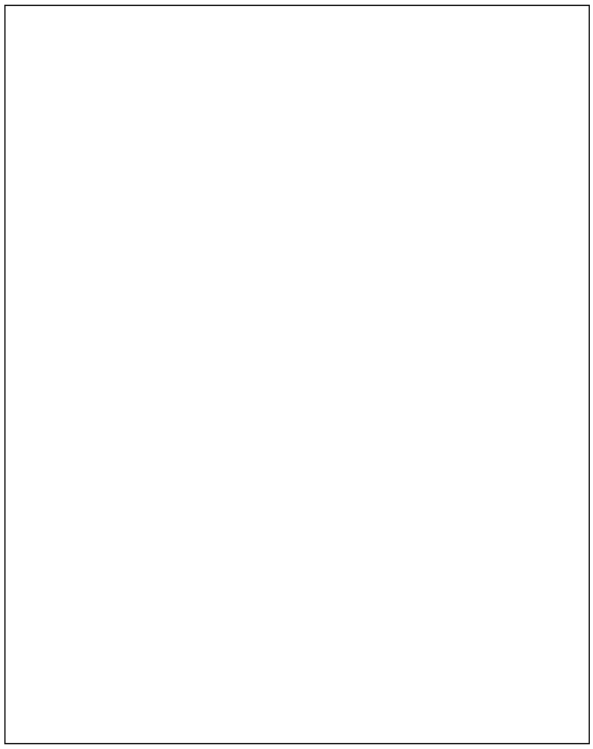
Data Table 2: Field Work

MOWED: DIAGRAM



MOWED: TABLE

LETTER	%COVER	BRIEF DESCRIPTION



LETTER	%COVER	BRIEF DESCRIPTION

Organism Identification:

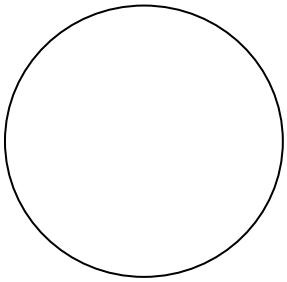
This is for fun — the experiment can be done without species identification (just use the letters). If you wish to identify your grasses and other plants, you may wish to try the free app and website iNaturalist.

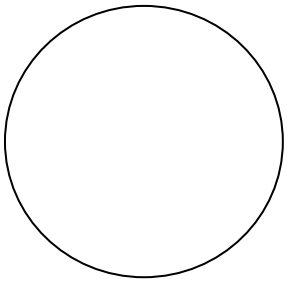
PLANT LETTER	COMMON /SCIENTIFIC NAME	WHERE FOUND (MOWED, UNMOWED, BOTH)	BRIEF DESCRIPTION
A			
B			
C			
D			
E			
F			
G			

Results: Graphic Representation

Mowed **Unmowed**

Using the "percentage cover" you estimated above, create two pie charts so you can easily visualize the data you collected.





Discussion and Conclusion: So, what does this all mean?

Try answering some questions like…

1. Which type of grasses do you think were the most successful and why?
2. Which area studied had the greatest biodiversity and why?
3. Which plants were able to be successful in the unmowed area and not in the mowed area?
4. What are some strategies (adaptations) that plants in the mowed areas have developed that contribute to their success?
5. REMEMBER: When recording adaptations be sure to include both the physical or behavioral characteristic and the adaptive advantage (example: many sharks have elongated pectoral fins to provide lift when swimming).

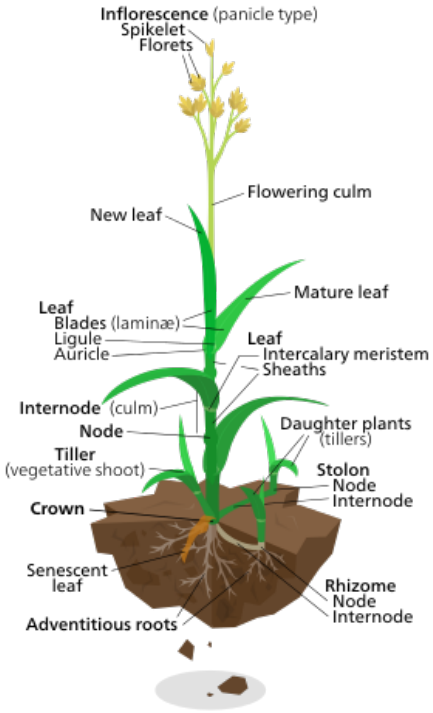
Part 3: Further Analysis: Transition Zone

TRANSITION

The area where the two habitats we have been studying come together is called the **buffer zone** or the **transition zone**. In most cases this will create a new habitat with its own limiting factors where the organisms in each individual habitat may interact—or not. Let's take a look…

As you have discovered, plants need at least the following to be successful:

- sunlight
- water
- nutrients
- reproduction



Let's concentrate on the grasses… a little research.

1. How do grasses collect:

   energy from the sun?

   water?

   nutrients from the soil?

2. How do grasses reproduce?