
How Tall Are You? Measure Plant Height

Activity Overview

Students measure and compare differences in height among native wildflowers or forbs and grasses.

Objectives

Students will:

- Use and interpret measuring tools in both metric and in the commonly used U.S. measuring system
- Compare size between two plant types
- Use statistical techniques to interpret data
- Organize and display data

Subjects Covered

Math and Science

Grades

3 through 12

Activity Time

30 mins. in field, 30 mins. in classroom

Season

Fall

Materials

Measuring instruments, clipboards, pencils, field sheets

State Standards

Math:

Use reasoning abilities (A.4.1, A.8.1, A.12.1)

Communicate mathematical ideas (A.4.2), logical arguments (A.8.2, A.12.2)

Connect mathematical learning with other subjects (A.4.3)

Use vocabulary, symbols, notation (A.4.4)

Explain solutions to problems (A.4.5)

Recognize & describe measurable attributes & units (D.4.1)

Demonstrate understanding of measurement (D.4.2)

Background

Assessing plant height in relation to other species helps to ensure species survival. Plants dependent on wind for pollination and seed dispersal for example, need to be exposed. Flowers attracting flying insects need to be seen. For instance, forbs or wildflowers blooming later in the growing season will carry their flowers and leaves higher on the plant to match or exceed the level of the surrounding grasses. Grasses will send their flower stems above their leaves.

Generally as the growing season progresses, plants grow taller to get enough sunlight to bloom and set seed. In the spring, when herbaceous plants are just beginning to emerge, blooming plants are short. In the fall, plants can be considerably taller when in bloom.

Additionally, competition for space, light, nutrients, and water affects the height of plants from year to year depending upon the local environmental conditions. Crowded conditions with limited resources reduce plant size. During times of drought, plants seldom reach their full height. Plants growing in high nutrient soils tend to grow taller than normal.

Activity Description

You are about to participate in a quick research project. Here are the questions you will answer: How tall are the plants in your restoration? Which ones are the tallest? Are grasses and wildflowers the same height?

On the school grounds

To find out how tall the plants are go to a spot on in a school planting or restoration where you can walk off the trail. When you get to your spot, look at the plants. There are two types of plants to look for in the restoration, the grasses and the wildflowers or forbs. Forbs are herbaceous prairie and savanna plants that are not a grass, sedge, or woody. Wildflowers are native flowering plants that grow in other ecosystems that are not grasses, sedges, or woody.

Use the measuring stick to measure (in centimeters or inches) the tallest five grasses you can find. Measure the plant from the ground to the tip or the tallest point on each plant. Record these measurements on your data sheet. Next, measure the tallest five forbs or wildflowers you can find and record these on your data sheet.

In the classroom

In any research project, the job isn't finished until the data are examined. There are two things researchers commonly do with their data.

How Tall Are You? Measure Plant Height (cont.)

Read & interpret measuring instruments (D.4.3)

Determine measurements by using standard tools (D.4.4)

Determine measurements by using basic relationships or estimations (D.4.5)

Analyze non-routine problems (A.8.3)

Develop effective oral & written presentations (A.8.4)

Explain mathematical concepts, procedures, & ideas (A.8.5)

Identify & describe attributes in situations not directly or easily measurable (D.8.1)

Demonstrate understanding of measurement facts, principles, techniques (D.8.2)

Determine measurement directly by using standard units (D.8.3)

Determine measurement indirectly (D.8.4)

Science:

Discover how organisms meet their needs (F.4.1)

Investigate how organisms respond to internal/external cues (F.4.2)

Investigate structure & function of organisms (F.8.1)

Show organism's adaptations (F.8.2)

Identify how technology is used in someone's job (G.4.1)

Discover changes in technology over time (G.4.2)

Determine how science discoveries change technology (G.4.3)

Identify uses of machines (G.4.4)

Explore how machines were invented & produced (G.4.5)

Identify skills needed for a career in science or technology (G.8.1)

Explain how discoveries influence careers (G.8.2)

Illustrate impact of science & technology (G.8.3)

Design an applied science model or machine (G.8.4)

Investigate local problem & propose scientific or technological solution (G.8.5)

1. First is to graph the results so they can look at them more easily. To see trends in details easier if it is graphed than if it is just a list of numbers.

Make a bar graph of your data on the attached sheets. First you will need to determine the scale for the vertical axis of the graph. Examine your data. You will need to number the vertical axis so that it includes the highest and lowest numbers that you measured. Graph each plant individually.

2. The second thing researchers do with their data is to examine them mathematically. You must calculate the average heights of your plants so that your measurements will not be thrown off by an "oddball" plant that is very unusual.

For prairie and savanna restorations: (Root depth of plants in other ecosystems or for plant types are too variable to generalize.)

3. The part of the plant you measure is "only the tip of the iceberg!" Most prairie plants have twice as much plant matter below ground in the roots as they do above ground in the stems. Using the worksheet, calculate how long the roots would be for an average grass and forb based on your measurements.

Further Questions to Consider

1. What is an advantage to being a tall plant?
2. What is an advantage to being a short plant?
3. What is an advantage to having deep roots?

Extensions

- Record plant height, temperature and rainfall data each year to see possible correlations between environmental conditions and plant heights.
- Research root depth of plants growing on the school grounds.
- Compare plant height of the same species growing under different conditions such a shade vs. sun or dry vs. wet.
- Compare plants blooming in the fall to plants blooming in the spring.

Additional Resources

- Egan, D. (2002). *Arboretum prairies*. Madison, WI: UW-Madison Arboretum.
- Gruchow, P. (1995). *The kingdom of grass: An introduction to the prairie world*. Available through the Earth Partnership for Schools program.
- Madson, J. (1995). *Where the sky began: Land of the tallgrass prairie*. Ames, Iowa: Iowa State University Press.

Assessments

- Communicate orally and with visuals your process of measuring plant height and your results.
- List at least three observations about plant characteristics relating to height.
- Using information from graph, write a paragraph on what you learned from this activity.

How Tall Are You? Measure Plant Height Field Sheet

Data Sheet

Location _____ Date _____

Researcher names _____

School Name _____

Collect Data

Grass Heights

Forb/wildflower Heights

1. _____
2. _____
3. _____
4. _____
5. _____

1. _____
2. _____
3. _____
4. _____
5. _____

1. Graph

What can you tell from your graphs?

2. Calculate the average

TOTAL
SUM _____

TOTAL
SUM _____

Grass Height Average = Total Sum _____ $\div 5 =$ _____

Forb/wildflower Height Average = Total Sum _____ $\div 5 =$ _____

3. Estimate root length

2/3 of a prairie plant is below ground and 1/3 is above ground. Calculate the length of the root of your average grass and average forb.

Grass height average _____ $\times 2 =$ _____
(grass root length)

Forb/wildflower height average _____ $\times 2 =$ _____
(forb/wildflower root length)

How Tall Are You? Measure Plant Height Graph

Plant Height- _____

