What Grows There?

By Sheri Amsel

Charting plant growth is a simple activity for introducing upper elementary students to plant life cycles and competition among plants.

Even though students see plants all around them, they tend to ignore them. Animal studies usually get all the "press." As a naturalist, children's book author, and coordinator for an educational science website for teachers, I know from personal experience that observing and charting plant growth can be as intriguing as observing animals. Here, I share a simple but thought-provoking activity teachers can use with fifth- and sixth-grade students: plant research plots. As students monitor the plant growth in one-meter plots over a period of six weeks, they practice science-process skills while learning about plant life cycles and how plants compete with each other.

By the end of the six weeks, students are able to confidently identify common plants growing in their immediate area and have developed some understanding of how plants succeed in their habitat. I encourage you to try this simple activity with your students—you'll soon discover that plants are ignored no more!

Plot Preparations

This study is ideal for early spring, when students might get to see plants emerge and bloom before summer break. Timing will vary in different parts of the country—check with your local garden center or extension service for specific dates for your area.

Before beginning this plant study with students on school grounds, make sure school maintenance staff is aware of the project. In advance, scope out possible plot

sites. For maximum species diversity, look for areas "on the edge"—i.e., near trees or an overgrown area rather than lawn. Consult school groundskeepers to find out whether there are areas that need to be avoided—be sure the selected sites are safe for students and free from pesticide spray, fresh manure, and poisonous plants, such as poison ivy. In addition, be aware of student allergies to pollen or bee stings and take appropriate precautions.

Once these preliminaries are in place, find out what students know about plants. Suitable preassessment questions include the following (answers in parentheses):

- Do all plants grow at the same rate? (no)
- What would be the advantage of one plant growing faster than the other plants nearby? (Faster-growing plants dominate the growing space, get more sunlight, and "shade out" slower-growing species.)
- What are four things that plants are competing for in their habitat? (sunlight, water, soil, space, nutrients, and pollinators)
- What is the purpose of a plant producing a flower? (The flower attracts pollinators.)
- Once a plant is fertilized with pollen, what does it produce? (fruit, which contains seeds)
- Once a plant has completed its cycle of flowering and producing seeds, what does it do? (die back, if an annual)
- What would be the advantage of a plant that grows up later in the season? (Late or slow-growing plants take advantage of the habitat resources after the fast-growing plants have finished their life cycle.)
- How many plants can you name that grow wild near where you live? (Answers vary.)

After the preassessment, present the study. Students, working in groups, will each be responsible for monitoring their own research plot—a one-meter square of land—that will not be mowed or disturbed for six weeks. The purpose of this activity is to observe plant life cycles and to see how plants compete with other plants to get what they need to complete their life cycle. Through this activity, students will be responsible for

- Observing their plot weekly at regular intervals (ideally, one to three times a week, depending upon time available to devote to the project) and identifying different kinds of plants in their plot—even if they can't name them (students won't be able to do this at first).
- Measuring the height of the plants (each different *kind* of plant, not each single plant) and recording their observations on a data sheet.
- Noting when different plants flower.
- Identifying plants using a field guide that includes local plant species.
- Noting any insects observed at their plants' flowers.
- Noting when plants form fruit.
- Noting when some plants complete their life cycle.
- Noting what happens to other plants when nearby plants complete their life cycle (annuals).

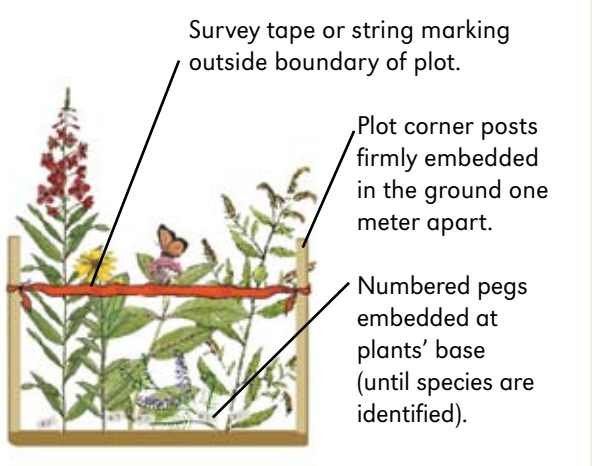
Marking and Observing

Once students know the scope of the project, teachers can select a day to establish and mark the plots (Figure 1). It is helpful to have metersticks or twine precut to one-meter lengths for students to use to mark out their one-meter study squares, though students will likely need adult assistance in getting their corner stakes firmly planted in the ground. (Corner stakes are available by the bundle at gardening or home improvement stores).

Typically, each group member performs a specific role, such as measurer, recorder, plant identifier, or quality-control person (recheck measurements, etc.), and the roles rotate each observation period. The teacher's role is to assist groups with problems as they work in the plots. It is helpful for teachers to model for students how to measure plants and how to record data on the data sheet (Figure 2, p. 46).

Allow at least 30 minutes per visit, and provide students with the necessary materials to use at the site: recording sheet, pencil, ruler, measuring tape, and plant identification sheets (see Internet Resources). On the first visit to the plot, the task is to conduct an initial survey of the plot, recording all the plants growing there. If students cannot name a plant definitively, have them number each plant and mark it with a toothpick and tag at its base. As the study progresses (and the plants grow), students are usually able to identify all the plants and can replace the number with the plant's actual name.

Figure 1.
Plant plot illustration.



At first, students will have several unidentified plants in their plots, so it is helpful for students to become familiar with various plant traits (see NSTA Connection). As students try to identify the plant in their plots, ask questions such as, "Is the plant stem smooth or hairy? Are the edges of the leaves *entire* (smooth or toothed)? Are leaves *opposite* (across from each other on the stem) or *alternate* (offset)? Are the leaves *simple* (plain oval shaped), or *compound* (do they have many leaflets)? Are leaves *lance-shaped* (wider at the base and coming to a point at the end), *oval* (wider in the middle), or *narrow* (long and thin)."

As the study continues each week, the level of detail in students' observations will increase, as will their ability to identify plants. For example, students will begin to note similarities and differences between the species of plants in their plot and comment on leaf shapes and edges, flower shapes and colors, etc.

Once the plants have flowered, provide students with paper and extra time to sketch their plants. These can be simple renditions. Have students focus on leaf patterns on the stem (opposite or alternate), leaf shape (the leaves on the stem, not at the base of the plant, as they can be quite different), flower location on the plant, and flower shape.

Remind students to record the date each plant flowers and to note if they see insects pollinating their plants, and if so, what kind of insect. Every week or so, spot check to make sure students are using their data sheets correctly.

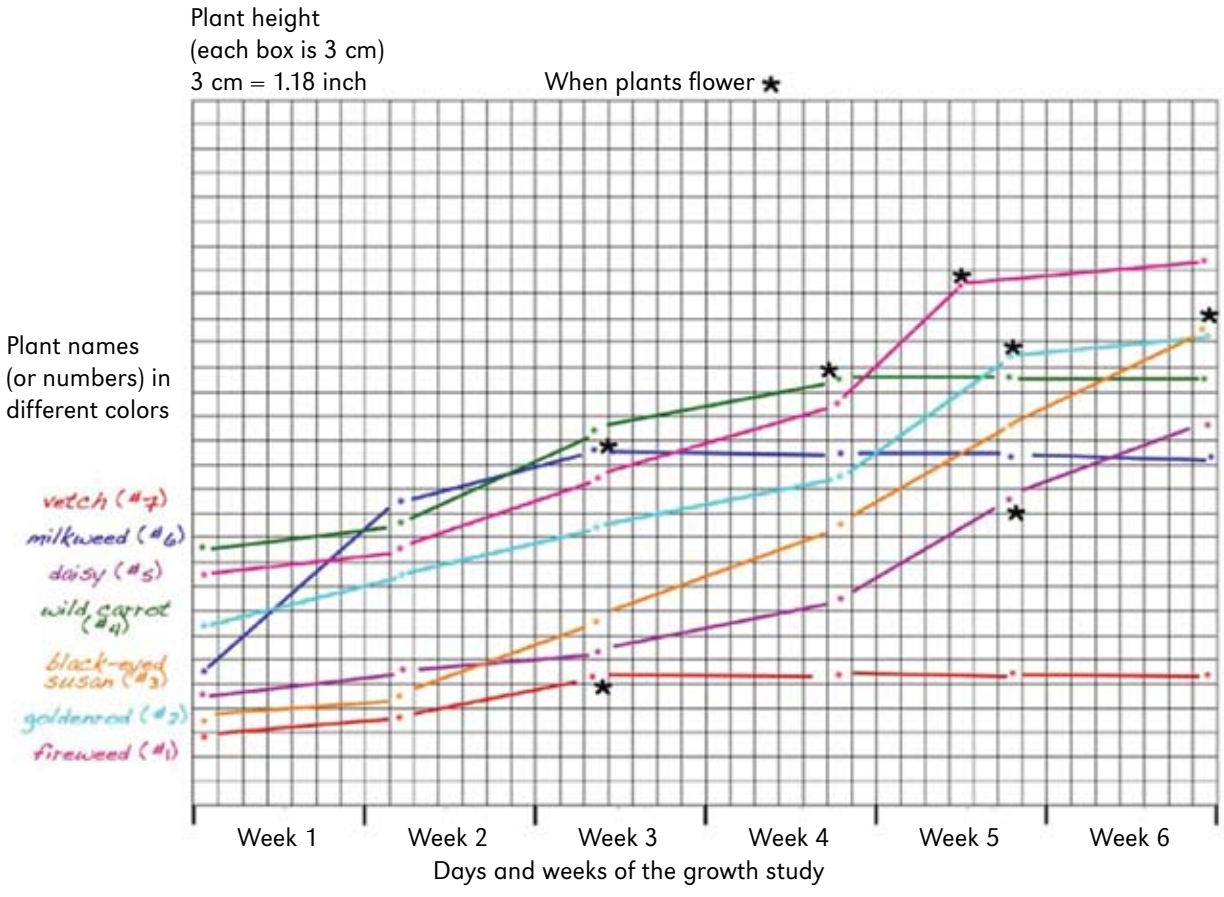
Making Connections

After a few weeks of observation, bring students together to discuss their experiences. Ask questions like, "Which plant is the tallest?" and "Which plant flowered first?" "Which plant do you see the most of in your plot?" "Does it seem like your tallest plant has stopped growing? If so, what is it doing now?"

Introduce the idea that plants compete with each other for sunlight and space and that the speed of plant growth is a factor in a plant's survival in their habitat. Did the faster-growing plants crowd out the smaller plants?

Point out the comparison that, in the animal world, the strongest predator gets the most food, while in the

Figure 2.
Plant growth recording sheet.



plant world the most efficient collector of sunlight *makes* the most food. Animal scavengers often prosper because they take leftover food without expending the energy to hunt and kill prey. Compare this to plants that grow more slowly, bloom later in the season, and take advantage of late season sunlight without competing with early fast growers. (This is an oversimplification, but it helps illustrate the concept of a plant niche.) These conversations will help raise students' awareness of plants as they discover that plants grow at different rates (speeds), grow to different sizes, and flower at different times.

Analyzing Results

At the end of observation period and after additional follow-up discussions, help students connect the points on the data chart and discuss what the graph they have created reveals. Students should be able to tell

1. How tall the plants grew compared to one another.
2. How quickly the plants grew and flowered compared to one another.
3. If the plants continued to grow taller after they flowered.
4. Which plants out-competed the others for sunlight and space over the duration of the study.

Help students understand that this data is showing that plants compete with each other for sunlight and space and that how fast plants grow is important to their survival in their habitat. To guide the discussion, ask students to look at the plant heights at the beginning of the study. (Plants should be similar heights at first.) Then, have students note the plants that got taller faster. What happened to the growth of the other plants? (It was much slower or stopped altogether.) If the research goes on long enough, students will observe that the fast plants stop growing at a certain height, flower, make seeds, and die. Ask students if other plants then grew taller. (Students should see secondary growth of late bloomers like goldenrod and ragweed.)

Students might also recognize water and pollinators as other important resources that affect plant growth. In addition, students may begin to realize how important plants are in supplying food to the bottom of the food web. To help make these connections more apparent, ask students how they think rain affected the study (rain enhances plant growth). Would the plants have grown the same way in a drought? In what other ways might plants be pollinated besides by insects? (wind).

Assessments

After these discussions, present students with the pre-assessment questions from the beginning of the study and have them answer them again. Charting plants lends itself to numerous opportunities for students to demonstrate what they have learned. For example, students could:

- Bring younger students to their plots and describe their study.
- Give a flora tour for other students and their parents.
- Create a plant mural, doing to-scale (accurate adult heights) drawings of local flora with plant facts to hang in the school hallway.
- Publish their findings online.

Sharing what they learned with other students and family members will help reinforce the knowledge students attained from the activity, give them a sense of pride in this new knowledge, and foster a greater sense of their own ability to learn science. For students who do not spend much time outside, this activity will raise their comfort level with getting right out there in the grass and looking at things. ■

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Internet Resources

Exploring Nature Educational Resource
www.exploringnature.org/database/wildflower_index.php
Making Tracks Wildflower Field Guide
www.makingtrackschallenge.com/tg/view_wildflowers.php

NSTA Connection

Download a blank plant growth chart and a plant traits worksheet at *www.nsta.org/SC0909*.

Connecting to the Standards

This article addresses the following *National Science Education Standards* (NRC 1996):

Content Standards

Grades 5–8

Standard C: Life Science

- Structure and function in living systems
- Regulation and behavior
- Populations and ecosystems
- Diversity and adaptations of organisms

National Research Council (NRC). 1996. *National science education standards*. Washington, DC: National Academy Press.