



7. *A Rose by Any Other Name*

Description: Students learn about the process of naming and studying plants by selecting and observing a plant, naming it, and sharing their observations and names with fellow students.

Objective: Students learn:

- that they do not need prior knowledge to identify and enjoy plants;
- about methods of identification and classification of plants;
- some common terms used to describe plants; and
- some methods of plant identification and classification.

Materials:

Although this activity can be conducted without any materials, the following items may be useful to have:

- Paper and clipboards
- Colored pencils
- Magnifying glasses or hand lenses
- Copies of student pages
- Field guides to plants

Phenomena: There are many plants growing in this area.

Lesson Question:

- *Can you tell one kind of plant from another?*

7. *A Rose by Any Other Name*



Grades: 4–8

Time: 45 minutes to an hour and half, depending on class size

Subjects: science

Terms: *binomial, genus, scientific nomenclature, species name, variety*



New Mexico STEM Ready! / Next Generation Science Standards

NOTE: see **NGSS Connections to *Going Out: Field Activities*** at the end of this chapter for more possible field trip NGSS connections and for suggestions using each standard.

NGSS DCIs

This activity can be the foundation for many Disciplinary Core Ideas. First, students observe, record, and become able to recognize unique features of a single kind of plant in this activity. Then, expand on this basic understanding of plants' unique features into plants' complex biology and roles in the ecosystem for standards such as: **LS3.A** Inheritance of Traits; **LS3.B** Variation of Traits; **LS4.C** Adaptation; and **LS1.A** Structure and Function, among many others.

NGSS CCCs

Patterns; Structure & Function

Background:

Have you ever wondered why plants have the names they have? Is there anything special about the names of plants? The world of plant names is a fascinating realm to explore. Often, understanding the name(s) of a plant helps us understand and appreciate the plant itself. Cottonwoods are trees (wood) with cottony seeds.

Most plants have several names. The common name is the name most people use for a plant. Each language may have its own common name for an individual plant, and often, especially for plants that have wide geographic ranges, there are several common names for each plant. These common names are also used for different plants, especially in different regions. Using only common names can result in much confusion. Since many plants have important properties, such as medicinal or food uses or toxic properties, it is important to communicate very clearly about which plant you are discussing.

Carolus Linnaeus (1707–1778), a Swedish scientist, developed a system (*Species Plantarum*, 1753) for giving each plant species its own unique name. This name is called the plant's "scientific name" and follows Linnaeus's formula for "**scientific nomenclature.**" The species name, sometimes called a **binomial**, has two main parts: the genus and the specific epithet (descriptor). Other parts of the species name include the author(s) who have first identified the plant and the family name that groups related genera (plural of genus) together.



Common sunflower *Helianthus annuus*
Photograph by Elliott Gordon



The **genus** is the first word in the binomial and is always capitalized. Although it comes first, it is more like a person's last name. The genus describes a group of plants that are related. The second word, or the specific epithet, is unique within that genus to one species of plant. It is usually not capitalized. Both are written in Latin and are *italicized* because it is a foreign language. It is easy to think of the specific epithet like someone's first name. For example, at school there may be several people named Katie, but in a family there is usually only one person with that name. To keep the Katies straight at school, a last name is often used. This is usually the same last name as other members of Katie's family. People familiar with Katie's brother may be able to recognize that she is related to him either by her last name or by similar features.

Plants are like that too. The scientific name for the cottonwood found in the Middle Rio Grande bosque is *Populus deltoides* var. *wislizeni*. The genus *Populus* shows it is a poplar tree; *deltoides* refers to the leaf shape (deltoid or triangular); and the last name is the **variety** (var.), named for Frederick A. Wislizenus, who collected plant specimens in New Mexico in 1846. Different populations of plants within one species are called varieties.

There are several kinds of poplars or cottonwoods that grow in New Mexico. The Fremont cottonwood found in the San Juan and Gila Rivers is *Populus fremontii*. *Populus angustifolia* or narrowleaf cottonwood grows along mountain streams. Another mountain tree is quaking aspen, or *Populus tremuloides*. Although these trees are all in the same genus (*Populus*), they are each individual species. When both the genus and the specific epithet are used together, they are known as the **species name**, such as *Populus deltoides*.

When scientists discover a plant that has not been described before, they get to name the plant. Sometimes they name the plant for themselves or for people they admire. Sometimes they name the plant for some unique features that the plant has. Often the location where the first plant of that species was found is part of the name.

In order for scientists to claim the "discovery" of a new plant, and thus get the honor of naming the plant, they must write and publish a description of the new species. They need to describe what the species looks like, including the features of the flowers, fruits, leaves, etc. They need to explain where it grows and attempt to describe the geographic range of the plant. They need to explain what other plants this new species is related to, and what makes it different from its closest relatives. Originally, this description was written in Latin!



Spear globemallow *Sphaeralcea hastulata*
 photograph by Elliott Gordon



Sometimes more than one person will assign a plant a name. The International Association of Plant Taxonomy governs the process of naming and has rules for resolving naming disputes. There are two codes (The St. Louis code and the Tokyo code) for deciding the proper name. Botanical congresses convene regularly to sort out any confusion.

Botanists have many words to describe very specific features of plants. The “Guide to Observing Plants” in this activity illustrates some of these terms for identifying various plant features, leaf shapes and arrangements, and flower and fruit types. The sidebar defines some common botanical terms.

Procedure:

- ♣ Ask students to name some of the plants they know. *Does anyone know why the plant has that name?* Discuss the kinds of names that plants have (see *Background*).
- ♣ Explain that scientists and explorers sometimes name plants. Today the students are going to be explorers and find “new” plants (actually, it is okay for students to select any plant, but preferably a plant that is new to the student.) They will make up their own names for the plants based on their observations. Once the students find, make observations on, and name a plant, the group will take a “guided nature hike” and every student will get to show their classmates a plant and explain its new name.
- ♣ Designate boundaries for the area where students can search for plants. This could be as simple as “do not get out of sight of this ‘designated landmark’.” Also designate a meeting time and a meeting place for students to return to start the nature hike.
- ♣ The tasks for students are to:

 - Select a plant that they would like to observe.
 - Draw the plant and take notes about it. Students use the “Guide to Observing Plants” student page to help describe the shape and arrangement of its leaves and characteristics of the flower or fruit. Students can also look for clues about where the plant grows. *Does it seem to like the sun or the shade? Does it appear to need lots of moisture? Are there any plants that it seems to grow next to? What does the plant feel like? Does it have a smell? Does it make a noise when the wind blows?*
 - Record at least three interesting observations about the plant.
 - Create a name or names (common and/or scientific, or in other languages) for their plant and describe why they are chose the name.

(Patterns; Structure & Function)



Desert willow *Chilopsis linearis*
photograph by Elliott Gordon



- ♣ While students are exploring the designated area and selecting, observing, and naming plants, circulate among the students to assist with individual questions. Most students will need five to 10 minutes for this part of the activity.
- ♣ Assemble the group together again and explain that the group is going on a guided nature walk to each person's plant. Ask a student to lead the group to his or her plant. Have the student introduce the group to his or her plant and explain his or her name for the plant. Ask if any other students selected the same kind (species) of plant. *What was their name?* Ask the students to share at least two of the special observations they have made. If you know the plant, you can add additional information about the plant here, but the activity works well without any previous plant knowledge. Ask if any other students have a plant nearby and move on to the next plant until all students have shown and discussed their plant.

Assessment:

Assessment can be based on participation and noting the care and quality of the students' observations.

Extensions:

- Younger students can do crayon leaf rubbings. Label parts of the leaf as appropriate.
- Do the "Who Grows Where?" activity on the *Changing River* model in this *Guide*.
- Students may want to learn more about their plants. With field guides, and even the plant identification cards in the "Who Grows Where?" activity, they can try to identify the plants they have become familiar with on their nature hike. You can invite someone along who knows the plants of an area to teach them to you.
- Use online sites like: iNaturalist, Seek, PlantNet, PlantSnap, LeafSnap, or Google Images. These allow you to take a photo, upload it and their artificial intelligence (AI) software will quickly send an identification, and in some cases will have human verification as follow-up.

Our caution is that when students ask for a name, and get it, often their attention and learning about that organism stops—it is identified. But the real learning comes with observation, noting qualities and relating that organism to its ecosystem.

- Students may want to research the different names for their plants. Most field guides give both the English common name or names and the scientific name. Seek out Spanish names and local Indigenous names for the plants. *Are any characteristics, locations or uses for each plant etc., reflected in its name?* Interviews are another excellent way to collect common names for plants.



- Conduct oral histories with elders to learn more about traditional knowledge of native bosque plants.
- Identify an adaptation of the chosen plant, and think of something humans have created or invented that is used for similar purposes, or have students invent something based on the plant's abilities (i.e. seed attachment for dispersal and velcro). (**Engineering**)

Resources/References:

There are many references to help with plant study and plant identification. Do a search for local field guides as well as student plant identification resources, or the online apps listed under extensions.

Cartron, J.E, et al. 2008 A Field Guide to the Plants and Animals of the Middle Rio Grande Bosque, University of New Mexico Press.

Harris, J.G & M. Woolf Harris. 1994/2001 Plant Identification Terminology: An Illustrated Glossary, Spring Lake Publishing, Payson, Utah.



Guide to Observing Plants

When you are trying to identify a plant, there are several observations you can make. Follow this guide and answer the questions to help you identify your plant.

1. Find a plant.

Is your plant a tree, a shrub, a forb, a graminoid, or other?



If it has a woody base, it is a tree or a shrub.

If it has a woody base and, when mature, it is over 10 feet (3 m) tall, it is a tree; otherwise it is a shrub.

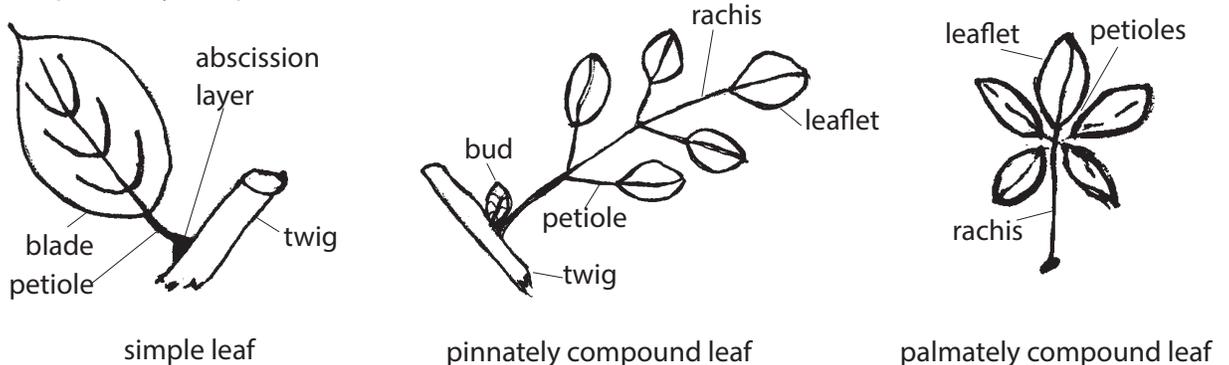
If it does NOT have a woody base and it looks like a grass, call it a graminoid.

If it does NOT have a woody base and it does NOT look like a grass, call it a forb.

If it doesn't fit any of these categories, call it other.

2. Look closely at the leaves.

Identify the basic leaf parts: blade, leaflets (if compound), petiole, etc. Determine if your leaf is simple or compound. If it is compound, is it pinnately compound or palmately compound?

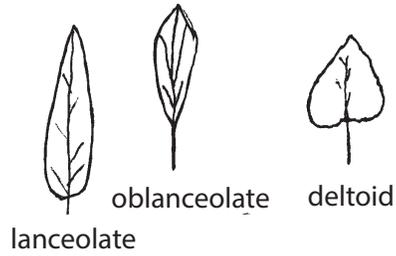
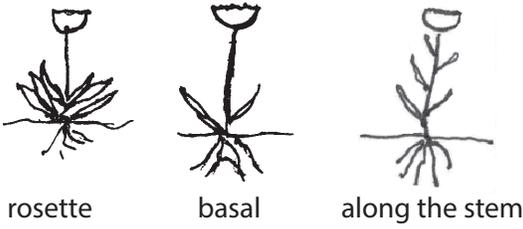


3. How are the leaves arranged on your plant?

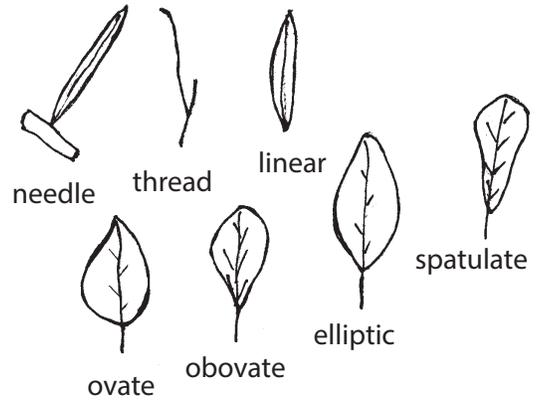




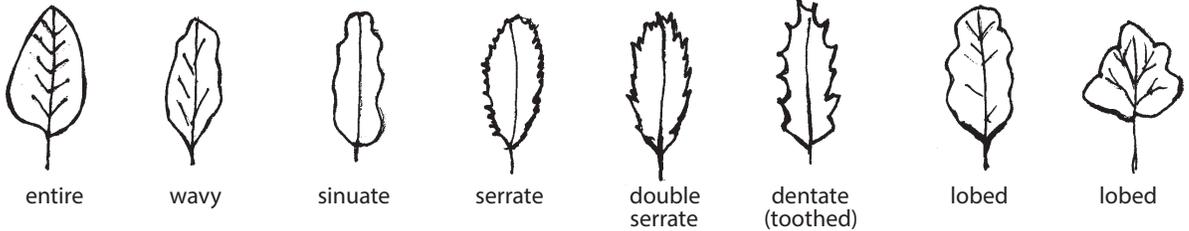
4. If your plant is a forb, where do the leaves grow?



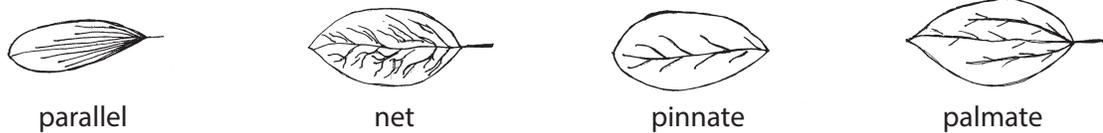
5. Draw your plant's leaves.
What shape is your leaf (or leaflets)?



6. What kind of margin (or edge) does your leaf have?



7. What kind of pattern do the veins in your leaf make?



8. Write three observations about your plant:

9. Name your plant: _____

Why did you choose this name:



Common Botanical Terms

Botanists use many special words to describe plants in very precise ways. Many of these words are very specific to distinct features, so they are not used in normal conversation. They are true English words, though (and legal for use in Scrabble®!).

Here is a list of some of the more common botanical terms that are used in this Guide to Observing Plants. (Primarily from *Plant Identification Terminology: An Illustrated Glossary*)

Growth Types:

tree: a large, woody plant that at maturity is over 10 feet (3 meters) tall

shrub: a woody plant, usually with several stems, that is generally under 10 feet (3 meters) tall

herb: a non-woody plant; stems die back to the ground at the end of the growing season;
herbs include graminoids and forbs

grass: an herb that is in a family of plants that has jointed, tubular stems, leaf parts that include a sheath, ligule, and blade, and modified flowers that produce grains

graminoid: an herbaceous plant that either is a grass or looks like a grass

forb: a non-grass like, herbaceous plant

Leaf Characteristics:

simple: undivided, as a leaf blade not separated into leaflets

compound: with two or more parts in one organ

opposite: having two parts across from each other at each node, as in leaves on a stem

alternate: having only one part at each node, as in leaves on a stem

blade: the broad part of a leaf or petal

petiole: a leaf stalk

rachis: the main axis of a structure, such as a compound leaf or an inflorescence (cluster of flowers)

abscission layer: a thin wall of cells at the base of the leaf petiole that breaks down and causes the leaf to fall

node: the position on the stem where leaves or branches originate

internode: the portion of the stem between two nodes

rosette: a dense, radiating cluster of leaves

basal: positioned at or arising from the base, as leaves arising from the base of the stem

clasping: wholly or partly surrounding the stem

pinnate: resembling a feather, as in a compound leaf with leaflets arranged on opposite sides of an elongated axis

palmate: divided from a common point, like fingers on a hand

lanceolate: lance-shaped; much longer than wide, with the widest point below the middle

oblanceolate: inversely lanceolate; much longer than wide, with the widest point above the middle

deltoid: with the shape of the Greek letter delta; shaped like an equilateral triangle

needle: a slender, needle-shaped leaf, as in pine trees

thread: a thin leaf, like a thread without fleshy tissue on each side of the blade

linear: resembling a line; long and narrow with more or less parallel sides



ovate: egg-shaped in outline and attached at the broad end

obovate: egg-shaped in outline and attached at the narrow end

elliptic: in the shape of an ellipse, or narrow oval; broadest in the middle and narrower at two equal ends

spatulate: like a spatula in shape, with a rounded blade above gradually tapering to the base

sinate: with a strongly wavy margin

serrate: saw-like, toothed along the edges, the sharp teeth pointing forward

dentate: toothed along the margin or edge, the teeth directed outward rather than forward

lobed: bearing rounded divisions or segments which are cut less than half-way to the base or mid-vein

net-veined: in the form of a network; reticulate

Flower Parts:

flower: the reproductive part of a plant

petal: generally the showy, colored part of a flower, yet determined by position in relation to other plant parts (i.e., above the sepal)

sepal: the outer parts of a flower, typically a green bract that is below the colored petal

stamen: the male reproductive organ in a flower, consisting of a stem called a filament and the head called the anther which contains the pollen

pistil: the female reproductive organ in a flower, consisting of the ovary where the seed develops, the stigma where the pollen enters, and the style that transports the pollen from the stigma to the ovary

Life Cycle:

annual: a plant that grows from a seed, flowers, sets seed, and dies in the same year

biennial: a plant that lives two years, usually forming a basal rosette of leaves the first year; the second year it flowers and fruits, and then dies

perennial: a plant that lives three or more years

