



Lesson 19

A TISKET, A TASKET, WHAT PLANTS ARE IN MY BASKET?

LESSON OVERVIEW

Students will learn about plant structures by working together as a class to identify, collect, and press local native plants found in the schoolyard or nearby natural areas.

SUBJECTS

Science

METHODS

Observe examples of forbs, grasses, and woody plants, field activity collecting plants, mounting and labeling plants

SKILLS

Observe, classify, collect, and organize data

MATERIALS

Nature magazines, chart paper, field guides (for identifying plants), plastic bags, plant press (9 x 12”), newspaper (18 x 12” folded in half), clippers, trowel, cardstock or posterboard (8.5 x 11”), glue, hand lenses

VOCABULARY

Forb, woody plant, grass, sheath, seedhead, leaves, stem, flower, root, seed, producer, consumer, photosynthesis, respiration, rhizome, succulent, dicot, monocot, inherited trait

CONCEPTS

- Plant parts include leaves, stems, roots, flowers, and seeds.
- Plant parts have functions that help the plant survive and reproduce.
- Plants have functions in the ecosystem as producers of food.
- Forbs are soft stemmed, broadleaved plants that feed domestic animals and wildlife (dicots).
- Grasses are narrow leaved plants with jointed stems that domestic animals and wildlife eat (monocots).
- Woody plants, such as trees and shrubs, have woody stems and branches, and the leaves serve as browse for some domestic animals and wildlife (dicots).

OBJECTIVES

- Observe samples of forbs, grasses, and woody plants.
- Identify plant parts and their functions.
- Make a plant collection and discuss its scientific purpose.
- Make generalizations about plant functions in the ecosystem.
- Discuss careers and why scientists make and collect plant specimens.

*Lesson name courtesy of
Trish Cummins*

BACKGROUND

One of the best ways to learn about plants is to collect, press, and mount local plant specimens. Plant mounts make better study material than any field guide. However, to minimize loss of plants from the environment, it is helpful to have the class make the collection together and limit the number collected to 3 of each type of plant for the class. Then students can work together to dry and mount the class specimens.

A properly dried, pressed, and mounted plant is attractive, easily displayed, and will last a long time. Dried plants can also be used in art projects. If plants are not too bulky, they can be laminated to protect them for permanent use. Completed plant collections can be checked using a field guide or by asking a range scientist to help ensure their accuracy. The best time for this activity is in the spring when many plants of all types are blooming. Use this activity in conjunction with field projects. Maintaining a record of common plant species with a plant collection will supplement data of many field studies.

PROCEDURE

NOTE: This lesson is best done in the spring when many plants are blooming.

Getting Ready

Collect field guides such as *Wildflowers of Texas* by Geyata Ajilvsgi, *Trees Shrubs & Cacti of South Texas* by James Everitt, Lynn Drawe, and Robert Lonard, *National Audubon Society Field Guide to North American Trees, Western Region* by Elbert L. Little, and *Common Texas Grasses* by Frank W. Gould.

To prepare for collecting plants, students should learn some background information, including basic understanding of rangeland plant groups (forbs, woody plants, and grasses). To make this possible the teacher should prepare samples of each plant group or have access to samples to use in the activity. You will need two or three examples of each type of plant. Forbs might include bluebonnet, Indian blanket, and Texas dandelion, but any wildflowers will be fine. Woody plants might include blackbrush acacia, agarito, and huisache. Grasses might include little bluestem, buffalo grass, and big bluestem.

Step 1: Importance of Plants in an Ecosystem

1. Begin by asking students the following questions:
 - Why are plants important to an ecosystem? (As the primary producers in an ecosystem, plants play a vital role in directly or indirectly sustaining all other life. Plants produce nutrients through photosynthesis that sustain their own growth and reproduction and provide for consumers (herbivores) that in turn provide food for other consumers (carnivores) in the food chain of an ecosystem.)
 - *Older Students* - How do plants make their own food and provide food for other organisms? (Older students should be able to give a simple explanation of what photosynthesis is and the importance of sunlight, carbon dioxide, water, and chlorophyll in the process.)

- How do carbon dioxide and oxygen function in the survival of plants and animals? (Plants use carbon dioxide to conduct photosynthesis which produces carbohydrates and oxygen. Plants use oxygen in respiration, but they don't use as much oxygen as they produce. Animals eat plants and use oxygen in respiration. Plants are users of carbon dioxide and the producers of oxygen and of carbohydrates. Animals are consumers that eat plants for energy and use oxygen for respiration.)
- Are plants renewable or nonrenewable resources? (Plants are renewable resources as long as they are allowed to live long enough to reproduce.)

Step 2: Food Chain Art Project

1. Have each group of four students diagram a food chain beginning with the sun, using photos cut from nature magazines on a large piece of chart paper to share with the class.
2. Have each group try to connect their food chain to another food chain as the class develops a food web. Notice that often there are animals that eat the same plants that connect the food chains into the food web. For example, bees, butterflies, hummingbirds, grasshoppers, and rabbits all eat some part of wildflowers (pollen, nectar, leaves, or the whole plant).

Step 3: Introduction to Rangeland Plants

1. Knowing how to identify plants is an important skill that enables range managers to assess the health of the plant community. To help students learn about some of the different types of plants on rangeland and familiarize them with a plant collection, bring in an example of dried and mounted plants illustrating each type of plant that you will discuss. For example, a bluebonnet and a huisache daisy to represent forbs, a sample of grasses such as a buffalo grass and little bluestem, and a sample of woody plants such as agarito, huisache, and mountain laurel. You will need enough plants to have one for each group (between 4 and 7 plants depending on the size of your class).
2. Divide the class into groups of 4-5 students. Give each group one of the plants and ask them to:
 - Make observations
 - Describe the plant
 - Write down what they observe in their journals
 - Include parts of the plant and function of each part:
 - Stems — hold the plant upright and transport nutrients and water
 - Leaves — conduct photosynthesis to transform energy from the sun to chemical energy the plant can use as food to survive and grow new top growth and other structures

NOTE: Some plants, including some grasses, propagate with rhizomes, which come from the roots. All these functions must take place in order for the plant species to survive.

Flowers — provide for reproduction of new plants of the species

Seeds — grow new individuals

Roots — store food and take in and transport water and nutrients from the soil

3. If students don't know all the parts and their functions, they can ask another group to help them. After about 5-10 minutes have students pass their plant to the next group. Continue observing, describing, and taking notes in journals until each group has had a turn with each of the plants.
4. Have the groups share their observations about the parts and functions of each plant with the class by asking each group to provide one observation about each plant until all observations are reported.
 - What would happen if some of the parts of the plants were not present? (If stems were not present, there would be no place for the leaves to attach. If leaves were not present, there would not be enough surface area to convert energy for food. If roots were not present, there would be no uptake of water and nutrients from the soil and no place to store food. If flowers were not present at some time in the year there would be no seeds. If there were no seeds, no new plants would grow, except for plants that can propagate by rhizomes. Then these structures must be present.)
 - What do we call something that doesn't function in the same way if parts are missing? (A system)
5. Review seed structure in dicots and monocots. (Soak enough bean and corn seeds for a week or so for each student in your class. The beans will be ready before the corn so you might want to start soaking the corn at least a few days earlier.) Allow students to dissect each seed to see the seed coat, cotyledons, and embryo. It helps to see the small embryo if you use a magnifier. Dicots have a seed coat, two cotyledons to provide food for the embryo plant which has two leaves. Monocots have a seed coat and one cotyledon that provides food for the embryo plant that has one blade shaped leaf.

Step 4: Making Generalizations and Sketches

1. After students examine each plant carefully, have them make some generalizations.
 - What can they tell about how the plants are different, and how they are alike? (Have students classify the plants into groups that they think are alike in some way and state their criteria. Have groups share their ideas with the class by writing their classifications on an overhead or on the board.)
2. As students share their criteria for their groupings, give them the names for each type of plant (forbs, grasses, woody plants). For

example students might say, “The agarito, huisache and mountain laurel are all alike, because they have hard twigs like those found on trees.” Then the teacher can introduce the term woody plants to students to describe these plants.

3. After all plants have been described and classified review the concepts by asking:
 - Based on your observations, what are the characteristics of forbs? (Forbs and grasses have stems, leaves, roots, possibly seeds, and flowers depending on the time of year collected. Forbs are soft-stemmed, broadleaved plants, some of which, we often think of as wildflowers.)
 - Based on your observations, what are the characteristics of grass? (Grasses are plants with soft jointed stems and long narrow leaves, flowers are sometimes not obvious and are arranged in spikes, and seeds emerge from a sheath.)
 - Based on your observations what are the characteristics of woody plants? (Woody plants, as you would assume from their name, have woody stems and branches, with leaves and, in spring, flowers. Their roots grow deep into the ground and will not be part of the mounted plant, because it would be difficult to collect them and it would damage the plant.)
4. If students haven’t made note of the shapes of leaves and patterns of veins in the plants ask them to look at the leaves of all the plants and draw a picture of each showing the vein pattern.
 - What does the leaf shape and the pattern in the veins of the leaves tell you about the plant? (Forbs and woody plants have broad simple leaves or compound leaves, and grasses have blades. Forbs and woody plants are dicots and grasses are monocots. Many dicots exhibit branching veins and monocots exhibit parallel veins.)
 - When a grass seed grows will it always have blade like leaves like the plant that made the seed? When a bluebonnet seed grows will it always have compound leaves like the plant that made the seed? (yes) What do we call this trait? (It is an inherited trait.)
 - Based on the characteristics of these 3 types of plants, what do you think the main uses for each type might be? (Forbs have food value for livestock and wildlife including insects, they have a short growing season, and are often called “ice-cream plants” because they are a favored treat for livestock and wildlife. They reduce runoff, may enrich the soil, and are often beautiful additions to the landscape. Grasses protect the soil from erosion, hold water to allow it to penetrate into the soil, and are the main food for cattle. Woody plants provide shade, shelter, and browse for wildlife and some livestock such as goats, and their roots hold soil in place. The flowers are often food for insects and other animals.)

- What might happen to the rangeland ecosystem if some of these plants were missing? (Some animals might not get enough to eat. The soil might wash away and erode when there is a big rain with lots of runoff. The soil might not retain as many nutrients.)
- How is the rangeland a system? (There are parts that work together; plants that grow in and protect the soil from erosion, animals that eat the plants and other animals that eat the plant eaters.)

Step 5: Collecting Plants

1. Collect plants for pressing by following instructions on Student Page “Collecting Guidelines” at end of lesson.
2. You will need clippers, a trowel, and bags for your samples.

Step 6: Pressing Plants

1. Students will now get to build their own plant press! Follow instructions on Student Page “Guidelines for Pressing Plants” at end of the lesson. If you don’t have plant presses, have students bring several old magazines to class and place the newspaper with the plants inside magazines. Make a stacks of 3 or 4 magazines to add weight.

Step 7: Completing Plant Labels

1. Follow instructions on Student Page “Completing Plant Labels” at end of the lesson. Select the *Older Student* or *Younger Student* transparency as appropriate.
2. *Older Students* may record all data. For *younger students*, you may wish to limit the information students record to common name, plant type, habitat, date, and name of student.

Step 8: Mounting and Storing Plants

1. Once plants are pressed and dried they are ready to be mounted. Card stock or poster board will work well for mounting plant specimens. Lay the specimen out on the card stock so that it looks attractive and leave room in the lower right-hand corner for a mount label. Use transparent glue (such as Elmer’s) to fasten the specimen to the sheet. Attach the label to the mount. See Student Page “Mounting Plants” at end of the lesson.
2. Once the specimens are completely dry and mounted they need to be stored safely. Purchase an airtight, flat plastic container. Lay plants flat in the container, preferably inside a file-folder to protect the plant specimen.
3. If you intend to keep the specimens for long-term use, add a few mothballs to prevent insects from destroying your specimens. Do not allow students to handle mothballs because they are toxic. Take

the mothballs out before you use the collection with students. If you have students with respiratory problems, do not use. Check plants periodically to ensure there is no damage from insects. Store plants in a cool, dry, preferably dark area.

4. Dried and mounted plants can be laminated to preserve them and keep out bugs.

Step 9: Discussing Scientific Use of Plant Collections

1. Ask students to think of ways that scientists might use mounted plants. (Scientists use collections of plants from specific areas to help document the current ecosystem since particular plants each require specific conditions under which they can grow. These plants can be compared to earlier collections and to future collections to see how the ecosystems [i.e. growing conditions] have changed over time. These collections also show how specific species change over time. Science students also use these collections as learning tools for developing skills in plant identification.)

Step 10: Festival Connection

1. Create a display of plant mounts to put in the entry or on a bulletin board for parents and visitors to see, highlighting native rangeland plants. This could be part of a Spring Celebration which might include other exhibits such as videos, music, drawings, and stories done by students in various science lessons.

LESSON SUMMARY

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1. Students observe and describe examples of forbs, grasses, and woody plants to develop an operational definition for each.
 2. Students classify plants by their characteristics.
 3. Students describe the functions of the parts of a plant and how each plant functions in the ecosystem.
 4. Students collect examples of forbs, grasses, and woody plants.
 5. Students press and dry mount their plant collection.
 6. Students make labels for their plant collection.
 7. Students discuss careers that use plant surveys and plant collections.
 8. Students create a display of their plant collection.
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TEKS

Streamlined Science TEKS

3rd—1 A, B; 2 B, C, D, F; 3 C; 4 A; 9 A, B; 10 A
4th—1 A, B; 2 B, C, D, F; 3 C; 4 A; 9 A, B; 10 A, B
5th—1 A, B; 2 C, D, F; 3 C; 4 A; 9 A, B, C; 10 A, B

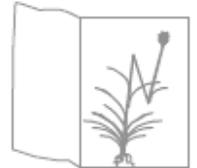
Collecting Guidelines

Note: Take several plastic bags when collecting plants and put the plants in the bag to preserve moisture until they can be pressed later in the classroom.

1. **Choose plant specimens carefully.** Select common plants; do not take plants that are few in number, (10 or fewer) as they need to be able to stay, continue to grow, and reproduce so that they will continue to exist in that location in the future. If there are fewer than 10, draw a picture or take a photograph and write a description instead of collecting specimen.
2. **When collecting grass:**
 - Choose plants with seedheads
 - Choose plants that are still green
 - Collect the whole plant, including some of the roots
3. **When collecting forbs:**
 - Find a flowering plant
 - Collect the whole plant including some of the root
 - Collect some forbs that have both flowers and seeds, or seedpods
4. **To remove a plant from the soil with its roots:**
 - Dig about 6 inches straight down around the plant and about 3 inches out from and around the stem
 - Carefully lift out the chunk of sod
 - If the soil is dry, shake the soil gently from the roots
 - If the soil is wet, use water to wash the roots clean
5. **When collecting shrubs and other woody plants:**
 - Select a branch about 12 inches long that has leaves and flowers, if possible
 - Mount both branches on the same sheet
 - Roots should not be included
6. **Record information for each plant and its habitat in your journal:**
 - Number each plant and each description
 - How many plants like the plant you have chosen are in that location? (fewer than 10 or more than 10.) (If there are fewer than 10, list the plant, take a photo or make a drawing, and do not collect the plant.)
 - Type of soil (sand, rock, clay, and/or silt)
 - Location (name of county, and physical location such as bottom of hill, flat prairie, top of hill, sand dune)
 - Sun or shade
 - Any insects or other animals found on the plants (don't touch blister beetles, bees, or spiders)
 - Description
 - Is the plant a forb, grass, or woody plant?
7. **Record other plant you see nearby:**

Guidelines for Pressing Plants

1. Press the plants as soon as possible after collecting. Once a plant wilts, it will not make an attractive mount. The purpose of pressing plants is to quickly dry the plant under firm pressure to retain plant colors and the arrangement of the plant structures.
2. If the plant is less than 12 inches long, place it inside the folded newspaper. Arrange the stems, leaves, roots, and flowers exactly as you want them to appear on the mount. Flowers should be pressed open.
3. If the plant is longer than 12 inches, fold the plant in the shape of a V, N, or W.
4. Place the folded newspaper with the plant inside between 2 sheets of cardboard in the press. Use the straps of the press to squeeze everything together tightly. Store in a dry place for five to seven days until the plants are dry.
5. Include a plant label with each specimen (see Plant Label Instructions).



Guidelines for Mounting Plants

1. Once plants are pressed and dried they are ready to be mounted. Card stock or poster board will work well for mounting plant specimens.
2. Lay the specimen out on the card stock so that it looks attractive.
3. Leave room in the lower right-hand corner for a mount label.
4. Use transparent glue (such as Elmer's) to fasten the specimen to the sheet.
5. Attach the label to the mount.

Plant Label Instructions (Older Students)

1. Use resources, including field guides and the Internet, to research each plant.
2. Record information from your research to include in the final mount on the plant labels including:
 - Common name
 - Scientific name
 - Plant type
 - Type of habitat
 - Location
 - Date of collection
 - Name of collector
 - Comments, such as, if the plant is a non-native species.

Example Plant Label

Common Name: Texas Bluebonnet

Scientific Name: *Lupinus texensis*

Plant Type: forb

Type of Habitat: along roads

Location: near Blanco, Texas

Date: April 20, 2012

Collected by: Sandra Johnson

Comment: Legume that can enrich soil. State flower of Texas.

Plant Label Instructions (Younger Students)

1. Use resources, including field guides and the Internet, to research each plant.
2. Record information from your research to include in the final mount on the plant labels including:
 - Common name
 - Type of plant
 - Type of habitat
 - Date of collection
 - Name of collector

Example Plant Label
Common Name: Texas Bluebonnet
Plant Type: forb
Type of Habitat: along roads
Location: near Blanco, Texas
Date: April 20, 2012
Collected by: Sandra Johnson

Plant Labels (Older Students)

<p style="text-align: center;">Texas Rangeland Plants</p> <p>Common Name: _____</p> <p>Scientific Name: _____</p> <p>Plant Type: _____</p> <p>Location: _____</p> <p>Habitat: _____</p> <p>Date: _____</p> <p>Collected By: _____</p> <p>Comment: _____</p> <p>_____</p>	<p style="text-align: center;">Texas Rangeland Plants</p> <p>Common Name: _____</p> <p>Scientific Name: _____</p> <p>Plant Type: _____</p> <p>Location: _____</p> <p>Habitat: _____</p> <p>Date: _____</p> <p>Collected By: _____</p> <p>Comment: _____</p> <p>_____</p>
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Plant Labels (Younger Students)

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