



Lesson 20

GROW, GRASS, GROW!

LESSON OVERVIEW

Students role-play parts of a plant to model structures and functions of the parts of a grass plant and demonstrate how re-growth occurs after grazing.

SUBJECTS

Science, Language Arts

METHODS

Class discussion, role-playing in a model of plant growth and grazing

SKILLS

Develop vocabulary, role-play, model, critical thinking

MATERIALS

Copies of grass part cards (create laminated drawings for younger students), yarn or string, hole punch, Teacher Page

VOCABULARY

Crown, root, phloem, xylem, stem, leaf, chlorophyll, epidermal tissue, inflorescence, carbohydrate, photosynthesis, rhizome

CONCEPTS

- Parts of a plant have specific functions to help it survive and reproduce.
- Rangeland plants such as grasses are grazed by domestic animals and wildlife and have evolved to re-grow the parts eaten by animals.

OBJECTIVES

- Act out the process of how a grass plant uses its many parts for specialized tasks.
- Describe how adaptations of plant structures help the plant survive, grow, and reproduce.
- Model planning for utilization of grasses for livestock grazing considering the factors associated with re-growth of grazed parts.

BACKGROUND

Grasses are soft-stemmed (herbaceous) plants. Grasses are characterized by their jointed stems, slender blade-like leaves, sheathing, and flowers arranged in spikelets. Like all plants, grasses consist of a collection of parts with specialized functions. These parts include roots, crowns, leaves, and inflorescences (flowers).

Grasses are classified as either perennial or annual. Perennial grasses die back to the ground each year and produce new flowering stems the following year. Annuals complete their life cycle in a year or less, and die at the completion of that one cycle.

In many areas, grassland plants evolved under grazing pressure from native animals, such as bison. Grasses are able to withstand grazing because of their capacity for re-growth. Re-growth can occur because grasses have a growing point (terminal bud) low to or near the surface of the ground, which helps protect the grass plant from grazing animals. Grasses also possess mechanisms for producing new shoots from rhizomes, which are like daughter plants.

The crown is critical for the re-growth of grass plants (however, annual grasses do not develop a crown). The crown produces buds that are the source of new growth. Review the grass plant part cards to learn more about the functions of these parts.

Grasses form the foundation of forage-livestock systems around the world because they can be consumed and converted by animals into useful products for humans such as food or fiber (such as wool or mohair).

Knowing when and how to harvest grass through grazing requires an understanding of grass growth and re-growth mechanisms. The range manager must determine how to achieve optimal forage quantity and quality while safeguarding the vitality of the grasses.

DID YOU KNOW? *More than 140,000,000 acres of prairie once existed in the U.S., but the majority has been plowed under to plant crops or to develop cities.*

Prairie Chickens once flourished in the prairies, but as the grassland disappeared so did the Prairie Chicken. Today only 400,000 survive in 11 states.

PROCEDURE

Getting Ready

Make copies of the grass parts cards. Punch holes in the cards and loop string through so students can wear them around their neck. Copy the diagram of a grass plant on a transparency or use a grass sample from Lesson 19 to show the class. For younger students draw pictures of each part.

Step 1: Introducing Grass Plants

1. Give each group of students an opportunity to look at a sample of grass you collected and mounted in Lesson 19.
 - What parts of the grass plant can you identify? (List student responses on an overhead or on the board. Have students make notes in their journals. Students will usually think of stem, leaf, root, seed, and flower. Tell students that the flowering part of a

plant is called an inflorescence, which like many scientific words is from Latin, and means to begin to blossom. Some students may also remember rhizomes from Lesson 19.)

- How does each plant part contribute to the survival of the plant? (List student responses.)
 - Can you tell what part might help the grass with regrowth after it has been grazed? (Students may not know the name of the part, but they can probably figure out where the growth would happen near the soil. Then you can give them the proper term (crown).
2. Explain that in addition to the external parts that we normally think of, there are also other parts that help the grass plant survive.
 3. Show the transparency of the parts of a plant and point out all the parts students have named. Compare the mounted grass plants with the transparency.
 - Can you see everything that is labeled on the transparency in the real plant?
 4. Ask students to think about the importance of plants in the food web.
 5. They may see and recognize the green color of the chlorophyll. Review the importance of chlorophyll in photosynthesis. Photosynthesis can only take place in the presence of chlorophyll. That means that all of the food chain is dependent on chlorophyll since producers (plants) need it to produce carbohydrates through photosynthesis to provide their own nutrients, and consumers (herbivores) use carbohydrates for food when they eat plants [producers] and, in turn, predators (secondary consumers or carnivores) eat herbivores and receive energy to survive.
 6. Explain to students that the other parts are the epidermal tissue, xylem, and phloem. Explain that the epidermal tissue is on the outside of the plant and the xylem and phloem are on the inside of the plant. Epidermal tissue is the outer covering of the plant much like your skin is your outer covering. The xylem and phloem work much like your veins and arteries. The xylem brings water and nutrients from the soil to all parts of the plant and the phloem brings carbohydrates made in the green parts of the plant to other parts of the plant for nourishment and to the roots for storage to be used later by the plant for growth and reproduction.

Step 2: Making a Model of a Grass Plant

1. Tell the students that they are going to work together to make a model of the different structures and functions of the parts of a grass plant.
2. Pass out the grass cards as follows—adjust the numbers of cards you use to fit the number of students in your class.

Part	Number of Students
Crown	1-2
Roots	1-3
Stem	1-2
Leaves	1-4
Chlorophyll	1-3
Phloem	1-3
Xylem	1-2
Inflorescence	1-3
Epidermal Tissue	1-3
Rhizome	1-3

3. *Younger Students* - Make simple drawings of stem, leaves, roots, flowers, rhizomes, crown and add the chant on the back to provide cues for making the model. Laminate and use as a floor puzzle to give students a new example of parts of a plant.

Step 3: Introducing Plant Parts and Functions for the Model

1. Build the grass plant one part at a time. Start with the root and work up the plant structure. Ask each student to read the card aloud, draw the part of the plant on the board or journals and label it.
2. Then the student will follow the directions on the card. Be sure to provide opportunities for students to ask questions and get explanations of any new vocabulary.
3. Continue until the grass plants are completely assembled, and then have all the students act out and chant their parts simultaneously.

Step 4: Making a Model of Defoliation

1. Tell students that cattle have been moved into the rangeland. The instructor can play the role of a cow by grazing the grass.
2. Pull a few of the leaves and possibly the inflorescence away, also take some of the chlorophyll, phloem, xylem, and epidermal tissue—since they would be contained in the leaves
3. Tell the students that removal of the leaves is called defoliation. (“de” means to remove and “foliage” means leaves)
4. Ask the group to consider and discuss how the plant will be affected by defoliation.
 - Will the grass be able to produce as much food as before? (no)
 - Where will the plant get the energy to re-grow the leaves that were grazed? (from the crown and the roots that have been storing carbohydrates before grazing)

Step 5: Modeling Re-growth

1. Ask the students to come up with a new slogan for the crown during regrowth. Instead of chanting “storing carbohydrates,” what would be a more appropriate task for the crown? (something along the lines of “sending carbohydrates to the plant”)
2. Review by asking how the carbohydrates will be transported to where they are needed in the plant (by the xylem).
3. Have students actively model the re-growth phase. Send the leaves and its associated parts back into the plant after re-growth has occurred.
 - Now that the leaves are back and producing food, will the grass return to its normal functions? (Yes. Tell the students to resume their original roles described on their grass cards.)

Step 6: Wrap-up and Discussion

1. Ask students to think about the model they have represented.
 - What would happen if some of the parts of our grass plant were missing? (If the seeds were not present, no new plants would grow. If the inflorescences (flowers) were missing, no seeds would be produced. If the roots were gone, no food could be stored. If the crown were missing, the plant could not re-grow. If the leaves were gone, no photosynthesis would take place. If the stem were missing, the plant would not be upright. If the chlorophyll was missing, the plant could not photosynthesize. If the xylem and phloem were missing, there would be no way to get nutrients and water as well as carbohydrates to all the parts of the plant. If the epidermal tissue were missing, the surface of the plant would be open to weather, bacteria, or other dangers. In other words, the plant would not be able to function in the same way if any of the parts were missing. When something has parts that work together in a particular way and when parts are missing they do not work in the same way, we call that a system. So a plant is a system.)
 - What would happen if the grazing was continuous and the plant never got a break from grazing or a chance to re-grow its grazed parts? (It would eventually die.) How would that affect the food chain or food web?
 - What does this phrase mean? “If we keep down the shoot, we kill the root!”
 - How does this fact guide how the ranch manager makes decisions about where cattle should graze and how long they should stay in one area of the ranch? (The rancher must know when to move cattle and allow regrowth to occur and when to put cattle back on a pasture to balance the needs of the cattle for forage and the needs of the grass to re-grow.)

- How is our model like a grass plant? (It shows the many of the parts of a grass plant and how they work together in a system.)
- How is our model limited in the way it depicts a grass plant? (It does not show all of the plant parts (cells, etc); it does not really function as a grass plant. It does not show the size of the grass plant and its parts.)

Step 7: Other Factors in Plant Growth

1. Ask students to think about and write their ideas in their journals and then share with the class:
 - What other factors would affect the growth and survival of the grass plant? (use by humans, weather, drought, floods, seasons, competition with other plants, nutrients available in the soil, overgrazing, and use by wildlife)
 - Humans have an impact on grasslands. How do ranchers take care of the grasslands? (rotational grazing, controlling numbers of animals grazed, prescribed burns, keeping animals off stressed plants such as in a drought when they use supplemental feeding)

LESSON SUMMARY

1. Students will learn vocabulary as they review the parts and functions of a plant.
2. Students will draw and label the parts of the grass plant as they read their card aloud.
3. Students will learn more detailed parts of the plant and their functions as they role-play the life of a plant.
4. Students will discuss the effects of grazing on grass plants and the food chain or web.
5. Students will model effects of grazing and re-growth on grass plants.
6. Students will discuss other factors that affect growth and survival of grass plants.

TEKS

Streamlined Science TEKS

3rd—3 B, C; 9 B, C; 10 A
 4th—3 B, C; 9 A, B; 10 A
 5th—3 B, C; 9 A, B, C; 10 A, B

Streamlined Language Arts TEKS

3rd—1 A, B, C, D, E; 2 A i, ii, iii; 3 B; 5; 6 A, D, E, G, H, I; 7 A, D, E, F, G
 4th—1 A, B, D; 2 A i, ii, iii; 3 B; 5; 6 A, D, E, G, H, I; 7 A, D, E, F, G
 5th—1 A, B, C, D; 2 A i, ii, iii; 3 B; 5; 6 A, D, E, G, H, I; 7 A, D, E, F, G

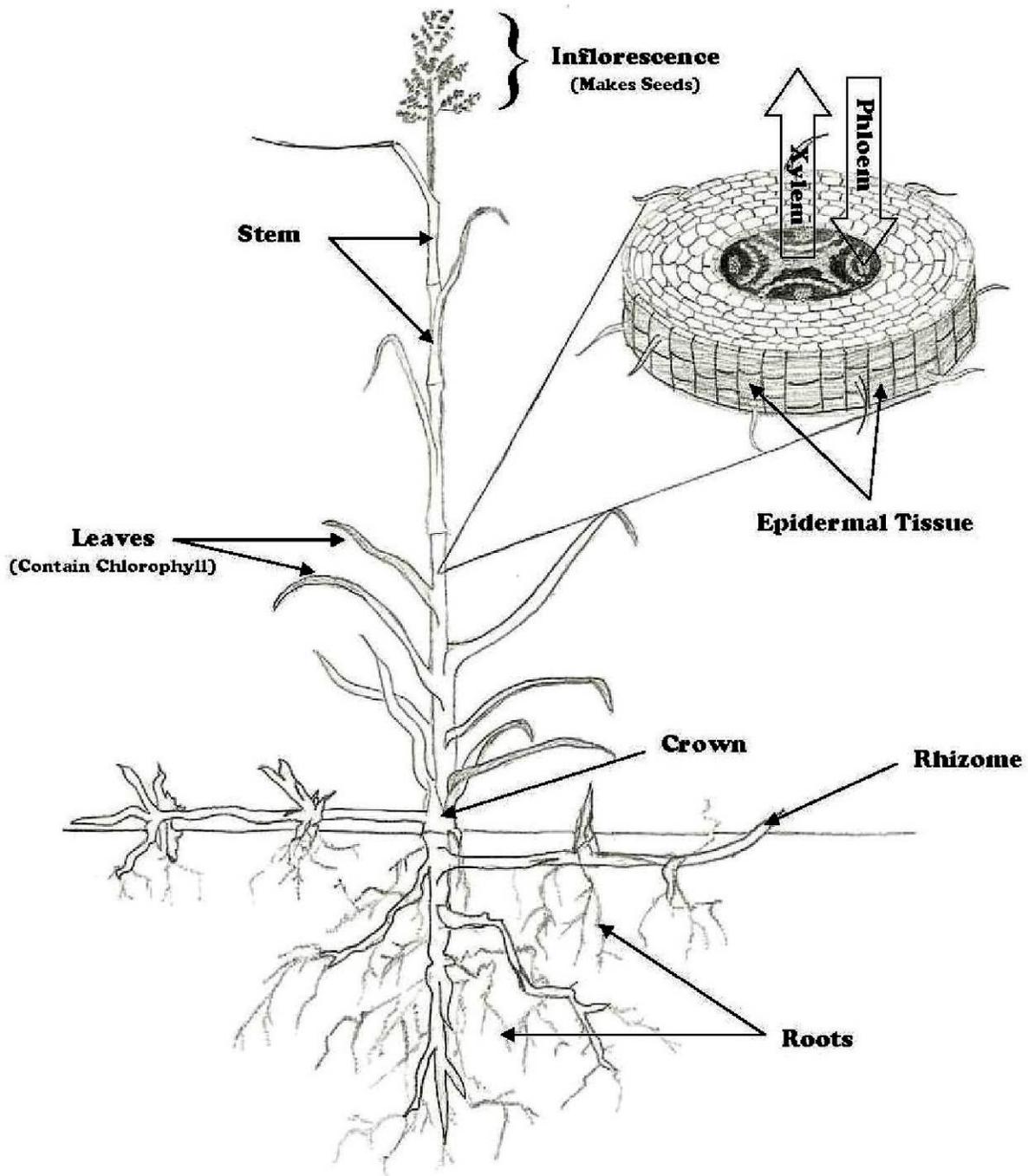


Image courtesy of Ashley Whaley Exendine

Grass Cards

<p style="text-align: center;">Crown</p> <p>The crown:</p> <ul style="list-style-type: none"> • is the base of the grass plant • connects the roots and the shoots • is essential for the perennial growth of the plant because this zone is the over-wintering tissue which also allows regrowth after grazing by livestock. Produces new shoots. <p>Carbohydrates are stored in the crown as an energy source for growth when photosynthesis is not possible.</p> <p>If there is more than one crown, sit with your backs to each other. Sit on the ground and chant “Storing carbohydrates.”</p>	<p style="text-align: center;">Roots</p> <p>The roots:</p> <ul style="list-style-type: none"> • anchor the plant to the ground • absorb nutrients and water from the soil • function as carbohydrate storage tanks <p>Lie on the ground with your feet pointing towards the crown.</p> <p>Stretch your arms and fingers out to represent root hairs and make sounds to show that you are collecting water and nutrients.</p> <p>Chant “Slurp, Slurp, Slurp!”</p>
<p style="text-align: center;">Stem</p> <p>The stem:</p> <ul style="list-style-type: none"> • produces the leaves • produces the inflorescence (flower) • supports these important parts of the plant • is very strong • contains chlorophyll, phloem, and xylem <p>Stand by the crown, raise both arms, sway in the wind</p> <p>Chant “Strong support! Strong support!”</p>	<p style="text-align: center;">Leaves</p> <p>A grass leaf:</p> <ul style="list-style-type: none"> • consists of a blade, collar, and supporting sheath which holds it onto the stem • grows alternately on opposite sides of the stem • contains most of the chlorophyll in the plant <p>Place one hand on the stem, with your other hand reach up towards the sun.</p> <p>Chant “Leaves make food!”</p>

Grass Cards

<p style="text-align: center;">Chlorophyll</p> <p>Chlorophyll:</p> <ul style="list-style-type: none"> • gives green plants the ability to perform photosynthesis. • during photosynthesis solar energy and carbon dioxide are converted into carbohydrates. <p>This reaction is directly or indirectly responsible for all life on earth!</p> <p>Chlorophyll in the presence of sunlight makes photosynthesis possible, providing the energy for plant growth and repair.</p> <p>Stand with the leaves and chant: “Photosynthesis, converting solar energy.”</p>	<p style="text-align: center;">Phloem</p> <p>Phloem:</p> <ul style="list-style-type: none"> • is responsible for transporting manufactured food for the plant • moves food from the leaves to the other parts of the plant where it is used • transports energy to storage in the plant’s roots or crown <p>Stand by the stem and reach above your head and collect food.</p> <p>Move your hands down and release the food to the crown and roots.</p> <p>Chant: “Transport food to plant!”</p>
<p style="text-align: center;">Xylem</p> <p>The xylem:</p> <ul style="list-style-type: none"> • transports water up from the roots to the rest of the plant • takes the water and nutrients that the roots collect from the soil to all the other parts of the plant <p>Grass plants may be up to 98% water.</p> <p>Stand by the stem and use your arms to “transport” water and nutrients from the roots to all other parts of the plant.</p> <p>Chant: “Moving water up! Moving water up!”</p>	<p style="text-align: center;">Inflorescence</p> <p>The inflorescence:</p> <ul style="list-style-type: none"> • grows from the stem of the grass plant • makes small flowers <p>Once the flowers are pollinated by the wind, many small seeds are produced.</p> <p>Because it produces the seeds, this part is also called the seed head.</p> <p>When the seeds fall from the inflorescence, a new grass plant can begin to grow.</p> <p>Stand by the stem and hold your arms up above your head, with your hands representing the flowers or seeds. Chant “Making seeds.”</p>

Grass Cards

Epidermal Tissue	Rhizome
<p>Epidermal tissue:</p> <ul style="list-style-type: none">• is the surface tissue that protects the plant• helps to make and store nutrients <p>The cells that make up this tissue are brick-shaped and are arranged like a brick wall.</p> <p>March around the entire plant.</p> <p>Chant “I protect! I protect!”</p>	<p>Rhizome:</p> <ul style="list-style-type: none">• is a thick underground stem• is horizontal• produces roots and shoot• develops into new plants <p>Touch the root with one hand and reach out with the other, point thumb up to represent a new shoot and fingers down to represent new roots.</p> <p>Chant “New plants growing! New plants growing!”</p>