



# GRAZE LIKE A COW

## Overview

Students will learn the biology of how a cow digests the grasses they eat, compare quality of forage (overgrazed versus healthy), and the effects of the animal's environment to its production.

## Objectives

1. Student will learn how a cow digests the grasses and plants they eat.
2. Students will simulate "eating" like a cow using their hands and compare amount of forage gathered in overgrazed situations compared to healthy grass situations.
3. Students will determine the effects of rangeland health on the production (milk, beef, etc.) of a cow.
4. Students will understand the importance of native grasslands to Kansas' economy.
5. Students will learn about different management techniques ranchers use to maintain the health of native grasslands.
6. Students will act out the roles of native plants and invasive weeds to see the impact overgrazing can have in pastures.

**Suggested  
Grade Level:**  
4th-10th

**Time:**  
2 hours

**Subjects:**  
Science  
Math

## Background Information

Native grasslands support a unique web of life. They allow Kansas ranchers to be among the top producers of beef cattle in the country. Grasslands offer a diverse assortment of gaming wildlife and display a dazzling assortment of colors throughout the spring and summer. Kansas must protect this valuable resource. There are some natural management techniques that can be used to protect these native grasslands. Different practices are used in rangeland management and are used as a guide for farmers and ranchers. Stocking rates and the concept of "take half, leave half" are two such concepts.

Promoting the health of native grasslands is important through management, but natural processes are also used to promote native plants to thrive. One natural process is the use of fire by burning in the spring. Controlled burning is used to stunt the growth of introduced plant species, like fescue and give the native species, like big bluestem, a running start at growth. The use of fire, over a period of several years, can actually promote these native plants so much that it reduces the amount of introduced plant species.

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## Background Information Continued

Farmers and ranchers are also protecting native grasslands through the idea of “take half, leave half.” This practice is where farmers and ranchers monitor their rangelands and when the cows have eaten half of the growth of grass, they are moved to another area or pasture. This practice keeps the grasses healthy and protects them from being overgrazed. In an overgrazing situation, too much leafy material is eaten by the cattle, leaving a weakened plant that is unable to grow back. These weakened plants may lose root structure, which means that they will produce less leafy material in the coming years. Less leafy material means that the area will not be able to support as many cows in the coming years. It also means that weeds and invasive species may be able to get a foothold into the pasture.

A stocking rate is the number of animals per acre of land. A stocking rate is a way to measure how many acres of rangeland it takes over a given amount of time to provide a single cow and their calf with enough nutrients to maintain production. The stocking rate is often set by “what granddad used to do.” However, these rates can change significantly based on rainfall, temperature and many other factors. Stocking rates are determined by looking at the plant species present, the health of those plant species, evidence of weeds and invasive plants, and multiple other factors. Stocking rates can change from year to year as well due to environmental factors such as weather. There are some specific methods such as intensive grazing and strip grazing that branch off this type of practice. The use of stocking rates is by far the most efficient management tool for farmers and ranchers.

Farmers and ranchers also monitor their native grasslands with other different practices. One practice is called a monitor cage. This is an area that has been “caged” off so that grazing animals do not have access to its leafy material. Ranchers can view this caged area and compare the height of grass within the cage to the height of grass outside of the cage and make decisions from that point.

Cows will eat approximately 3% of their body weight in dry grasses and forbs every day to maintain production (growth or milk production). That means a cow weighing 1200 pounds need 36 pounds of dry grass and forbs to maintain themselves on a given day. Since the grass in rangeland is made up of approximately 70% moisture they actually need 120 pounds of grass and forbs to maintain production.

Cows are ruminant animals because they have more than one stomach compartment. A cow’s stomach has four parts; the rumen, the reticulum, the omasum, and the abomasum.

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## Background Information Continued

The rumen is the largest part of the stomach and can hold up to 50 gallons of partially digested food. Cows will chew on cud, which is regurgitated food. They re-chew it about 50 times and then re-swallow it. This adds moisture and helps to physically break down the plants and grasses the cow eats. The rumen houses good bacteria that help the cow digest and break down its food into protein. This is a very important process because human digestion systems cannot break down plants and grasses to access the protein available. However, we can access the protein available in beef produced by animals that consume plants. The rumen is a fermentation vat. Fermentation is a chemical reaction where sugars are broken down into alcohols. Fermentation gives cows the unique ability to access the nutrients, carbohydrates and proteins available in plant cells. Humans do not have this ability.

The second part of a cow's stomach is the reticulum. The food is further softened in this portion of the stomach. This portion of the stomach removes any type of foreign objects, such as fence wire, bolts, etc., from the cow's digesting food.

The third part of a cow's stomach is the omasum. The omasum filters through the food and regulates water absorption and reduction. The digesting food will then be sent to the cow's abomasum.

The abomasum is the part that most resembles a human stomach. Here digestion will be completed, nutrients will be completely broken down and will enter into the small intestine where they will be absorbed into the blood stream. The unused material will be sent into the excretory system and will be excreted as feces – which acts as a fertilizer for plants.

# GRAZE LIKE A COW

## Lesson 1: Graze Like A Cow

### Materials

- Large area of grass that is left to grow for a while (~1' tall, can be found in ditches or ask maintenance to skip one or two mowings in an area)
- Large area of shorter grass (~4-6" tall, can use the regular mowed playground)
- 2 paper bags (1 labeled short/overgrazed and 1 labeled tall/health)
- Clock with second hand or stopwatch
- Scale

### Procedures

1. Talk about grassland and the cow's digestion system using the background information.
2. Discuss how a cow eats:
  - To simulate a cow's mouth have the students make peace signs with their hands (ring and pinky finger held down by their thumb), the thumb will resemble the hard upper toothless gum of the cow. Then have the students bring their pointer and middle fingers together, this will simulate the cow's tongue. To "graze" have the students gather grass with their tongue (pointer and middle fingers) and grasp and tear it against their gum (thumb).
  - Students will use their other hand as their rumen. Have students "graze" with their dominant hand and then transfer that grass to their non-dominant hand. Once their rumen is full they must put their grass in the appropriate paper bag.
  - Because a cow rests after grazing times, students should stand beside the paper bag for 15 seconds (determine time you think your students will wait) before going out to graze again. Either time them, or supply stop watches/clock with a minute hand for them to time themselves.
3. Students should be given 1-2 minutes to graze in each type of grassland. Have students put all their "eaten" grass in the appropriate labeled bags. Determine time based on how many students there are compared to area to be grazed.
4. Take the mass of each bag and record for the class.
5. Have students calculate needed values on their data table and answer conclusion questions.

# GRAZE LIKE A COW

## Graze Like A Cow (Student Instructions)

Name: \_\_\_\_\_

### Procedures

1. Follow the instructions given by your teacher to “graze like a cow.”
2. Record the data for the healthy and overgrazed grass sacks.
3. Grass is made up of 70% moisture. Moisture although necessary for plant growth and development is of little nutritional value to a cow. The nutritional value for a cow is found in the dry matter of the grass. Approximately 30% of green grass is dry matter. To calculate the Mass of Dry Matter, multiply the mass of your sack times 30%. (Mass of sack X 30%)
4. A cow will eat 3% of its body weight in DRY MATTER grass and forbs EVERY DAY! That means a 1200 pound cow will need to eat 36 pounds of dry matter grass. Because the composition of grass is 70% moisture and 30% dry matter, a cow would have to consume 120 pounds of grass to maintain production EVERY DAY!!!

### **Data**

Sack	Mass	Mass of Dry Matter	Amount of Grass Required for a 1200 lb. Cow
Healthy Grass (taller grass)			
Overgrazed Grass (shorter grass)			

### Conclusion Questions

1. How many parts are there in a cow’s stomach? List them and describe their function.

2. What happens when a cow is not given enough grass? How would this affect the rancher that is raising the cow for beef? How would this affect the dairy farmer that is raising the cow for milk production?

# GRAZE LIKE A COW

## Lesson 2: Where's the Grass?

### Materials

- Large area on playground OR large area in classroom (some where students can spread out)
- Play horse/cow on a stick (or use a picture stapled onto a measuring stick)

### Procedures

1. Divide students into a grass group (90% of students) and a weed group (10% of students).
  - Have the grass students spread out over area. Instruct grass students to stand like a big X, with their arms stretched in a “v” above their head and the legs spread out as well. Students should not be touching, but need to be close enough that it is difficult to maneuver through their outstretched arms and legs.
  - When weed students “invade” their arms need to be extended above their heads with their hands clasped together, taking “baby” steps as they try to invade the grass (make sure to tell weeds that they are NOT to push or “nudge” a grass plant to fit into a space AND if they touch a grass plant they are not allowed to participate any further). Tell them they are “invading” this way because they are seedlings. As the activity progresses, have the weed students try to grow (extend their arms and legs like the grass students). The grazing animals do NOT like to graze these particular weeds.
2. With the grass students spread out, talk about canopy of grass and the importance of maintaining our native grasslands.
3. Instruct grass students that when they are grazed (touched with the play horse/cow), they must put one of their arms down, if they are grazed again they must put their other arm down, if they are grazed a third time they must stand on one leg and if they are grazed a fourth time they must sit down (Indian style) because they have been overgrazed to the point of death.
4. Before starting have the weed students try to invade the ungrazed native grassland. (No weed should be able to get through without touching a grass student.)
5. Using the play horse/cow touch each grass student once.
6. Have the weed students try to invade again.
7. Using the play horse/cow touch each grass student once or twice more. At this point all grass students should have both arms to their sides. Tell the students that at this point the grasses have been grazed, but still have enough leafy material and healthy roots to grow back. If grazing is stopped at this point the grassland can recover and grow more. If you want at this point you could throw out some candy labeled with sun, fertilizer, or rain. Those students who caught and ate the candy would grow more. If this is done there are more opportunities for grazing animals to graze.
8. Have the weed students try to invade again.
9. Using the play horse/cow touch several grass student until they are sitting/dead.
10. Have the weed students try to invade again.

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## Conclusion Questions

1. How does the activity relate to the idea of “take half, leave half?”

*Grass students could grow when their arms were still down, so this means that the grass would be able to recover.*

2. At what point was it easiest for the weed students to invade?

*When the grass students had both of their arms to their sides, were on one leg, or were sitting down.*

3. What would be some implications if grazing animals are allowed to graze too much?

*There would be little/no grass left for the animals to graze and grow, weeds would take over and there wouldn't be the right type of nutrition available for the grazing animal.*