



Grade Level: 3-5

Essential Skills: 1, 2, 3, 9

CCSS: 3.L.6, 4.L.6, 5.L.6

Social Sciences: 3.8, 3.10, 4.10, 5.11

Time: 60 minutes

Materials: On the Range Kit*
Per Student:

- 9 oz Clear Cup*
- Peat Pellet*
- 1 teaspoon Grass Seed*
- Water

Scissors
Station 1-4 Worksheets for each student
Grazing and Lawn Mowers Activity page per student

***Free Kit with materials available to Oregon Educators from our Lending Library.**

AITC Library Resources:

Companion Resources:
Beef Cattle - An A to Z Book
The Beef Lifecycle
Land of Contrasts: Ranching Commitment to Oregon
Cattle Kids

More Lessons:
Caretakers All
Cowabunga! All about Dairy Breeds
Beef Basics

Lesson adopted from:



09/19

Lesson to Grow

At Home on the Range

Description:

Students will learn about rangelands by participating in a hands-on activity of growing their own grass to represent a beef or sheep ranch.

Background:

In 2019, Cattle and Calves were ranked Oregon's 2nd agricultural commodity in terms of value to the state with approximately 533,000 head of beef cattle. The USDA's 2017 Census of Agriculture found that 9.1 million acres of Oregon land is pastureland and a large percent of that is called rangeland. Rangeland is a term used for areas like natural grasslands, deserts, coastal marshes or wet meadows that are usually mountainous or areas not suitable for growing crops. Although this land is unsuitable for growing food crops, these lands are great for grazing livestock where grass can be consumed. Rangelands provide both a forage for livestock to graze and also an ecosystem for many wildlife species. It's important that farmers and ranchers maintain and preserve the rangelands resources for future use. Today, we will look at the benefits of grazing to these rangelands and steps ranchers take to ensure these resources will be available for future use.

Directions:

Part I: Interest Approach

- 1) Show your students the *Cow Grazing* picture. Ask your students if they see anything in the picture that looks tasty to eat.
- 2) Explain to the students that humans do not have an adequate digestive system to obtain sufficient nutrients from grasses and other similar plants. However, cattle and sheep thrive by grazing rangelands. In this lesson, students will learn how grazing can be managed to be a benefit to ranchers and to improve and maintain the health of the land.

Part II: Trail Blazing

- 1) Place the four station signs around the room with a stack of each station's associated worksheet for students to complete as they rotate around each station.
- 2) Divide your class into four groups and assign each group to one of the station.
- 3) Each group will rotate around the stations taking a different "trail," and on their way, they will start their own "ranch" with a small planting of grass.
- 4) Students will spend approximately 10 minutes at each station before they should rotate with their group to the next station.
- 5) Once students have completed Stations 1-4, review the information that students learned at each station as a class.

Part II: Starting your own Ranch

- 1) Students will work to create their own ranch by growing a small plot of grass in a cup. Distribute the *Grazing and Lawn Mowers Worksheet* to students.
- 2) Provide each student with a peat pellet and a plastic cup to hold it.
- 3) Provide each student with a permanent marker, 2-3 teaspoons (10-15 g) of grass seed in a small bowl.
- 4) Ask students to place the peat pellet into the cup. Explain that you will be pouring a 1/2 cup (120 mL) of water into each person's cup while each group reads their Background Information provided on the *Grazing and Lawn Mowers Worksheet*.

- 5) Instruct the students to begin working on the activity but to also observe their peat pellets. When they finish the worksheet activity, the water should be absorbed and the peat pellet completely hydrated. It takes about 15 minutes for the peat pellet to hydrate and expand into a pot in which seeds can be planted.
- 6) Have students complete the planting portion of the ranch, instructions can be found in their worksheet.

Part III: Grass and Grazing (After Grass has Germinated)

- 1) Once the seeds germinate, keep the peat pots moist, and allow the grass to grow until it has reached 2 – 3 inches (5-7 cm) in height. Students will be applying two different grazing treatments and will leave some of the grass untreated.
- 2) When the grass is 2 – 3 inches (5 - 7 cm) tall, ask the students to use scissors to cut half of the grass blades short—1 inch (2.5 cm)—above the soil to simulate a cow grazing.
- 3) They should clip another quarter of the grass down to the crown—where the blades meet the roots; this part of the blade is white in color. To simulate overgrazing, ask students to clip this quarter area to the crown every couple of days.
- 4) The last quarter section of the grass should remain unclipped.
- 5) Observe the grass for a few weeks, and then make comparisons. What are the results of the overgrazed, grazed, and ungrazed grasses? Ask students how their grazing experiment compares to mowing their grass.

This lesson was adopted from Utah Agriculture in the Classroom, At Home on the Range and Story-writing activity (Activity 2) contributed by Hooper Elementary (Hooper, UT) teacher Sharlie Wade

Reference Material

The National Atlas of the United States of America, U.S. Department of the Interior & U.S. Geological Survey



Station 1

Trail 1: Land Use in Oregon

Student Name: _____

Like many other western states, most of Oregon's land is too rocky, cold, hot, or dry to grow crops, but it can support livestock. About 80% of the feed consumed by cattle, sheep, and goats could not be eaten or digested by humans. Animals convert low-energy and otherwise indigestible plant matter into nutrient-dense, protein-rich food, while returning organic matter (manure) to the soil—the original recycling program. Some rangeland is privately owned by ranchers, but public lands (managed by the federal government) are also used for grazing livestock.

Using the map on the next page, answer the following:

1. What color represents privately owned land?
2. Geographically, in Oregon where is most of the private land? (Hint: think about relation to land and water features, cities, counties, etc.)
3. Which federal agency is responsible for managing the greatest land area in Oregon?
4. How many different Indian reservations (IRs) are there in Oregon? List their names below.
5. What biome (major type of ecological community) best describes the Oregon lands indicated in yellow?
a. wetland b. desert c. forest
6. Along what geographical feature is most of Oregon's Forest Service land located? (Hint: think of physical features that share names with many of the national forests)
7. In what part of the state are most of Oregon's water resources?

FEDERAL LANDS AND INDIAN RESERVATIONS

- Bureau of Indian Affairs
- Bureau of Land Management / Wilderness
- Bureau of Reclamation
- Department of Defense (includes Army Corps of Engineers lakes)
- Fish and Wildlife Service / Wilderness
- Forest Service / Wilderness
- National Park Service / Wilderness

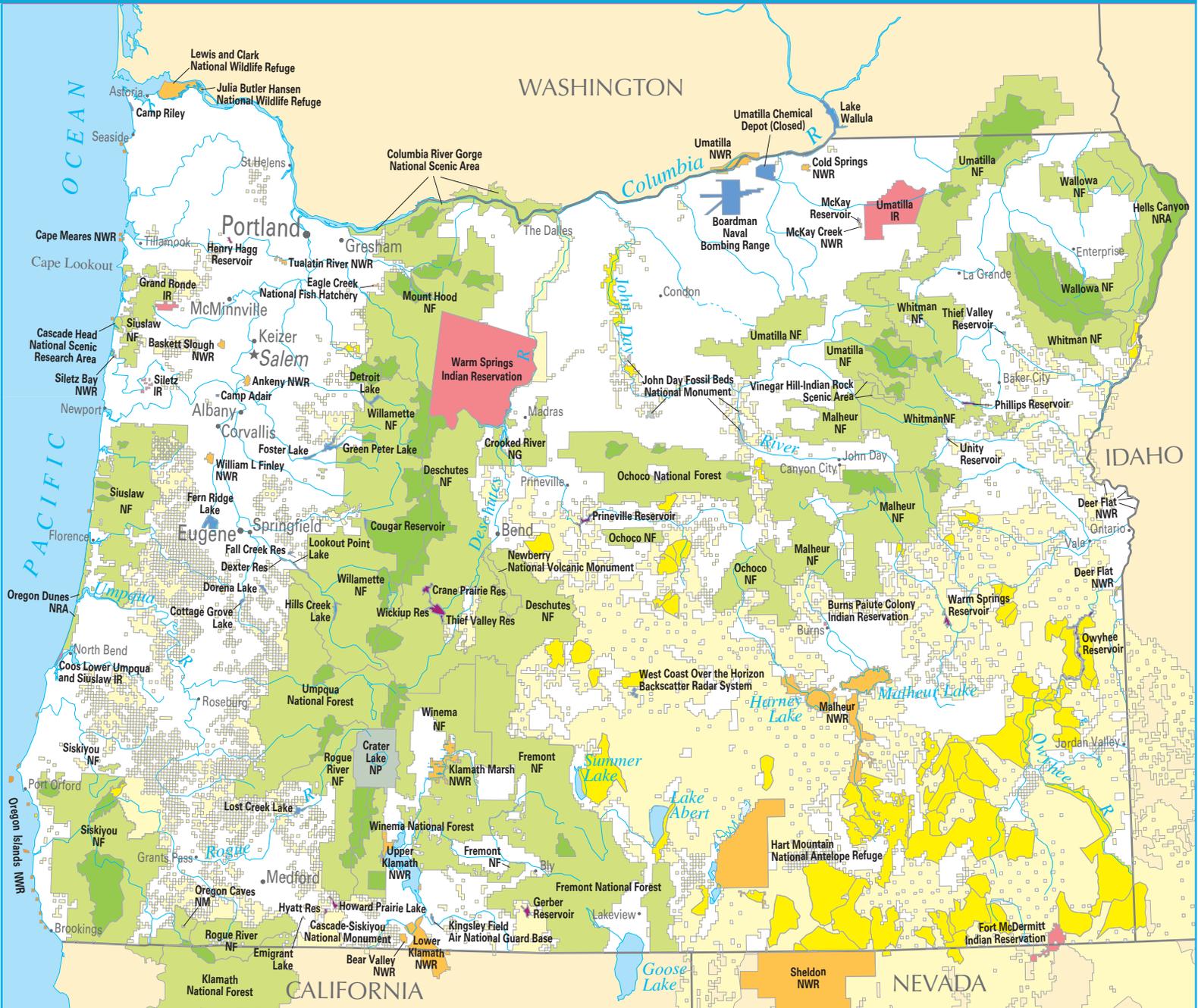
Some small sites are not shown, especially in urban areas.



Albers equal area projection

Abbreviations

- IR Indian Reservation
- NF National Forest
- NG National Grassland
- NM National Monument
- NP National Park
- NRA National Recreation Area
- NWR National Wildlife Refuge
- Res Reservoir





Station 2

Trail 2: Cow Tales

Student Name: _____

Calves are typically born between January and April in Oregon. However, some ranchers choose to breed their cattle so calves are born at other times of the year. After their calves are born, mother cows are given additional feed to help keep them and their baby calves healthy. Young calves stay with their mothers, nursing milk and learning to eat grass. When calves are six to eight months old, they are separated from their mothers and weaned. By this time, the calves weigh between 400 and 600 pounds and are able to digest grass and drink water—they no longer need their mother's milk to survive. When calves are weaned, they are provided a balanced diet of feed to keep them healthy and growing. This feed might be hay, grain, or silage.



The rancher keeps some of the best female calves, or heifers, to add to the herd. These females will become mother cows. The rest of the "calf crop" is then either sent to pasture or to a feedlot. In the feedlot, cattle are fed grain, hay, and sometimes other food processing by-products like potato peels, cornstalks, and cottonseed that would otherwise be shipped to landfills. When cattle weigh about 1,200 pounds, they are ready for market. At the processing plant, all cattle are inspected for health and safety by a United States Department of Agriculture (USDA) inspector as they are processed into beef. It typically takes just under two years to produce a steak or hamburger for the table.

Why can a cow eat grass? All ruminants, including cattle, are able to digest grass and other vegetation. Ruminants include cattle, goats, sheep, camels, llamas, giraffes, bison, buffalo, deer, and antelope. Some of these animals are livestock, such as cows, goats, and sheep. Others are wild animals such as deer, elk, bison, and antelope. Ruminants have a special digestive system that allows them to digest plants more thoroughly than other animals.

Rather than the small stomach you have, ruminants have very large stomachs with four parts: the reticulum, rumen, omasum, and abomasum. The rumen is filled with microorganisms that produce the enzymes needed to digest plants thoroughly. Cellulose is a primary component of plant cell walls—it is produced by all plants and may be the most abundant organic compound on Earth. However, most animals (including people) do not make the enzyme needed to digest cellulose. Ruminants can digest the cellulose in grass and other plants thanks to the billions of microorganisms living in their giant rumens.

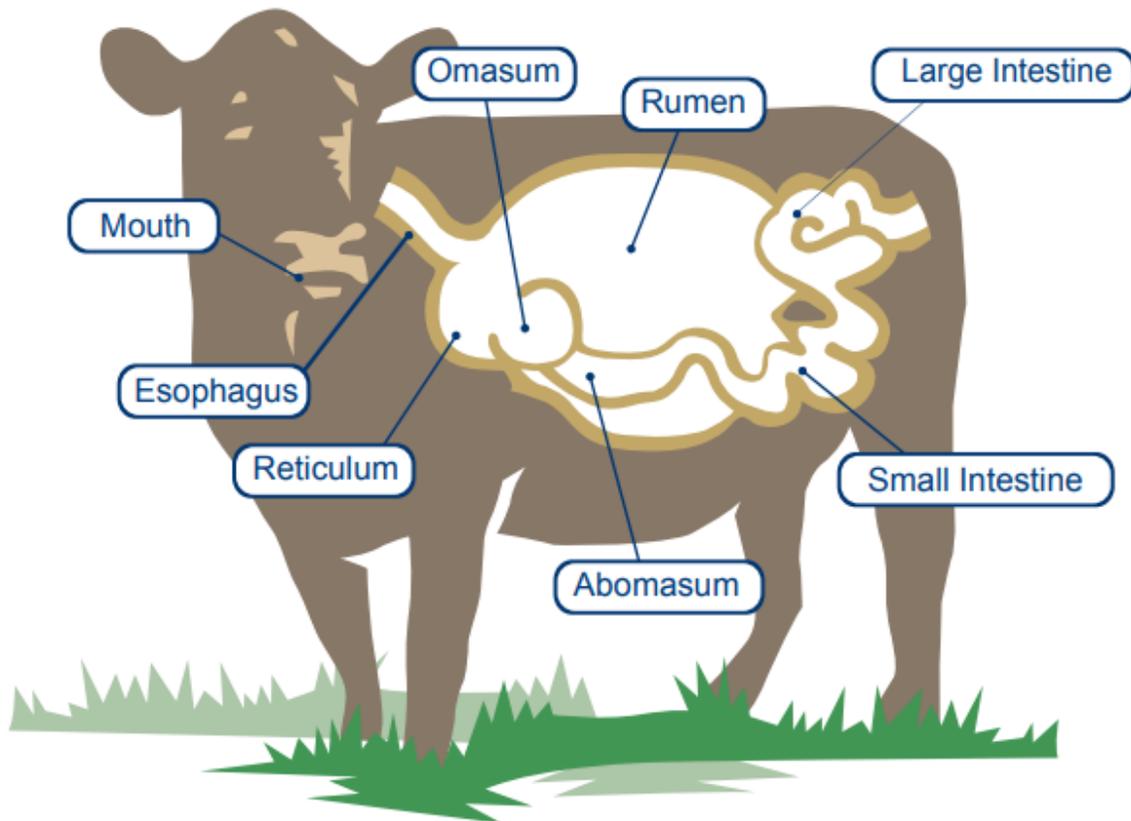
Using the diagram on the back of this page, trace the steps food takes in a ruminant's digestive system!

Why a cow can eat grass

Read the steps food takes through a ruminant's digestive system and look at the diagram below. Using a pencil/ marker, trace the path of grass as it moves through the four compartments of a ruminant's stomach. You may want to place arrows on your tracing line.

1. Teeth tear and chew food in the mouth, breaking the food into smaller pieces and mixing it with saliva.
2. Food travels down the esophagus through the reticulum to the rumen. The reticulum is connected to and works together with the rumen. The two stomachs together are often referred to as the reticulorumen. Anything large and heavy falls to the bottom of the reticulum, while smaller, lighter pieces of food pass to the rumen.
3. Great quantities of food mix and soften in the rumen. A cow's rumen can hold up to 50 gallons! Small pieces of food are broken down by microorganisms, releasing energy to the ruminant.
4. The larger pieces of food—now called cud—will be regurgitated to the mouth for more chewing by rear molars and more mixing with saliva. A cow will chew her cud 40–60 more times before swallowing it again for further breakdown in the rumen.
5. The next compartment is the omasum, which acts like a filter, absorbing water and nutrients from food particles and acts like a filter, allowing only small particles to pass through.
6. The abomasum is the final compartment, and it is the most similar to a human stomach. Here enzymes and acids are secreted to break down food.
7. After the abomasum, material passes through the intestines, which absorb remaining nutrients into the blood stream. Waste materials pass all the way through the intestines and exit the body as manure (not really waste, especially if you use it as fertilizer!).

Ruminant Digestive System





Station 3

Trail 3: Where's the Beef?

Name: _____

Cattle provide us with burgers, steaks, roasts, and more. Beef is a nutrient-dense food, providing an excellent source of protein, B vitamins, iron, and zinc.

Proteins, which are made up of amino acids, help build and maintain strong muscles. Nine amino acids are considered essential because we must get them from the food we eat—they cannot be made by the human body. Beef protein is considered a complete protein because it provides all nine essential amino acids that our bodies need but cannot make. Proteins help build, maintain, and repair body tissues, form hormones and enzymes, and increase resistance to infection and disease.



Beef also supplies five of the B-complex vitamins: thiamin, riboflavin, niacin, and vitamins B6 and B12. These vitamins are important to our health in many ways. For example, riboflavin helps the body use energy and promotes healthy skin and good vision in bright light. Niacin promotes healthy skin and nerves, aids digestion, and fosters normal appetite. Vitamin B12 is needed for normal functioning of the nervous system and is only found naturally in animal foods.

Beef is rich in iron and also aids the body in absorbing iron from plants. Iron helps red blood cells carry oxygen to and away from other body cells. This helps our body produce energy. Iron helps to make new blood and brain cells.

Red meat and poultry provide the majority of zinc in the American diet. Zinc boosts the immune system and helps wounds heal quickly. Zinc is a component of every living human cell and plays a role in growth, reproduction, appetite, food utilization, taste, night vision, production of hormones, and the immune system. Beef is an excellent source of zinc, providing more than 25% of the recommended daily allowance in one serving.

In addition to nutrition, cattle provide us with a multitude of by-products. Almost nothing goes to waste; by-products are made from the parts of the animal that we don't eat. Leather, is a cow's hide made soft and flexible by a process called tanning. Tallow, or fat, is used for a variety of things including the manufacturing of steel. Tires are hardened with materials from cattle. Many of the fluids, like antifreeze, used in cars and trucks come from cattle. In your classroom, materials from livestock help to make chalk, paper, books, erasers and much more.



Check out everyday products that we use often originate from cattle on the activity on the back of this worksheet!

Beef and more!

Using the by-product list below, check off everything you or others in your group have used either directly or indirectly in the last 24 hours.



Collagen (cartilage)

- Band-aids
- Book bindings
- Glue
- Sandpaper
- Sheetrock
- Wallpaper
- Plywood adhesive
- Face creams
- Film

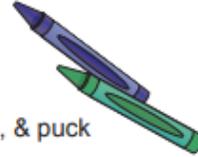
Tallow (fat)

- Soap
- Bird feed (suet)
- Baked goods
 - Breads
 - Rolls
 - Crackers
 - Cookies



Fatty Acids (fluids)

- Crayons
- Candles
- Plastics
 - Football helmets
 - Water & snow skis
 - Hockey stick, gloves, & puck
 - Fishing line
- Linoleum
- Brake fluid
- Antifreeze
- Car lubricants
- Car wax
- Detergent/soap
- Insecticides
- Tires
- Plastic lawn chairs
- Packaging for food



Glands

- Heparin (blood thinner)
- Dietary supplements

Hide/Leather

- Gloves
- Wallets/purses
- Luggage
- Car upholstery
- Shoes
- Pet chews
- Footballs and baseballs





Station 4

Trail 4: Carrying Capacity

A successful rancher must be a good range manager and steward of the land. In order to care for the land, ranchers try to estimate the carrying capacity of a range area as accurately as possible. Carrying capacity is the number of grazing animals a piece of land can support without causing harm to the vegetation, soil, or water. Any given piece of range-land produces only so many pounds of forage (plants like grass, trees, and shrubs that are eaten by livestock) each year. If ranchers overestimate how much forage is available, their animals may go hungry and overgraze the range.

Carrying capacity is commonly calculated in animal unit months (AUMs). An AUM is the amount of forage a 1,000-pound cow with a calf will eat in one month. This is approximately 800 pounds of forage. So, a cow and calf equals 1.00 AUM or 800 pounds of forage. Equivalent AUMs have been calculated for other animals (see the list on the next page).

To calculate carrying capacity, ranchers first estimate how much total forage is available on the area they have and then divide that estimate in half. They will allow livestock to consume only 50% of the available forage so that the land will not be overgrazed. Then, the pounds of forage available for livestock to consume are divided by the pounds of forage a 1000-pound cow will eat in a month to find the total number of AUMs available.

For example, if you have:

- 10,000 acres (an acre is about the size of a football field) that produce
- 600 pounds of forage per acre per year, then
(10,000 acres x 600 pounds of forage per acre = 6,000,000 total pounds of forage)
- 3,000,000 pounds of forage are available for grazing, which
is equivalent to
(6,000,000 pounds of forage x .5 = 3,000,000; use only half of the total to prevent overgrazing)
- 3,750 AUMs available for grazing
(3,000,000 pounds of forage / 800 pounds of forage per AUM)

Let's say that on these 10,000 acres you need to feed 12 deer for 12 months in addition to the cattle you'll raise for profit:

- 100 head of deer for 12 months require 240 AUMs
(100 deer x 12 months x .20 AUMs per deer = 240 AUMs)
- 3,510 AUMs are available for cattle
(3750 total AUMs - 240 AUMs for deer = 3510 AUMs)

How many cows with calves can you graze for 12 months?

- 292 cows with calves (3510 AUMs / 12 months x 1 AUM = 292)

If you had 500 cows with calves, how many months could they graze?

- 7 months (3510 AUMs / 500 cows with calves x 1 AUM = 7)



Ranch Management

Now you try your hand at managing the range. Show your work and include units. You have 100 acres of land that produces 800 pounds of forage per acre per year.

1. How many total pounds of forage will your land produce?

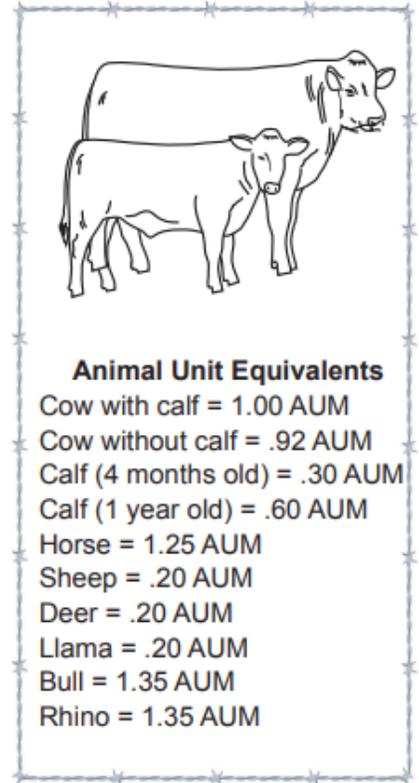
2. How many pounds are available for grazing without causing overgrazing?

3. How many AUMs for cows with calves will your pasture provide?

4. If you had 20 cow/calf pairs, how many months could they graze?

5. If you had 5 cow/calf pairs, how many months could they graze?

6. If you had 4 horses, how many months could they graze?





Grazing and Lawn Mowers - In pursuit of Greener Grass

Student Name: _____

Ranchers may use their own land to graze their animals or pay a fee to the government to lease public rangeland. Private and public rangelands are usually mountainous, rocky, or dry lands that can't be used to grow the usual farm crops. However, grass and other plants on this rangeland can be used for grazing live-stock. People can't eat grass, but cattle and sheep can turn grass into beef and lamb. With a growing human population and limited land suitable for growing crops on Earth, it is nice to know we can produce food from land that isn't suitable for cropping. In order for rangelands to support grazing year after year without being degraded, grazing must be actively managed.

Rangeland management begins with grass. We tend to take grass for granted because there seems to be so much of it. In fact, there is a lot of grass. It is one of our most important and available renewable resources. Grass plays a number of environmentally important roles. Grass covers the soil and holds it in place, slowing runoff of rain, preventing erosion, and reducing the potential for floods. Grass traps and filters sediments and nutrients from runoff, and helps water percolate through the soil and back into streams and ground water. Grass also serves as food for wildlife and livestock.

Cattle and sheep are like rangeland lawn mowers that can help care for grassland ecosystems. Imagine what your lawn would look like if you didn't mow it! At first glance when we see animals grazing, it seems like the animal wins all. However, there are more winners here than first meets the eye. The moment grass is shorn, it seeks to restore a balance between its roots and leaves. When the tops of the grass leaves are eaten by grazing livestock, the same amount of root is lost. When the roots die, the soil's population of bacteria, fungi, and earthworms gets to work breaking down the dying roots. This creates fertile organic matter that enriches the soil. In turn, rich soils support more grass growth.

Grasses recover from grazing and mowing more easily than many other plants because grasses regrow from the bottom up. Mowing and light grazing removes only the top portion of plants, leaving the growing point of grasses untouched. However, repeated, heavy grazing can kill grass. When a grass plant is grazed very low to the ground, a large portion of its roots die, and it has little leaf area left to make energy through photosynthesis. Because the plant can't generate much energy, it takes a long time for the roots to regrow, and the plant is very susceptible to drought. Proper management of grazing involves moving livestock to a new area before grasses are grazed too low and allowing grasses a period of rest to regrow leaves and roots before they are grazed again. With proper management, grazing can be a tool for keeping rangelands healthy.

In well-managed grasslands, decaying roots are the biggest source of new organic matter, and grazing animals actually build new soil from the bottom up. In the absence of grazers, the soil-building process would be nowhere near as swift or productive. Grazing cattle aerate the soil with their hooves, scatter seeds, and trim wild grasses. Wildfires have a harder time taking hold on shorter, cropped grass than on longer vegetation. Properly grazed or "mowed" grass can help create healthy green grass. Ranchers work to improve the land and the plants that grow there so they will always have a renewable food source for their animals. The land is a fragile resource. If the land is not cared for, it can become unproductive, and then making a living from the land would be impossible.

Got it!

There are many factors ranchers consider before they put their cattle on rangelands. Unscramble the following sentences to discover a few of the questions ranchers need to answer when managing land. Write your unscrambled sentence below the scrambled sentence. Be sure to capitalize the first word of your sentence and punctuate it.

plants are what type rangeland of found on this

animals found are what in area this

received how moisture much has land the

improved can how the be range

need does wildlife what the

what best livestock number of is the to graze the land

how graze area in an should livestock the long

After you have complete these questions, it's time to start growing your ranch! Follow the directions on the right side of this worksheet.

Ranch Starter Kit . . . Grass for Grazing

1. Write your name on your cup using a permanent marker.
2. Place your peat pot into the cup (make sure the end with the small hole faces up). Fill the cup half full with water.
3. When your peat pot is completely hydrated, use a pencil to loosen the top $\frac{1}{4}$ inch of peat moss.
4. Evenly spread $\frac{1}{2}$ teaspoon of seeds on the top of the peat pot. Press the seeds down gently with your thumb so that they contact one another and the damp peat. Capillary action will move the water through the seeds and the soil.
5. Remember to check your pot daily. Keep about $\frac{1}{4}$ inch of water in the bottom of the cup. Your grass should be up in about a week. Take care of your "ranch;" you will be using the sprouted grass for a future activity.





Teacher Copy- Answers

At Home on the Range Worksheet Answers

Trail 1 - Land Use in Oregon

1. What color represents privately owned land?

White. (Students may find this confusing. The map key indicates the colors used to represent federal lands and Indian reservations. Any area left without color (white) represents either private or state-owned land.

2. Geographically, in Oregon where is most of the private land? (Hint: think about relation to land and water features, cities, counties, etc.)

Answers may vary. Most of the private land is around highly populated areas, at the base of mountains, and/or near rivers and lakes.

3. Which federal agency is responsible for managing the greatest land area in Oregon?

The Bureau of Land Management (BLM)

4. How many Indian reservations (IRs) are there in Oregon? List their names.

There are 7 Indian reservations

Fort McDermitt IR

Coos Lower Umpqua & Siuslaw IR

Warm Springs IR

Umatilla IR

Grande Rhonde IR

Siletz IR

Burns- Paiute Colony IR

5. What biome (major type of ecological community) best describes the Oregon lands indicated in yellow?

a. wetland

b. desert

c. forest

6. Along what geographical feature is most of Oregon's Forest Service land located? (Hint: think of physical features that share names with many of the national forests)

Along the mountain ranges

7. In what part of the state are most of Oregon's water resources?

Answers may vary. Lakes are concentrated in the north. Rivers run along the valley bottoms largely near mountains. The largest reservoirs are in the south.

Trail 2 - Cow Tales

Students will learn the steps that's ruminant animal's food takes through the digestive system. Using the diagram on their worksheet, student will trace the path grass takes as it moves through the ruminant digestive system using a writing utensil. Have them use arrows to help trace the path. **Students should trace a line connecting the esophagus to the rumen, then to the reticulum, the abomasum, through the small and large intestine and then out the end.** They should be able to share information with the class such as what a ruminant is and why ruminants can eat grass.



Teacher Copy- Answers

At Home on the Range Worksheet Answers

Trail 3 - Where's the Beef?

Students will read through the by-product list on their worksheet and check off everything they or their group members have used in the last 24 hours directly or indirectly. **Answers will vary.**

Trail 4 - Carrying Capacity

1. How many total pounds of forage will your land produce?

$$100 \times 800 = 80,000 \text{ lbs}$$

2. How many pounds are available for grazing without causing overgrazing?

$$80,000 \text{ lbs} \times 0.5 = 40,000 \text{ lbs}$$

3. How many AUMs for cows with calves will your pasture provide?

$$40,000 \text{ lbs} / 800 \text{ lbs per AUM} = 50 \text{ AUMs}$$

4. If you had 20 cow/calf pairs, how many months could they graze?

$$50 \text{ AUMs} / 20 \text{ cow/calf pairs} \times 1 \text{ AUM per cow/calf pair} = 2.5 \text{ months}$$

5. If you had 5 cow/calf pairs, how many months could they graze?

$$50 \text{ AUMs} / 5 \text{ cow/calf pairs} \times 1 \text{ AUM per cow/calf pair} = 10 \text{ months}$$

6. If you had 4 horses, how many months could they graze?

$$50 \text{ AUMs} / 4 \text{ horses} \times 1.25 \text{ AUM per horse} = 10 \text{ months}$$

Grazing and Lawn Mowers Activity Page Answers

plants are what type rangeland of found on this

What type of plants are found on this rangeland?

animals found are what in area this

What animals are found in this area?

received how moisture much has land the

How much moisture has the land received?

improved can how the be range

How can the range be improved?

need does wildlife what the

What does the wildlife need?

what best livestock number of is the to graze the land

What is the best number of livestock to graze the land?

how graze area in an should livestock the long

How long should the livestock graze in an area?



Cow Grazing Photo
*This lesson was adopted from Utah Agriculture in the Classroom,
At Home on the Range*



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