

TRAIL 1 - LAND USE IN UTAH

Like many other western states, most of Utah'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. Most of Utah's land is rangeland used for grazing livestock. 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:

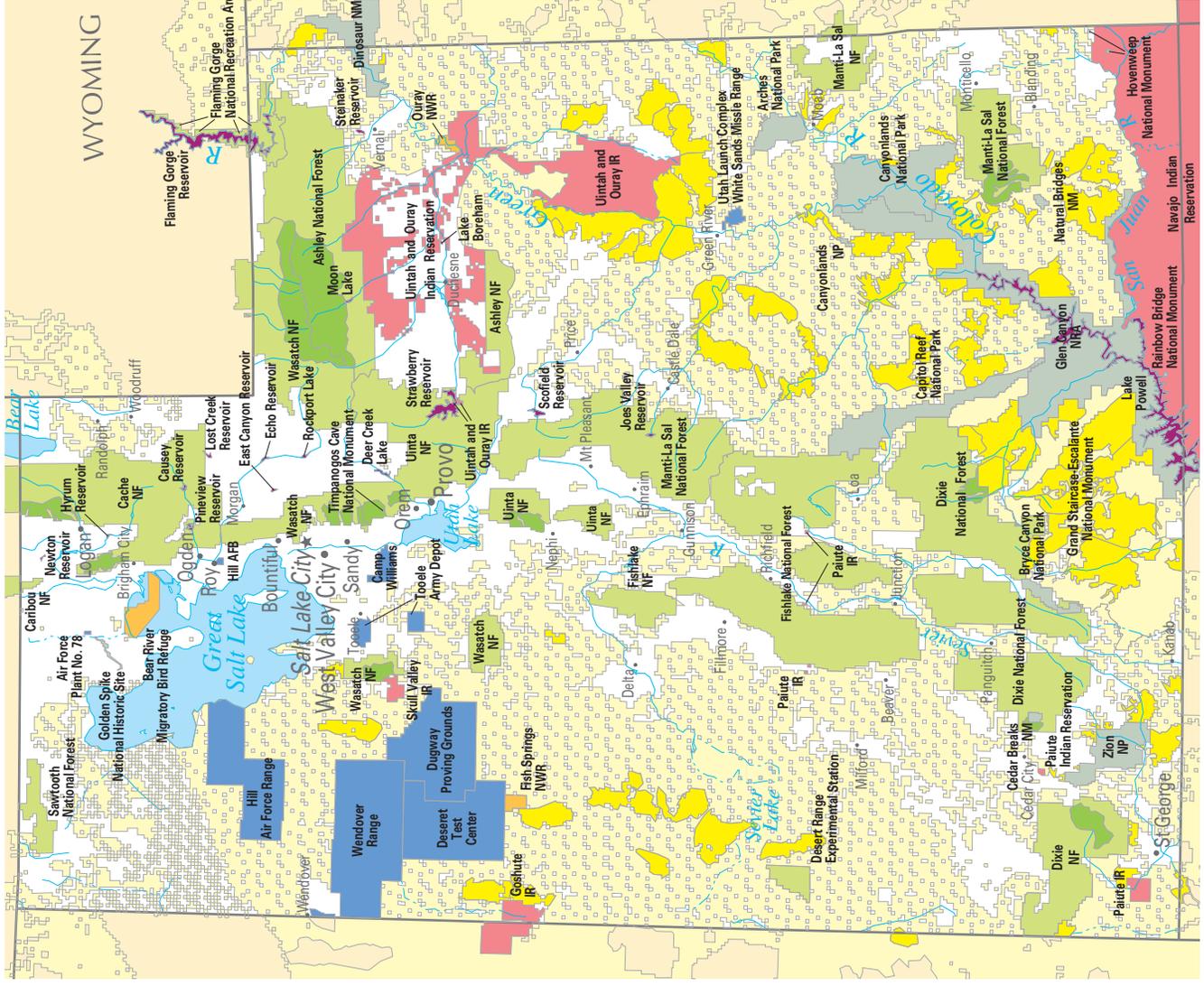
1. What color represents privately owned land?
2. Geographically, in Utah where is most of the private land? (*Hint: think about relation to land and water features, cities, counties, etc.*)
3. Which federal agency is responsible for managing the greatest land area in Utah?
4. How many different Indian reservations (IRs) are there in Utah? List their names and the name of one nearby city for each reservation:
5. What biome (major type of ecological community) best describes the Utah lands indicated in yellow?
 - a. wetland
 - b. desert
 - c. forest
6. Along what geographical feature is most of Utah'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 Utah's water resources?

Ranch Starter Kit . . . Grass for Grazing

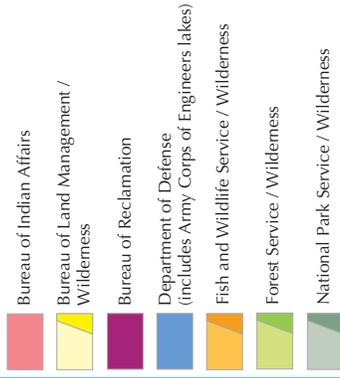
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Utah Land Ownership



FEDERAL LANDS AND INDIAN RESERVATIONS



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



Albers equal area projection

Abbreviations

AFB	Air Force Base
IR	Indian Reservation
NF	National Forest
NM	National Monument
NP	National Park
NRA	National Recreation Area
NWR	National Wildlife Refuge

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U.S. Department of the Interior

U.S. Geological Survey

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TRAIL 2 - WESTWARD HO! RANCHING IN UTAH

Modern day Utah ranchers can trace their roots back to the late 1700s when horses and cattle first appeared in Utah. In Utah, cattle generate over one-fifth of the cash receipts received from agricultural products and create over \$350 million dollars of revenue annually. While cattle production is the largest agricultural commodity in the state, Utah is not the largest producer of cattle, nationally ranking number 28 in production of beef cows (2012). Every county in the state produces cattle. Box Elder County in northern Utah produces the most cattle.

While most states in the west have had cattle since the time of the early Spanish explorers, Utah cattle history is unique in that it did not develop until the Mormon pioneers began to arrive in the 1840s. Around this same time, prominent mountain men Jim Bridger and Miles Goodyear started small herds in the region. Mormon traders purchased Goodyear's cattle at Fort Buenaventura (near present-day Ogden) in 1847, effectively cornering the Utah cattle market. For the first decade after the settlement of the Utah territory, cattle and sheep were the only major exports.

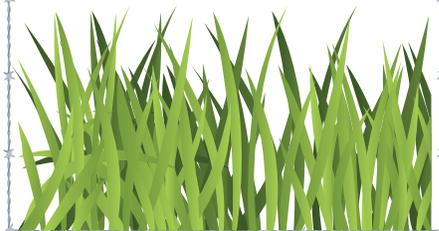
Utah settlers bred, bought, and traded for more cattle. Many settlers made journeys to other states to bring home cattle, while some businessmen would trade with other settlers passing through Utah on their way to California. Oftentimes these trail-weary cattle were traded at a rate of two tired to one fresh, quickly building the Utah supply from 12,000 head in 1850 to 34,000 by 1860. The sheer number of cattle in Utah made it an important region for trade.

During this era, Utah cattle ranchers practiced a communal type of cattle farming. A person may have owned only a small number of cattle that they would combine with other ranchers' cattle to form a large herd. The cattle were allowed to graze on public lands around towns and through the mountains and valleys. There was a lot of open range—unfenced area that can be grazed by livestock. This communal ranching style was effective through the 1870s, but as herd sizes began to grow even more rapidly, Utahans shifted toward the Texas-style of ranching, which included the use of long-horn cattle held in large quantities by a single owner.



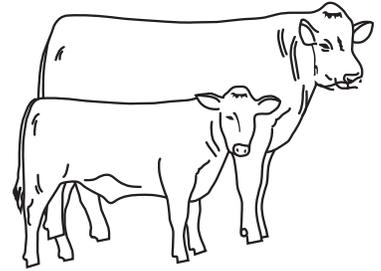
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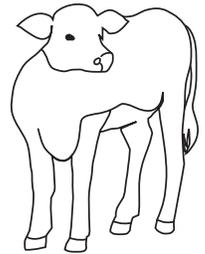


Calculate the Value of Cattle in Utah

People who collect, analyze, interpret, and calculate information on any number of things—people, cattle, crops, etc.—are called statisticians. They work with statistics or numbers and values. In Utah, statistics on cattle have been kept since 1867. To get the total value of cattle in Utah, multiply the number of cattle by the value per animal. Round to the nearest \$50,000. You may want to use a calculator.

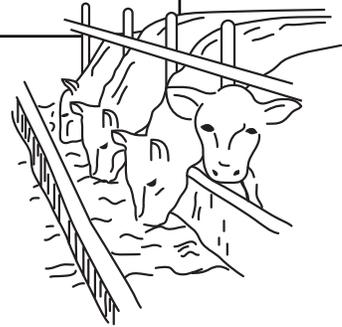


Year	Number of Cattle in Utah	Value of Cattle (based on average carcass weight of 800 pounds)	Total Value
1924	540,000	\$43.20	
1930	461,000	\$58.40	
1940	432,000	\$54.40	
1950	588,000	\$185.60	
1960	719,000	\$147.20	
1970	808,000	\$204.80	
1980	840,000	\$482.40	
1990	780,000	\$590.40	
2000	910,000	\$791.20	
2010	810,000	\$768.00	



Short Answer:

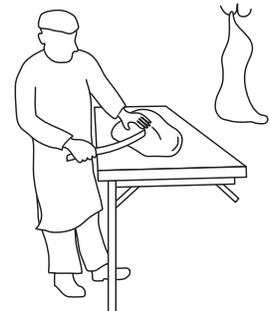
1. Study the numbers above. Write a statement based on what the numbers indicate.



2. What are some reasons the value of cattle may increase or decrease? (*Hint: Think about factors that might affect supply and demand—more supply, the lower the price; the less supply, the higher the price*)



3. If you are a rancher with 300 cattle to sell, how much money would you have made in 2010?



TRAIL 3 - COW TALES

Calves are typically born between January and April in Utah. 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.

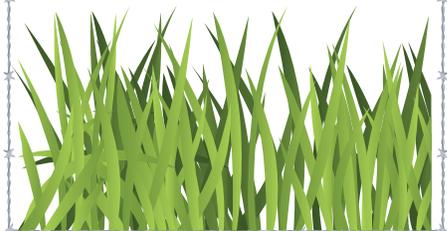
Why can a cow eat grass? All ruminants, including cattle, are able to digest grass and other vegetation. Ruminants include cattle, goats, sheep, camels, llamas, giraffes, bison, buffalo, deer, and antelope. Some of these animals are livestock, such as cows, goats, and sheep. Others are wild animals such 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.

Ranch Starter Kit . . .

Grass for Grazing

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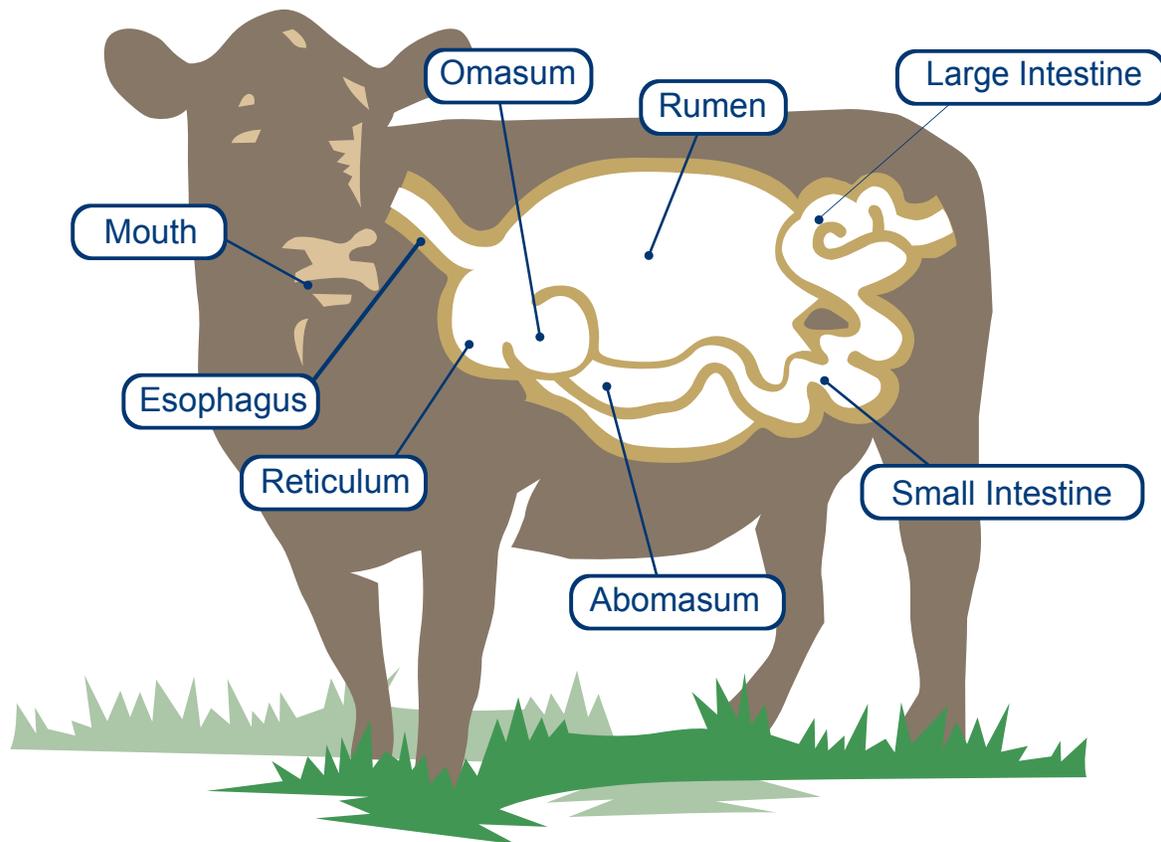


Why a cow can eat grass

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



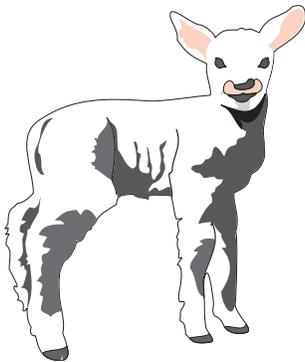
TRAIL 4 - SHEEP ON THE RANGE

In the United States, most sheep are raised west of the Mississippi River. In 2012 Texas ranked first in the nation for the most sheep production, followed by California, Colorado, Wyoming, and Utah, respectively. Sheep like to graze, and they will eat plants that other animals will not eat. Some sheep are raised in pastures on farms, but in Utah it is common for sheep to graze mountainous areas in the summer and desert ranges in the winter. Sheep may be hunted by predators while grazing. Coyotes, mountain lions, eagles, and foxes prey upon sheep—lambs are particularly vulnerable. Many sheep producers use guard dogs to protect their sheep and hire shepherders, or shepherds, who live in small trailers year-round protecting the flocks and moving the sheep to new feeding areas to prevent overgrazing.



Sheep less than one year old are called lambs. Before they are born, lambs have spent less than 5 months (145 days) growing inside their mothers, which are called ewes. Lambs are usually born in the spring. The ewes provide milk to their lambs for the first few weeks of their lives. Sheep are born with tails, but they are docked (cut short) within the first couple of weeks. Docking helps to keep sheep clean and healthy. Ewes and lambs are often kept in barns or lambing sheds for a couple of weeks before they go outside and begin to graze. After the lambs graze for 7–9 months, they weigh about 110 pounds and are ready for market.

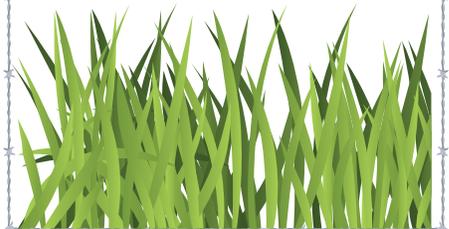
Sheep are multi-purpose animals; they can be used for meat, milk, and wool. Some sheep are raised specifically for their meat. The meat is made into roasts, chops, and more. Specialty cheeses and yogurt can be made from sheep's milk. The "hair" on sheep is called wool. Once a year, in the early spring, the sheep are sheared, or given a haircut. This provides people with wool and



helps to keep the sheep cooler in the summer. The wool, or fleece, is shipped to market to be cleaned and spun into wool yarn for fabric. In addition to these three uses, sheep (and goats) are unique in that they will eat plants that are avoided by other animals. Grazing sheep and goats can be an effective way to control invasive weeds that are not native to Utah rangelands.

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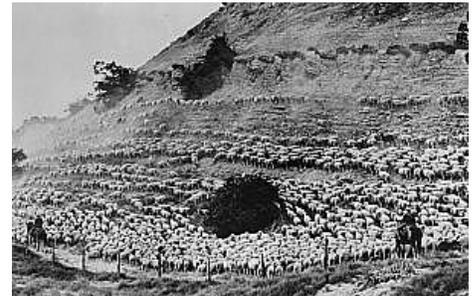
Counting Sheep

1. One ewe eats 4 pounds of hay per day. If you feed the ewe hay from December to April (150 days), how many pounds of hay will she eat?
2. If you paid 8 cents per pound for the hay, how much did you spend?
3. From May to September (150 days), you put the ewe out on pasture. It costs 6 cents a day. How much does it cost to have her on pasture?
4. Next, the ewe is put out to eat corn stalks from October to November (60 days). It costs 5 cents a day to let her eat the corn stalks. How much will it cost to keep her there?



Shepherd and Flock, circa 1930

5. How much did it cost you to feed your ewe for one year?
(Hint: add your answers to questions 2, 3, and 4)
6. If the ewe's wool sells for \$1 per pound and her fleece weighs 8 pounds, how much money will you make from her wool?

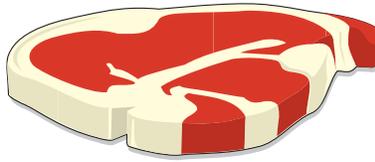


Sheep on their way to winter range, circa 1930

7. If the ewe raises one lamb that weighs 100 pounds when you send it to market, and it sells for \$1.80 per pound, how much money will you make from the lamb?
8. How much did you earn all together from selling the ewe's wool and lamb?
9. If you subtract the amount it cost to feed the ewe for one year from the amount you earned from the wool and lamb she produced, how much profit did you make?

TRAIL 5 - WHERE'S THE BEEF?

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.



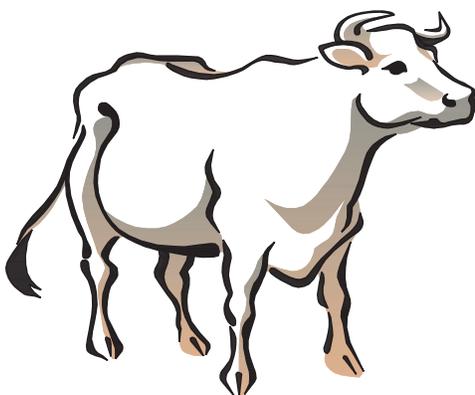
Proteins, which are made up of amino acids, help build and maintain strong muscles. Nine amino acids are considered essential because we must get them from the food we eat—they cannot be made by the human body. Beef protein is considered a complete protein because it provides all nine essential amino 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.

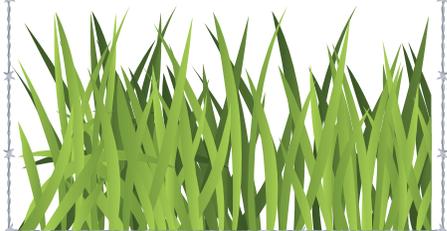
In addition to nutrition, cattle provide us with a multitude of by-products. Almost nothing goes to waste; by-products are made from the parts of the animal that we don't eat. Leather, is a cow's hide made soft and flexible by a process called tanning. Tallow, or fat, is



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.

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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

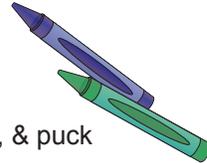
Tallow (fat)

- 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



TRAIL 6 - 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 rangeland 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
($10,000 \text{ acres} \times 600 \text{ pounds of forage per acre} = 6,000,000 \text{ total pounds of forage}$)
- 3,000,000 pounds of forage are available for grazing, which is equivalent to
($6,000,000 \text{ pounds of forage} \times .5 = 3,000,000$; use only half of the total to prevent overgrazing)
- 3,750 AUMs available for grazing
($3,000,000 \text{ pounds of forage} / 800 \text{ pounds of forage per AUM}$)

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
($100 \text{ deer} \times 12 \text{ months} \times .20 \text{ AUMs per deer} = 240 \text{ AUMs}$)
- 3,510 AUMs are available for cattle
($3750 \text{ total AUMs} - 240 \text{ AUMs for deer} = 3510 \text{ AUMs}$)

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

- 292 cows with calves ($3510 \text{ AUMs} / 12 \text{ months} \times 1 \text{ AUM} = 292$)

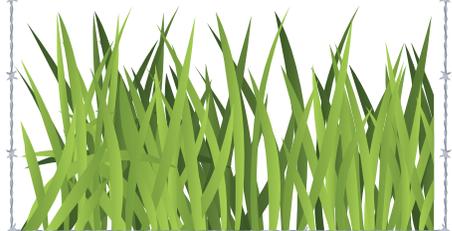
If you had 500 cows with calves, how many months could they graze?

- 7 months ($3510 \text{ AUMs} / 500 \text{ cows with calves} \times 1 \text{ AUM} = 7$)

Ranch Starter Kit . . .

Grass for Grazing

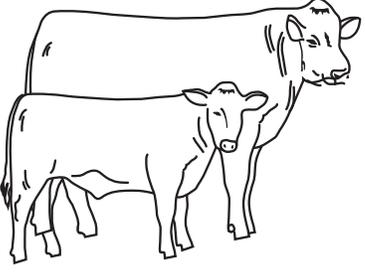
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Ranch Management

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?



Animal Unit Equivalents

- Cow with calf = 1.00 AUM
- Cow without calf = .92 AUM
- Calf (4 months old) = .30 AUM
- Calf (1 year old) = .60 AUM
- Horse = 1.25 AUM
- Sheep = .20 AUM
- Deer = .20 AUM
- Llama = .20 AUM
- Bull = 1.35 AUM
- Rhino = 1.35 AUM



TRAIL 7 - WHO ARE YOU? WHAT'S YOUR BRAND?

Cattle ranchers brand their cattle to show ownership. Some cattle receive plastic ear tags for additional identification. Brands are registered and regulated at the state level. All brands used in Utah are registered by the Utah Livestock Brand Board.

The use of branding to identify animals dates back 4,000 years. Pictures on the walls of tombs in Egypt show cattle were branded as early as 2,700 BC. In the American West, the Spanish were the first to use branding to identify ownership of cattle. The custom spread quickly to those raising cattle throughout the West. It provided a way to discourage cattle rustling (stealing cattle). Once an animal is branded, there is no way for a thief to remove the brand.

To keep track of all the cattle producers, someone needed to record these brands. Utah has recorded brands since 1851—the first year Utah became a territory of the United States. While the responsibility of recording brands once belonged to the “Recorder of Marks and Brands,” a special state position, this job is presently handled by the Utah Department of Agriculture and Food’s Division of Animal Industry.

In Utah, brands can be put on the left hip, right hip, right rib, left rib, right shoulder, or left shoulder of animals. The same brand can be used on cattle and horses. Cattle brands need to be unique and concise. Special branding alphabets have developed in which a letter can be tipped or extra lines added to alter the meaning of the letter. For example, a letter or character that is in the horizontal position is said to be “lazy.” In addition to letters, symbols and shapes are commonly used in brands.

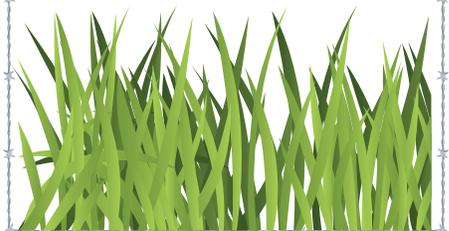
Today, there are two main methods of branding: hot iron branding and freeze branding. Hot iron branding is usually preferred for cattle. This process includes pressing a hot metal brand into the animal’s hide. Though this seems like it would be painful, when done correctly the animal experiences very little discomfort due to its thick hide. Cowhide is thick and tough. The resulting mark is a permanently hairless, darkened area on the animal’s hide.

The freeze branding method involves shaving part of the animal’s hair, then using a super cold metal brand on the bare skin. As the hair grows back, it is white everywhere that the skin was touched with the cold brand.

Although it has ancient roots, cattle branding is still the best way to prevent cattle theft!

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.



Brand Interpretation

Brands are read from the left to the right, from the top down, or from the outside to the inside. How would you read these Utah brands? Sometimes the registered brand name can give you a clue. Sometimes a brand might just be what the rancher likes. Try to match the brand letter with who you think might be the Utah registered brand owner; then check the answers. Can you find their hometowns on a Utah map?

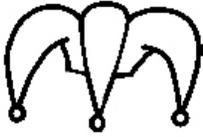
a.  _____ Jesse and Rakell Nash; Vernal
 _____ Thunder Rose Ranch; Palmyra

b.  _____ Daniel Knuchel; Fielding
 _____ Samuel & Mariah Cuch; Fort Duchesne

c.  _____ Bar B Ranch; Salt Lake City
 _____ Cheryl Broadhead, Neola

d.  _____ Blake Quayle; Sterling

e.  _____ Kenneth and Fawn Evans; Vernal
 _____ Darwin Jones; Hooper

f.  _____ Melroy Vigoren, Morgan
 _____ Ann Bogdanich; Coalville

g.  _____ 4-Sale Cattle Company; Hanksville
 _____ Floyd Barrow; Ogden
 _____ Deborah Spader; Coalville

h. 

i. 

j. 

k. 

l. 

m. 

n. 

Answers: f, a, b, j, d, i, g, h, e, k, n, c, m, l

TRAIL 8 - WHAT'S NATIVE? WHAT'S INVASIVE?

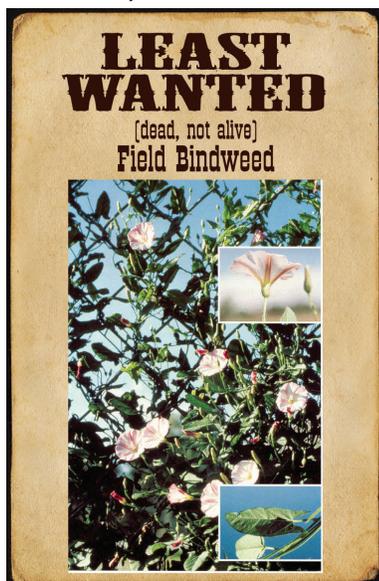
A plant or animal that lives or grows naturally in a particular region without direct or indirect human intervention is said to be native. Utah juniper, pinyon pine, and sagebrush are natives of Utah, and so is the state flower, the sego lily. These plants are commonly found in many parts of Utah. Other native plants are more rare, and some are endangered. Native plant populations often dwindle because human activity has disturbed their habitat. Exotic weeds tend to grow and reproduce better in disturbed landscapes than native plants.

Early European settlers in North America inadvertently brought weed seeds with them, perhaps in the hay they brought for their animals or in the dirt they used as ballast for their ships or even in their clothes or bedding. Some activities, like clearing the land to grow crops, opened up places for weeds to grow. Settlers also purposely brought plants from their home countries to reseed areas, make dye for clothing, and use as ornamental plants. Some of these plants became weeds. Dyer's woad is a yellow-flowered, dark-seeded plant that was brought to North America in the 1600s for use as a dye. It didn't become a weed until it reached the western part of the continent in the 1900s.

What is an invasive plant? What's a weed? What makes it exotic? Most simply stated, a weed is a plant out of place. A plant may be a weed in one place and an acceptable plant in another. Weeds interfere with the way people want to use the land. Weeds in your lawn may not look nice or feel nice to walk on with bare feet. Weeds in rangelands and pastures are plants that livestock don't like to eat; some may even be poisonous. Most weeds are exotics, meaning they are not native. The term *invasive* refers to the ability of a weed to spread aggressively and outcompete more desirable plants. Noxious weeds are weeds that, by law, must be

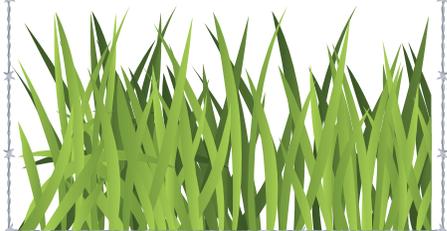
controlled. They are usually the most invasive and aggressive of the weeds. They often spread easily, reproduce quickly and in large numbers, and reduce populations of desirable plants.

Exotic, invasive weeds can destroy wildlife habitat, outcompete native plants, and block recreational opportunities. The challenge is to prevent them from spreading to non-infested areas. Everyone can help by learning to identify invasive weeds, taking care not to spread them, and reporting them when found.



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Good, Bad & Ugly

Using what you've read and the graphics on this page, identify which of the following would be native plants in Utah by placing an "N" in the blank. Identify the exotic, invasive plants with an "I."

___ Leafy Spurge

___ Douglas Fir

___ Russian Knapweed

___ Scrub Oak

___ Dalmation Toadflax

___ Dyer's Woad

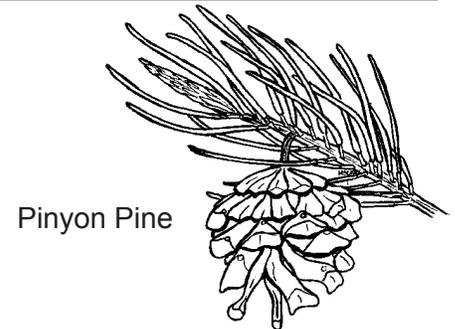
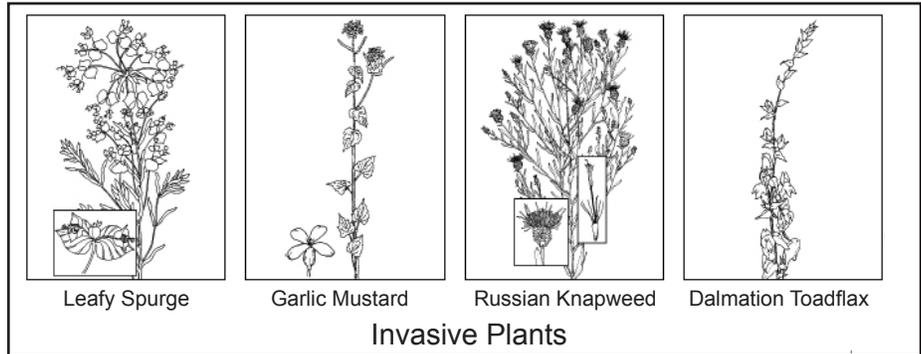
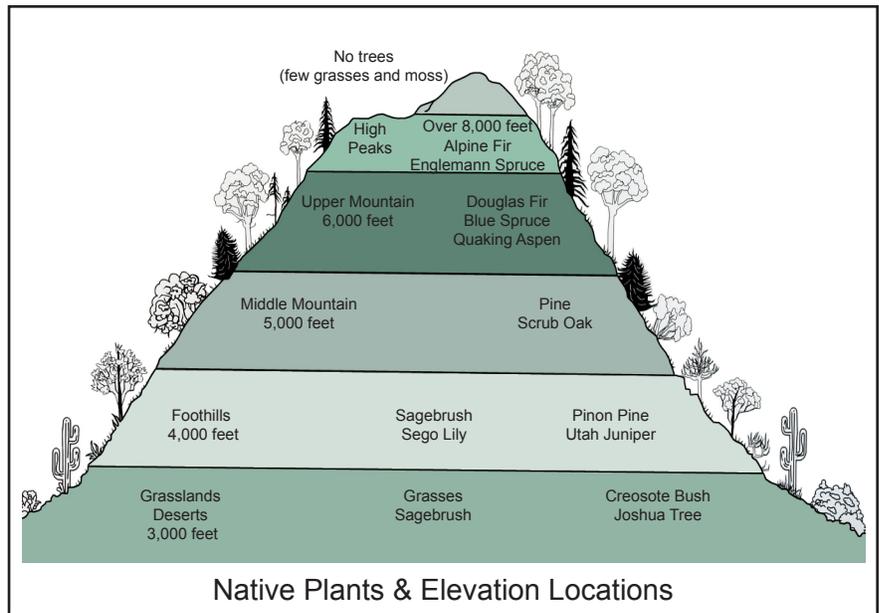
___ Sagebrush

___ Utah Juniper

___ Pinyon Pine

___ Segó Lily

___ Garlic Mustard



Utah Juniper



TRAIL 9 - GRAZING AND LAWN MOWERS - IN PURSUIT OF GREENER GRASS

Much of Utah's private land is owned by ranchers. 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 livestock. 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.

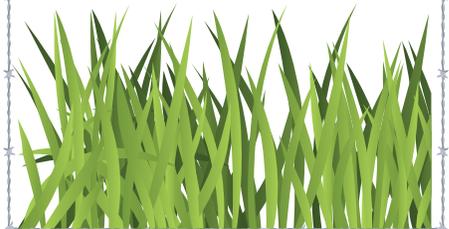
Cattle and sheep are like rangeland lawn mowers that can help care for grassland ecosystems. Imagine what your lawn would look like if you didn't mow it! At first glance when we see animals grazing, it seems like the animal wins all. However, there are more winners here than first meets the eye. The 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

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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

“Trail” Activity Sheets Answer Key

TRAIL 1 - LAND USE IN UTAH

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. Students may also wonder about the square patterns dotted throughout Utah. When the western states were first being settled, all the land was surveyed and divided by the federal government into 36-square-mile townships, which were further subdivided into one-square-mile sections. At statehood, the federal government granted four sections per township as state trust lands to fund education, creating a checkerboard pattern of state land ownership that persists in the west today.)

2. Geographically, in Utah 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 Utah?

The Bureau of Land Management (BLM)

4. How many Indian reservations (IRs) are there in Utah? List their names and the name of one nearby city for each reservation:

There are 5 Indian reservations:

Goshute, near Wendover

Navajo, near Blanding

Paiute, near St. George

Skull Valley, near Tooele

Uintah and Ouray, near Duchesne, Green River, Vernal

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

a. wetland **b. desert** c. forest

6. Along what geographical feature is most of Utah’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 Utah’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 - WESTWARD HO! RANCHING IN UTAH

1. Study the numbers above. Write a statement based on what the numbers indicate.

Answers may vary. The value and number of cattle in Utah have both increased since 1924. From 2000 to 2010 the value and number of cattle both decreased.

2. What are some reasons the value of cattle may increase or decrease?

Answers may vary. The value of cattle may change based on supply and demand. Factors that might affect supply and demand include imports from other countries, natural disasters such as drought or fire, changes in nutritional recommendations indicating people should eat less or more beef, etc.

3. If you are a rancher with 300 cattle to sell, how much money would you have made in 2010?

\$230,400

TRAIL 3 - COW TALES

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 ruminant digestive system. You may want to place arrows on your tracing line.

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.

TRAIL 4 - SHEEP IN UTAH

1. One ewe eats 4 pounds of hay per day. If you feed the ewe hay from December to April (150 days), how many pounds of hay will she eat?

600 lbs

2. If you paid 8 cents per pound for the hay, how much did you spend?

\$48.00

3. From May to September (150 days), you put the ewe out on pasture. It costs 6 cents a day. How much does it cost to have her on pasture?

\$9.00

4. Next, the ewe is put out to eat corn stalks from October to November (60 days). It costs 5 cents a day to let her eat the corn stalks. How much will it cost to keep her there?

\$3.00

5. How much did it cost you to feed your ewe for one year?

(Hint: add your answers to questions 2, 3, and 4)

\$60

6. If the ewe's wool sells for \$1 per pound and her fleece weighs 8 pounds, how much money will you make from her wool?

\$8.00

7. If the ewe raises one lamb that weighs 100 pounds when you send it to market, and it sells for \$1.80 per pound, how much money will you make from the lamb?

\$180

8. How much did you earn all together from selling the ewe's wool and lamb?

\$188

9. If you subtract the amount it cost to feed the ewe for one year from the amount you earned from the wool and lamb she produced, how much profit did you make?

$\$188 - \$60 = \$128$

TRAIL 5 - WHERE'S THE BEEF?

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.

Students should check at least some of the boxes indicating items they've used in the last 24 hours, and they should be able to share information about the nutritional value of beef, the value and diversity of byproducts of beef production.

TRAIL 6 - 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?

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

TRAIL 7 - WHO ARE YOU? WHAT'S YOUR BRAND?

Brands are read from the left to the right, from the top down, or from the outside to the inside. How would you read these Utah brands? Sometimes the registered brand name can give you a clue. Sometimes a brand might just be what the rancher likes. Try to match the brand letter with who you think might be the Utah registered brand owner; then check the answers.

Answers are provided at the bottom of the student activity sheet. Students should be able to share information about the process and history of branding and what kinds of symbols are used in branding.

TRAIL 8 - WHAT'S NATIVE? WHAT'S INVASIVE?

I Leafy Spurge

N Douglas Fir

I Russian Knapweed

N Scrub Oak

I Dalmation Toadflax

I Dyer's Woad

N Sagebrush

N Utah Juniper

N Pinyon Pine

N Segoe Lily

I Garlic Mustard

TRAIL 9 - GRAZING AND LAWN MOWERS - IN PURSUIT OF GREENER GRASS

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

What type of plants are found on this rangeland?

What animals are found in this area?

How much moisture has the land received?

How can the range be improved?

What does the wildlife need?

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

How long should the livestock graze in an area?