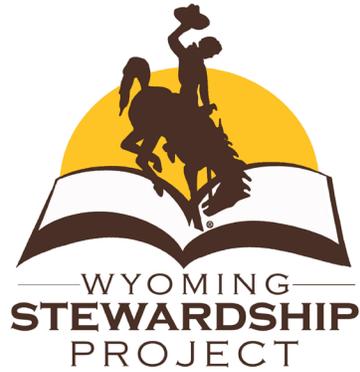




— WYOMING —
STEWARDSHIP
PROJECT

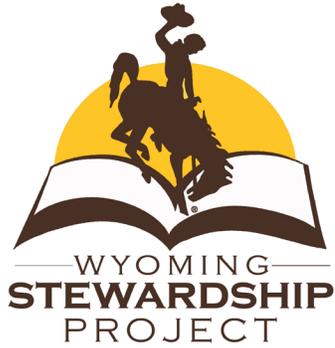
4th Grade
Agriculture Unit



4th Grade Agriculture

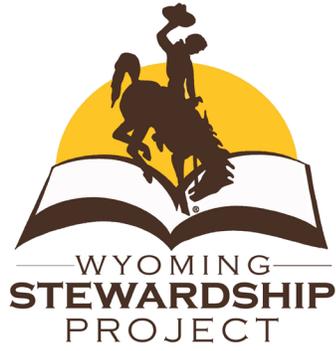
TABLE OF CONTENTS

| |
|------------------------------------|
| Standards Map |
| Educator Essentials |
| Lesson 1: The Roots of Agriculture |
| Lesson 2: Hills and Valleys |
| Lesson 3: Made for Success |
| Lesson 4: Crop Talk |
| Lesson 5: A New Way of Thinking |
| Lesson 6: Making Dollars and Cents |
| Lesson 7: Seeking New Management |
| Glossary |



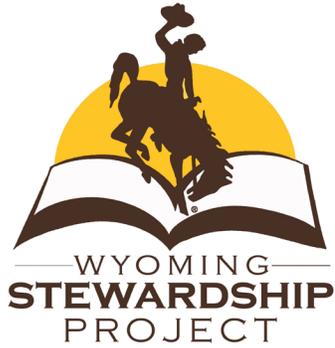
4th Grade Agriculture Standards

| Day | Lesson Title | Science | | Social Studies | |
|---------|------------------------------------|-------------------|--|--|------------------------|
| | | Explicitly Taught | Practiced/ Encountered | Explicitly Taught | Practiced/ Encountered |
| 1 | Lesson 1: The Roots of Agriculture | | | SS5.5.3 | |
| 2 | Lesson 2: Hills and Valleys | 4-ESS2-2 | | | |
| 3 | Lesson 3: Made for Success | 4-LS1-1 | | | |
| 4 | Lesson 4: Crop Talk | 4-LS1-1 | | | SS5.2.1 SS5.5.4 |
| 5 | Lesson 5: A New Way of Thinking | | | SS5.1.1 SS5.2.1 SS5.3.3 SS5.4.2 | |
| 6 | Lesson 6: Making Dollars and Cents | | | SS5.3.2 | |
| 7, 8, 9 | Lesson 7: Seeking New Management | | 4-ESS2-2, 3-5-ETS1-1 (DCI,SEP), 3-5-ETS1-2 (DCI,SEP) | | |



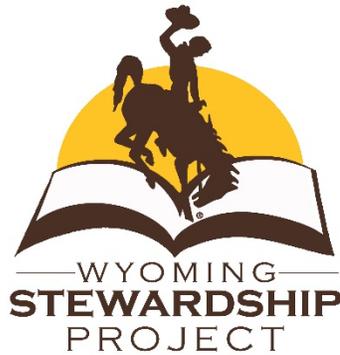
4th Grade Agriculture Standards

| Day | Lesson Title | ELA | | Math | |
|------------|------------------------------------|-------------------|--|-------------------|---------------------------|
| | | Explicitly Taught | Practiced/ Encountered | Explicitly Taught | Practiced/ Encountered |
| 1 | Lesson 1: The Roots of Agriculture | | 4.RI.1, 4.RI.4, 4.SL.2, 4.SL.4 | | |
| 2 | Lesson 2: Hills and Valleys | | 4.RI.1, 4.RI.7, 4.W.7, 4.SL.2, 4.SL.4 | | |
| 3 | Lesson 3: Made for Success | | 4.RI.1, 4.RI.2, 4.SL.1, 4.SL.2 | | |
| 4 | Lesson 4: Crop Talk | | 4.RI.1, 4.RI.7, 4.SL.1, 4.SL.2, 4.SL.4 | | |
| 5 | Lesson 5: A New Way of Thinking | | 4.RI.7, 4.SL.1, 4.SL.2, | | |
| 6 | Lesson 6: Making Dollars and Cents | | 4.RI.1, 4.RI.7, 4.SL.1, 4.SL.2, 4.SL.4 | | 4.NBT.4 |
| 7, 8, 9 | Lesson 7: Seeking New Management | | 4.SL.1, 4.SL.2, 4.SL.4 | | 4.NBT.4 |



4th Grade Agriculture Standards

| Day | Lesson Title | CVE | | Health | |
|------------|------------------------------------|-------------------|--|-------------------|---------------------------|
| | | Explicitly Taught | Practiced/ Encountered | Explicitly Taught | Practiced/ Encountered |
| 1 | Lesson 1: The Roots of Agriculture | | CV5.2.2, CV5.2.3 | | |
| 2 | Lesson 2: Hills and Valleys | | | | |
| 3 | Lesson 3: Made for Success | | CV5.1.4, CV5.2.3 CV5.4.1 | | |
| 4 | Lesson 4: Crop Talk | | CV5.1.4, CV5.2.1, CV5.2.2, CV5.2.3 | | |
| 5 | Lesson 5: A New Way of Thinking | | CV5.1.4 | | |
| 6 | Lesson 6: Making Dollars and Cents | | CV5.2.2 | | |
| 7, 8, 9 | Lesson 7: Seeking New Management | | CV5.1.4, CV5.2.1, CV5.2.2, CV5.2.3 CV5.3.2, CV5.3.3, CV5.4.1 | | |



Dear Educator,

I am honored to introduce you to the Wyoming Stewardship Project. I want you to know, this unit was written with you and your students in mind. Developing this project has been a thoughtful process and multi-year commitment to offer lessons for classrooms across the state.

Wyoming educators, in collaboration with field experts and the Wyoming Department of Education, wrote, piloted, and revised the unit you are about to teach in your classroom. We are tremendously grateful for their efforts. These units are not intended to be a burden but were created purposefully to be easy-to-use, cross-curricular, and comprehensive. Units build on each other throughout the grades. However they can be used independently without loss of integrity.

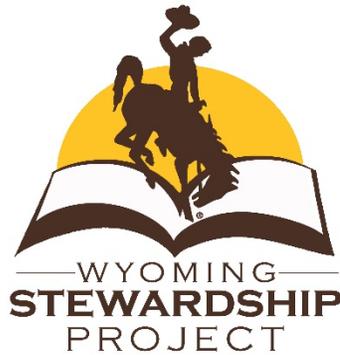
Found in the Educator Essentials document is everything needed to be prepared to teach this unit. We outline the Higher Order Thinking Skills and how to identify them throughout the units. We have compiled a material list of everything you need to complete all lessons; worksheets, PowerPoints, and video links are included in individual lessons. Additionally, a '101' sheet has been included to give you background information for the highlighted industry in Wyoming.

Our hope for the Wyoming Stewardship Project is to empower students to be our critical thinkers and problem solvers of tomorrow. We believe the stewardship definition captures the overall intent: As Wyoming citizens, we are stewards entrusted with the responsible development, care, and use of our resources to benefit current and future generations.

Thank you again for your effort in the classroom, presenting these lessons to your students, and helping advance this pivotal project for our state. Please don't hesitate to contact us with questions!

Jessie Dafoe

Executive Director
Wyoming Agriculture in the Classroom



Teacher Preparation and Required Materials

Higher Order Thinking Skills:

The critical work of Higher Order Thinking Skills (HOTS) involves breaking down complex material into parts, detecting relationships, combining new and familiar information creatively within limits set by the context, and combining and using all previous levels in evaluating or making judgments. Within each lesson you'll find reference to the Higher Order Thinking Skills that are part of the work students will be doing using language from Bloom's Taxonomy: Analysis, Synthesis, Application, and Evaluation.

- Analysis skills are used in areas with this symbol: 
- Synthesis skills are used in areas with this symbol: 
- Application skills are used in areas with this symbol: 
- Evaluation skills are used in areas with this symbol: 

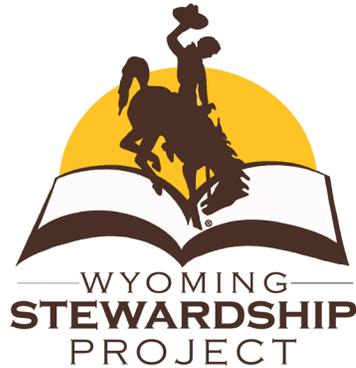
The following ideas and content will be important to know for this unit:

- Understanding of topography
- Understanding of irrigation
- Influence of water on animals and crops; drought
- Accurate information about harvesting animals
- Importance of harvesting and movement of animals
- Risks of raising different animals on farms/ranches (see Lesson 5)
- Information about market price fluctuation

- Formations of ranches and farms
- Factors in livestock/crops on acreage
- Understanding of cost/benefit

The following materials will be needed for this unit:

- Sticky notes
- Chart paper
- Poster board or construction paper for posters (optional)
- Media device to play music
- Timer (optional)
- Butcher paper (one large piece for each group)
- Wyoming Student Atlas
(<http://uwmaps.wygisc.org/studentAtlas/index.html?page=1>)



AGRICULTURE 101

Wyoming Agriculture Statistics at a glance:

- The value added to Wyoming's economy by the agricultural sector totaled \$1.72 billion in 2016.
- Of that total, animals and animal products accounted for \$1.084 billion, crops totaled \$338 million, and farm-related income totaled \$300 million.
- In 2016, 11,600 farms and ranches used 30.3 million acres to raise agricultural products in Wyoming.
- Farmer and rancher cash receipts totaled \$1.39 billion.
- Cattle and calves ranked as the largest livestock commodity raised in the state, followed by miscellaneous livestock (mostly horses and sheep), and hogs.
- Hay was the largest crop raised based on cash receipts, followed by sugarbeets, and barley.

*Provided by the National Agricultural Statistics Service, Wyoming Annual Bulletin, 2017

Wyoming Agriculture Overview:

Wyoming farms and ranches provide food, fiber, and open space. Farmers and ranchers make daily stewardship decisions for water, soil, rangeland, and the agricultural commodities they raise/grow. Agriculturists support communities throughout Wyoming, and the culture of hard work and neighboring help is noteworthy. Wyoming agriculture is not an easy business but a necessary way of life that farmers and ranchers pursue to provide for the nation's people, open space, and wildlife.

The story of agriculture in Wyoming started in 1830, when the first five cattle were brought to the state. Even then, it took almost another 40 years of cattle moving through Wyoming before large herds were brought to stay. The arrival of the railroad in 1867 started off the cattle boom in Wyoming. Free grass, a country hungry for beef, and railroad access for shipping provided the chance for businessmen to make money raising cattle. Raising sheep was also big business, and the sheep industry grew along with the cattle ranches. In fact, by the early 1900s, there were more sheep in Wyoming than cattle!

About that same time, homesteading acts began allowing settlers to claim pieces of land across the West. As the settlers arrived, the large areas of free grazing land used by the cattle and sheep men were broken into smaller pieces. This led to conflict between the different groups over the best uses for the land and resources. This time in history is now known as “The Range Wars” and includes events and people such as the Johnson County War, Tom Horn, and “Cattle Kate.” The Taylor Grazing Act of 1934 changed the way grazing was managed on public lands and ended “The Range Wars.”

Many of the early settlers tried raising crops, as well as livestock. Farming in Wyoming was a unique challenge for the settlers because of harsh weather conditions in our state. The rain water received each year is not enough to support most crops, and unless the settler was lucky enough to claim land near a stream or river, it was not possible to irrigate. Challenges in keeping crops watered led to building irrigation districts and water storage systems in several areas of the state. In areas without access to irrigation, dryland farming allowed farms to thrive.

By the 1920s, new farming equipment and technology encouraged the growth of larger farms and ranches and led to fewer small farms and ranches. Many are still family owned and operated today. As technology and culture have changed over the years, many people have moved into urban areas. In comparison, there are fewer farms and ranches remaining, but agriculture is still alive and well in Wyoming.

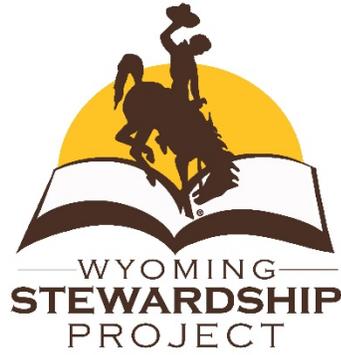
Today, dryland farming and irrigation have allowed Wyoming farmers and ranchers to raise crops that can thrive in our environment. Wyoming farmers raise hay, oats, barley, corn, beans, sugarbeets, and other crops. More than one million head of cattle, and over 350,000 sheep graze Wyoming’s grasslands, outnumbering the people here.

Wyoming is still one of the few states in the country with agriculture at its core, and our farmers and ranchers carefully steward the water, soil, and rangeland to make sure they are available for future generations.

Stewardship

As Wyoming citizens, we are entrusted with the responsible development, care, and use of our resources to benefit current and future generations.





Lesson One: The Roots of Agriculture

Grade Level: 4th Grade

Time: 30 - 45 minutes

Essential Question: How can we be stewards of Wyoming's agriculture to benefit current and future generations?

Objectives: Students will:

- Learn the definition of stewardship.
- Understand the history of agriculture in Wyoming and how it (positively or negatively) impacts the state today.

Purpose: Students learn about stewardship through the history of agriculture in Wyoming.

Required Materials/Resources:

- The "Roots of Agriculture" text (one per student) - (Sources: 1- 10)
- Stewardship poster
- Sticky notes (two per student)
- Chart paper

Suggested Teacher Preparation:

- Read "The Roots of Agriculture" text
- Display the Stewardship poster
- Prepare the T-chart (see example included at end of lesson)

Standards:

Social Studies: SS5.5.3 (Explicit)

ELA: 4.RI.1, 4.RI.4, 4.SL.2, 4.SL.4 (Practiced/Encountered)

CVE: CV5.2.2, CV5.2.3 (Practiced/Encountered)

Vocabulary:

- **Acre** - a unit of land area (about the size of a football field); a unit of measure to describe areas of land 66' x 660' or 1/640 mi²
- **Agriculture** - cultivating of the soil, producing of crops, and raising of livestock
- **Census** - the official process of counting the number of people in a country, city, or town, and collecting information about them
- **Commercial** - buying and selling of goods and services
- **Commodities** - something of use, advantage, or value
- **Export** - to send a product to be sold
- **Farmer** - a person who cultivates land for crops and may also raise livestock
- **Harvest** - (1) gather a crop; (2) process an animal for consumption
- **Inhabitant** - a person or animal that lives in a particular place
- **Modernization** - to make something modern and more suited to present styles or needs
- **Process (animals)** - to turn a live animal into products that can be easily used by humans
- **Processing plant** - a facility where live animals are turned into food products that can be easily used by the consumer
- **Rancher** - a person who raises livestock and may also cultivate the land for crops
- **Rangeland** - land used for livestock and/or wildlife grazing
- **Rural** - living outside of a city
- **Stewardship** - As Wyoming citizens, we are stewards entrusted with the responsible development, care, and use of our resources to benefit current and future generations.
- **Surpassed** - to be better or greater than someone or something

- **Sutler** - a person who followed an army or maintained a store on an army post to sell to soldiers
- **Urban** - living in a city

Instructional Procedure/Steps:

1. Display the definition of stewardship and review/discuss what it means as a class.
2. Have students read “The Roots of Agriculture” text by choosing a strategy that works best for your students. Review the “Terms to Know” before reading if necessary.

3.  Have students mark their texts for the following facts:

- UNDERLINE a fact that you thought was interesting
-  a fact that you would like to know more about
- Label with a ‘?’ a fact that you have a question about
- Label with a ‘+’ a fact about something that was positive in our history
- Label with a ‘-’ a fact about something that was a challenge in our history

4. After students finish marking their texts, have them discuss in small groups the facts they marked and why.

5.  Give each student two sticky notes. One is to record a fact about something positive in our history; the other is to record a fact about a challenge in our history. When finished, have students place their sticky notes on the T-chart’s corresponding column.



In this task, students will be engaged in the higher order thinking skill of analysis.

TEACHER NOTE: Some scaffolding may be required to support students in this task. Some suggested scaffolding may include: multiple readings, breaking up the tasks into smaller chunks, or even assigning individuals one task as they read together.



In this task, students will be engaged in the higher order thinking skill of synthesis.

6. At the end of the lesson, have each small group share the facts they posted and one or two interesting ideas that came out of their discussion and how they tie to stewardship. Have students explain their rationale for why it is a positive or negative fact. Since opinions about whether a fact is positive or negative may vary, students should be allowed to defend their thinking. *The teacher should bring forth information highlighting some positive facts, such as: cattle were initially brought to Wyoming, and now they make up one of the state's biggest industries; the Homestead Act brought many people to Wyoming who farmed and ranched; and many of the descendants of those people continue to farm and ranch today. In addition, the teacher should also highlight negative facts that impact us today such as the fact that cattlemen, sheepmen, settlers, and Native Americans were in great conflict over land use.*

Assessment: Examine responses on the T-Chart to ensure that students have an understanding of the history of agriculture as taken from the reading.

Credits/Sources:

1. Wyoming Stock Growers Association. Mantha Phillips. Region III Vice President.
2. Savages and Scoundrels. (2012). *1830 - Fur Trade nearing peak*. Retrieved August 4, 2017, from <http://savagesandsoundrels.org/events-landmarks/1830-fur-trade-nearing-peak/>
3. Zimmer, Vickie. WyoHistory.org. (n.d.) *Goshen County, Wyoming*. Retrieved August 4, 2017, from <http://www.wyohistory.org/encyclopedia/goshen-county-wyoming>
4. National Archives. (2016, October 3). *The Homestead Act of 1862*. Retrieved August 4, 2017, from <https://www.archives.gov/education/lessons/homestead-act>
5. Wyoming State Historic Preservation Office, State Parks and Cultural Resources. (2010). *Timeline of Ranching*,

Homesteading, and Farming in Wyoming, 1860-1960.

Retrieved August 4, 2017, from

<http://wyoshpo.state.wy.us/homestead/timeline.html>

6. United States Department of Agriculture, National Agriculture Statistics Service. (2016). *Wyoming Annual Bulletin, 2016*. Retrieved September 18, 2018 from https://www.nass.usda.gov/Statistics_by_State/Wyoming/Publications/Annual_Statistical_Bulletin/WY_2016_Bulletin.pdf
7. Harper, Douglas. Online Etymology Dictionary. (2001-2018). *Agriculture*. Retrieved August 5, 2018, from <https://www.etymonline.com/word/agriculture>
8. FarmCentric. (2018, June 28). *Cattle Inventory vs Human Population by State*. Retrieved August 2, 2018, from <http://beef2live.com/story-cattle-inventory-vs-human-population-state-0-114255>
9. FarmCentric. (2018, July 12). *Top 10 States with the Most Sheep & Lambs*. Retrieved August 2, 2018, from <http://beef2live.com/story-top-10-states-sheep-lambs-0-117992>
10. NSTATE, LLC. (2017, December 19). *Wyoming Economy*. Retrieved August 2, 2018, from http://www.netstate.com/economy/wy_economy.htm

T-Chart Sample

| + | - |
|---|---|
| | |

The Roots of Agriculture

Name: _____

Directions:

Underline a fact you thought was interesting

Circle a fact you would like to know more about

Label with a **?** a fact that you have a question about

Label with a **+** a fact about something positive in our history

Label with a **-** a fact about a challenge in our history

Agriculture means working with the soil, producing crops, and raising livestock. The word agriculture is the English adaptation of the Latin word agricultura, from ager, a “field,” and cultura, “cultivation,” meaning “tillage of the soil.”

The earliest known cattle to set foot in Wyoming came in 1830 with a party of mountain men led by William Sublette. They drove several beef cattle and a milk cow to the fur trader’s rendezvous on the Wind River in what is now Fremont County. In 1842, John Fremont, an explorer, noted the countryside around Ft. Laramie was well suited to grazing. Seth Ward, a **sutler**, at Ft. Laramie, provided a much needed supply of fresh oxen that pioneers could trade out for their weary livestock.

In the early 1860s, the western half of the United States was open territory, which was sparsely populated. Most of these **inhabitants** were Native Americans from the many different tribes that lived in Wyoming. In an effort to encourage more settlement in the west, President Lincoln signed The Pacific Railroad Act and The Homestead Act in 1862. These laws led to the distribution of over 80 million acres of the country’s public ground by 1900. Many of the successful homesteaders became farmers and ranchers.

The development of the railroad provided opportunities for farmers and ranchers to **export** their cattle. The railroad was also used to export coal and timber. The increased sale of cattle brought enormous wealth, as well as conflict to Wyoming. Cattlemen, sheepmen, settlers, and Native Americans endured much conflict over land use.

In 1890, when Wyoming became the 44th state, the **census** showed 3,125 farms and ranches in Wyoming. That was an increase of 2,668 in 10 years. In the early 1900s, the sheep industry **surpassed** the cattle industry. By 1910, there were 11,000 farms and ranches in Wyoming. Small family farms and ranches began to decline just before 1920 when **modernization** of farm equipment encouraged larger **commercial** operations. By the 1950s, there were fewer and fewer farms and ranches. The farms and ranches that did survive became larger. Many are still family owned and operated today.

In the late 1900s, several events occurred that affected farming and ranching in Wyoming. As technology continued to advance, production increased and the need for manual labor decreased. There was a massive movement from **rural** to **urban** areas, which caused some cultural changes.



© 2017 Wyoming Agriculture in the Classroom Materials

The Roots of Agriculture

For example, instead of going out to milk the family cow or gather eggs from the chickens each morning, people used grocery stores to supply everyday needs.

Wyoming is still one of the few states in the country with agriculture at its core. Approximately 90% of land in Wyoming is described as rural. About a third of the population lives in rural communities, and their primary source of income is from farming and ranching. Wyoming has over 30 million acres of agricultural land consisting of 11,000 farms and ranches. The average farm and ranch size is 2,621 **acres**. The population of livestock far exceeds the amount of people in the state. Recent estimates suggest over one million cattle and more than 350,000 sheep. The production of beef cattle is

the biggest part of Wyoming's agriculture industry. Other important **commodities** include hay, barley, wheat, corn, and sheep. Farmers also grow sugarbeets and raise hogs, horses, and honeybees. It's one of the top three main industries along with minerals and tourism.

The primary natural resources in Wyoming agriculture are water, soil, and rangeland. Farmers and ranchers carefully steward these renewable resources to ensure they are available for future generations.

Terms to Know:

Acre - a unit of land area (about the size of a football field)

Agriculture - cultivating of the soil, producing of crops, and raising of livestock

Census - the official process of counting the number of people in a country, city, or town, and collecting information about them

Commercial - buying and selling of goods and services

Commodities - something of use, advantage, or value

Export - to send a product to be sold

Inhabitant - a person or animal that lives in a particular place

Modernization - to make something modern and more suited to present styles or needs

Rangeland - land used for livestock and/or wildlife grazing

Rural - living outside of a city

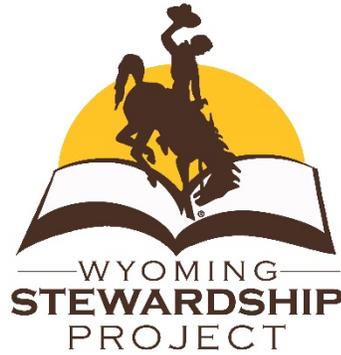
Stewardship - As Wyoming citizens, we are stewards entrusted with the responsible development, care, and use of our resources to benefit current and future generations.

Surpassed - to be better or greater than someone or something

Sutler - a person who followed an army or maintained a store on an army post to sell to soldiers

Urban - living in a city





Lesson Two: Hills and Valleys

Grade Level: 4th Grade

Time: 45 - 60 minutes

Essential Question: How can we be stewards of Wyoming's agriculture to benefit current and future generations?

Objectives: Students will:

- Understand which crops and livestock are produced in our state.
- Apply information of topography, irrigation, and precipitation to draw conclusions about crops or livestock.

Purpose: Students make the connection between the geography/climate and success of agriculture in Wyoming.

Required Materials/Resources:

- Video: <https://www.youtube.com/watch?v=K-UXrpAjyI0>
What is Topography (Source 4) Video length 1 minute 52 seconds
- Wyoming Student Atlas (project the different pages below and have at least one student book per group/pair for step 13) - (Source 1)
<http://uwmaps.wygisc.org/studentAtlas/index.html?page=1>
 - Physiographic Features (page 11)
 - Precipitation (page 16)
 - Livestock map (page 37)

TEACHER NOTE: If you need additional information, support, or conversation starters, use the captioned information accompanying each map. If using the Electronic Version, the "Go Interactive" button is available for even more information, pictures, and videos to support these maps.

- Major Crops map (page 38)
- Irrigation map (one per student) - (Source 2)
http://wwdc.state.wy.us/surveys/PWS_IS_Large.html
- 2015 Wyoming Cropland Map - (digital copy to display) - (Source 3, page 51)
https://www.nass.usda.gov/Statistics_by_State/Wyoming/Publications/Annual_Statistical_Bulletin/WY_2016_Bulletin.pdf
- 3-2-1 exit ticket (one per student)

Suggested Teacher Preparation:

- Become familiar with the Kagan strategy Whip Around. Watch video for the Whip Around strategy if you are not familiar with it.
<http://www.theteachertoolkit.com/index.php/tool/whip-around> (Source 5)
- Become familiar with the Kagan strategy Inside/Outside Circle and make a space large enough in your room to enact it with your students. Watch video for the “Inside/Outside” strategy if you are not familiar with it.
<http://www.theteachertoolkit.com/index.php/tool/inside-outside-circles> (Source 6)
- Practice flipping through the electronic version of the Wyoming Student Atlas if you did not make copies for your students.
- Preview *What is Topography?* video and have it ready for students to view during lesson.
- Review all maps used in the lesson.
- Save all the maps at the end of the lesson, as students will need them again in Lesson 6.

Standards:

Science: 4-ESS2-2 (Explicit)

ELA: 4.RI.1, 4.RI.7, 4.W.7, 4.SL.2, 4.SL.4 (Practiced/Encountered)

TEACHER NOTE:
Whip Around strategy: Pose a question to the whole class. Allow think time for students to formulate an answer. Then, students quickly share an idea with either their small group or whole class. Students must respond quickly and with a new idea though ideas can be reworded. After every student has responded, share common ideas from the Whip Around as a class.

Vocabulary:

- **Crop** - a cultivated plant that is grown for food, fiber, or livestock feed
- **Irrigation** - the process of delivering water to crops
- **Livestock** - animals kept for use and profit
- **Precipitation** - the amount of water an area receives through weather, example: rain and snow
- **Topography** - the features such as mountains and rivers in an area of land

Instructional Procedure/Steps:

1. Pass out or display the Wyoming's Physiographic Features map (page 11 of the Wyoming Student Atlas) for students to utilize when focusing on the topography. Allow time for students to explore the map.

2.  Ask: **“What do you think topography is?”** After students share their ideas, play the *“What is Topography?”* video.

3. Discuss the definition of topography. Say: **“Topography is the features such as mountains and rivers in an area of land.”** Using the map, help students build an understanding of the information about Wyoming's topography that can be gathered from it.

4. Say: **“The definition of a crop is a cultivated plant that is grown for food, fiber, or livestock feed. The definition of livestock is animals kept for use and profit.”** Using the Using the Whip Around Strategy, have students discuss this question:



“How could topography potentially affect what crops/ livestock are produced in Wyoming?” Some ideas for students to think about while they discuss are:

-  *If people grow crops there, what features make it possible?*



In this task, students will be engaged in the higher order thinking skill of analysis.



In this task, students will be engaged in the higher order thinking skill of synthesis.

-  *Why is it possible or not to have livestock/crops in the given topography?*
-  *Does the topography dictate what kind of livestock someone would choose to raise?*

5. Pass out or display the Wyoming's Precipitation map (page 16 of the Wyoming Student Atlas) for students to utilize when focusing on precipitation. Allow time for students to explore the map.
6. Discuss the definition of precipitation. Say: **"Precipitation is the amount of water an area receives through weather, like rain or snow."** Using the map, help students build an understanding of the information about Wyoming's precipitation that can be gathered from it.



In this task, students will be engaged in the higher order thinking skill of evaluation.

7.  Using the Whip Around strategy, have students discuss this question: **"How could precipitation potentially affect what crops and livestock are produced in Wyoming?"** Some ideas for students to think about while they discuss are:

-   *Why is it possible or not to have livestock/crops in the given area based on the precipitation?*
-  *Does the amount of precipitation dictate what kind of crop someone would choose to grow?*



In this task, students will be engaged in the higher order thinking skill of application.

8. Pass out or display the Wyoming's Irrigation map for students to utilize when focusing on precipitation. Allow time for students to explore the map.
9. Discuss the definition of irrigation. Say: **"Irrigation is the process of delivering water to crops."** Using the map,



In this task, students will be engaged in the higher order thinking skill of analysis.

help students build an understanding of the information about Wyoming's irrigation that can be gathered from it.

10.  Using the Whip Around strategy, have students discuss this question: **“How could irrigation potentially affect what crops and livestock are produced in Wyoming?”** Some ideas for students to think about while they discuss are:

-  *Why does irrigation allow for crops to be grown where they might not otherwise grow?*
-  *Are there areas in the state where irrigation might be needed for livestock?*

11. Pass out or display the Wyoming Livestock map (page 37 of the Wyoming Student Atlas) for students to utilize when focusing on livestock. Allow time for students to explore the map.

- Ask: **“Look at Carbon County and Park County. Compare the amount of livestock in each. What do you notice?”** *Carbon County has a high number of livestock. Park County has fewer livestock.*

12. Pass out or display the Major Crops and USDA Wyoming Cropland maps (page 38 of the Wyoming Student Atlas) for students to utilize when focusing on Wyoming's major crops. Allow time for students to explore the maps.

- Starting with the Major Crops map, ask: **“Again, look at Carbon County and Park County. Compare the amount of crops grown in each. What do you notice?”** *Park County grows a high number of crops. Carbon County has no crops. Park County has a dot for all 6 crops, and most of them are large dots.*



In this task, students will be engaged in the higher order thinking skill of evaluation.



In this task, students will be engaged in the higher order thinking skill of synthesis.



In this task, students will be engaged in the higher order thinking skill of analysis.

TEACHER NOTE:
Inside/Outside Circle Directions:
One-half of the participants stand and form a circle facing OUT. The other half of the participants form a circle around (outside) the first group, facing IN. Now each participant is facing a person from the 'other' circle. Next, the teacher instructs one circle to rotate. For example, the teacher may say, **"Outside circle move two persons to your right."** The newly formed partners then respond to a question/ statement. Rotate a couple of times so students may have the opportunity to discuss with different students.



- Ask: **"What does this tell us about Park County?"** *Many crops are grown there. Park County is one of the top five producers of each crop.*
- Next, draw their attention to the Cropland map. Ask: **"Looking at Park County on this map, what do you notice?"** *Students should be able to see that it's only a small portion of the county that has colors indicating agricultural crops.*



- Revisit the irrigation map and compare it to the Cropland map. Ask: **"Using your topography map and irrigation maps, can anyone propose an explanation why there are only crops in the northeast portion of Park County?"** *The mountains and lack of irrigation in the western half of the county make it ill-suited for cropland. Students should note that the part of the county where crops are grown is flatter and has access to irrigation water. Point out that this is the case with other counties, as well. Fremont County is another good example. It's the largest county in the state, but looking at the topography and irrigation information, it's clear why only a portion of the county is shaded for crop production.*

13. Say: **"In preparation for the next activity, think about the discussions we have had about topography, precipitation, and irrigation and how they affect Wyoming's crops and livestock."** Allow students think time.



14. Use the Inside/Outside Circle strategy for the following activity. Set up the inside/outside circles. Students on the inside circle are responsible for discussing crops; students on the outside circle are

responsible for discussing livestock. Once the circles are ready, have students discuss this question: **“What have you learned today that helps you understand the effects topography, precipitation, and irrigation have on our state’s livestock and crop production?”** Have students rotate and discuss two to three times.

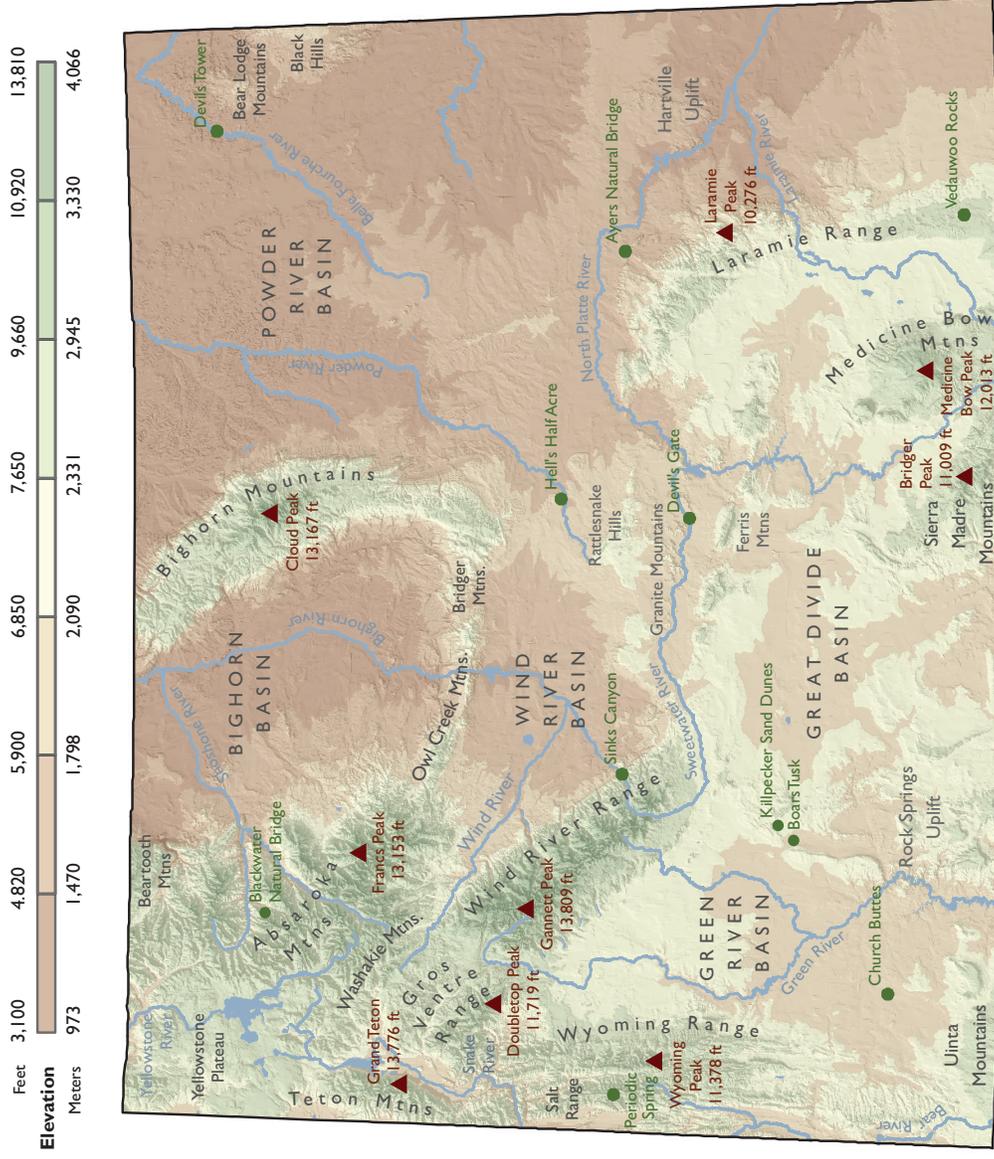
15. Reconvene the whole class and have a group discussion about the information gathered from all the maps studied during the lesson. *Students should connect that certain crops are grown in certain areas due to irrigation, low land, and location near natural water sources. It’s important to note that for the majority of crops, irrigation is a much more important factor than precipitation. They should also connect that ranchers are able to produce livestock in a wider variety of topographic locations. Ranchers are not as limited by terrain or the need for as much water.*

Assessment: Pass out the 3-2-1 exit slips. Students are instructed to record the following: **THREE factors that impact where crops are grown; TWO facts about what livestock are most common; and ONE summary sentence about how the topography of our state effects where livestock and crops are raised.** Collect the slips when all students are finished. Use the information to differentiate instruction or clear up any misconceptions that students may have. Collect all the maps at the end of the lesson since students will need them again in Lesson 6.

Credits/Sources:

1. Hammerlink, J.D., Webster, G.R., & Berendsen, M.E. (2014). *Wyoming Student Atlas: Exploring our Geography*. Laramie:Wyoming: University of Wyoming.
<http://uwmaps.wygisc.org/studentAtlas/index.html?page=1>
2. Water Resources Data System. (2017, April). *Wyoming public water and irrigation systems*. Retrieved August 4, 2017 from
http://wwdc.state.wy.us/surveys/PWS_IS_Large.html
3. United States Department of Agriculture National Agricultural Statistics Service. (2016). *2015 Wyoming Cropland Data layer (page 51)*. Retrieved August 4, 2017 from
https://www.nass.usda.gov/Statistics_by_State/Wyoming/Publications/Annual_Statistical_Bulletin/WY_2016_Bulletin.pdf
4. MonkeySee.(2013, March 27). *What is Topography?* Retrieved August 5, 2018, from
<https://www.youtube.com/watch?v=K-UXrpAjyI0>
5. theteachertoolkit. (n.d.). *Whip Around*. Retrieved August 5, 2018, from
<http://www.theteachertoolkit.com/index.php/tool/whip-around>
6. theteachertoolkit. (n.d.). *Inside/Outside Circles*. Retrieved August 5, 2018, from
<http://www.theteachertoolkit.com/index.php/tool/inside-outside-circles>

Physiographic features



The eastern part of Wyoming is dominated by high plains. The middle and western parts of the state have several distinct ranges of the Rocky Mountains, divided by large basins. Even the basins have relatively high elevations, averaging 6,200 feet (1,890 meters). Wyoming's basins include many remarkable natural features such as the Killpecker Sand Dunes, one of the largest active dune systems in North America.

- ▲ Highest peak in each mountain range
- Other natural landmarks

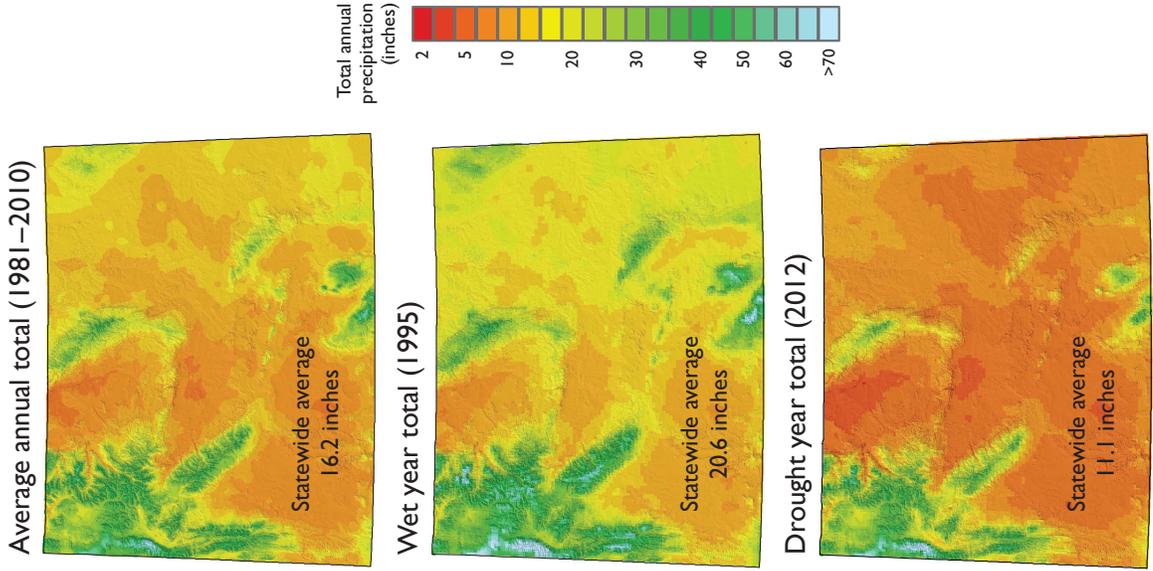
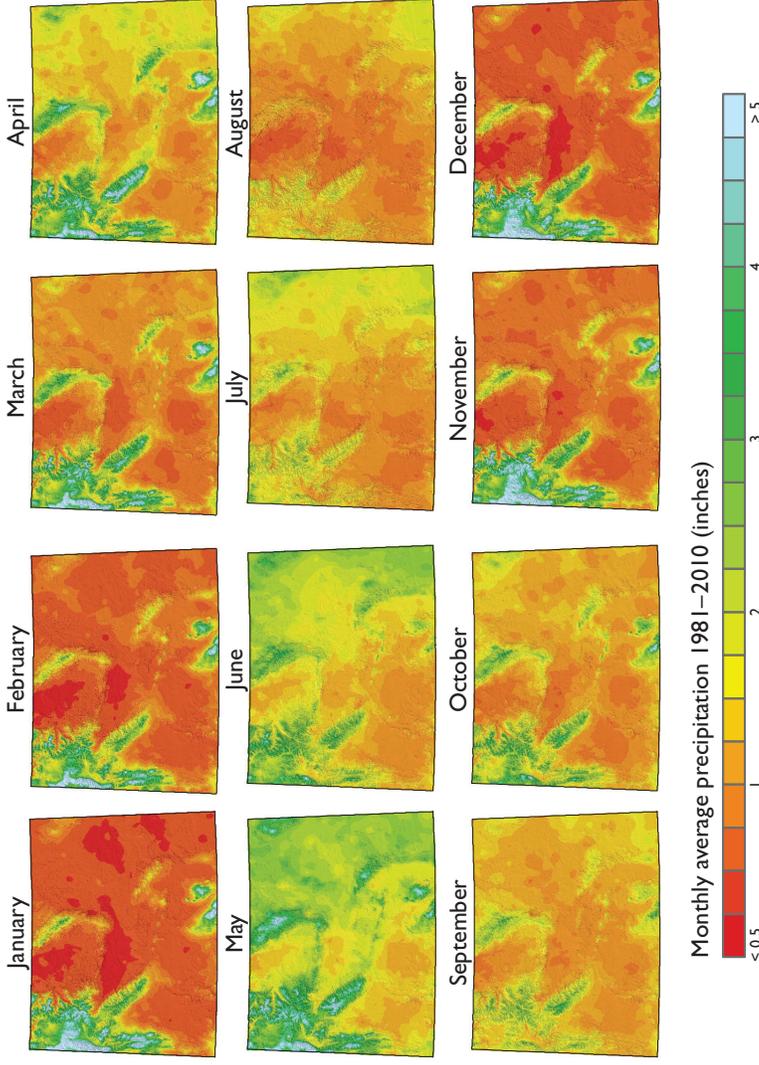
The highest point in Wyoming is Gannett Peak at 13,809 feet (4,209 meters), in the Wind River Range. There are more than 40 other named peaks taller than 13,000 feet in the Wind River Range, including many near Titcomb Basin, pictured below.



The lowest point in the state is where the Belle Fourche River flows out of Wyoming into South Dakota, at 3,099 feet (945 meters).



*reprinted from the Wyoming Student Atlas



Wyoming's mountains: Islands of moisture

When air masses encounter barriers like mountain ranges the air is forced up and over them in a process known as orographic lift. As air rises it cools and cannot hold as much water, so precipitation falls. This explains why Wyoming's lowlands are dominated by shrubs and grasses, but its mountain environment supports trees such as conifers and aspens.



Annual precipitation

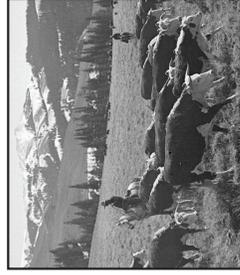
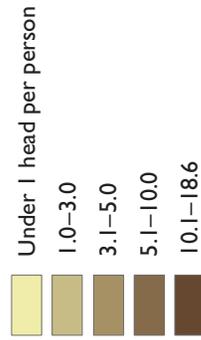
The threshold for growing most non-irrigated crops is 20 inches of precipitation per year. Most western states, including Wyoming, fall well below this average even during wet years. Droughts in Wyoming occur with some regularity. In 2012, Wyoming experienced its driest year on record with an increase in wildfires and economic hardship for the state's ranchers and hay producers.

*reprinted from the Wyoming Student Atlas

Number of cattle (2012)

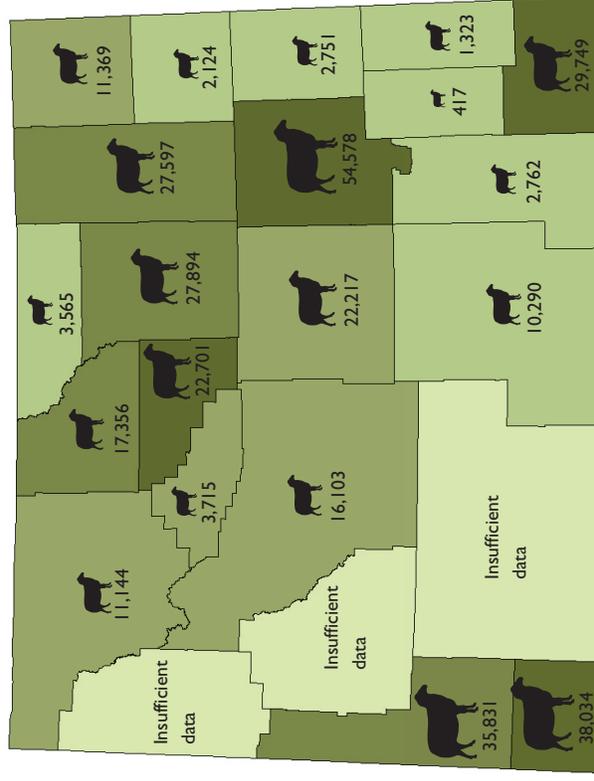


Cattle-to-human ratio

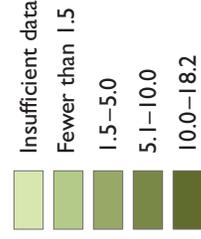


Much of Wyoming's agricultural land is too dry and cold for crop production but can support grazing animals. The expansion of the railroad to western states in the 1860s allowed cattle to be produced in Wyoming and shipped back east. Today the total cattle population in Wyoming is over 1.3 million, outnumbering people by more than two to one.

Number of sheep (2012)



Sheep per square mile

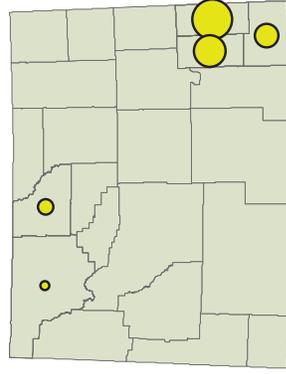


Though Wyoming's sheep totaled only 350,000 in 2012, the state has a long history of wool and meat production. During the mid-to-late 1800s, several ranchers purchased cheap land and struck it rich by raising sheep. As late as World War II, the state was home to four million sheep. Historically, sheep herders lived in horse-drawn wagons like the one pictured.

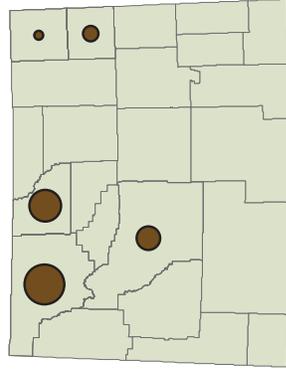
*reprinted from the Wyoming Student Atlas

Crop production (2012)

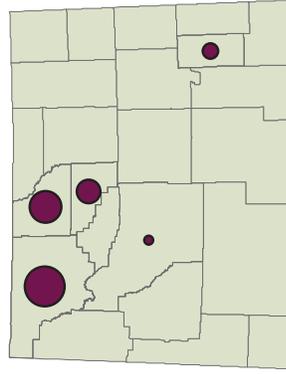
Top five producing counties for each major Wyoming crop



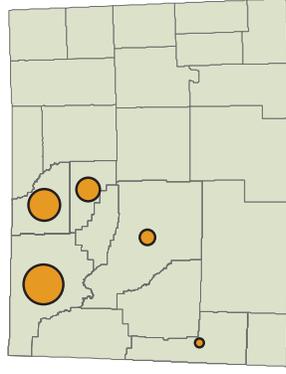
| County | (bushels) |
|----------|-----------|
| Goshen | 4,185,288 |
| Platte | 1,149,935 |
| Laramie | 1,097,886 |
| Big Horn | 761,569 |
| Park | 587,736 |



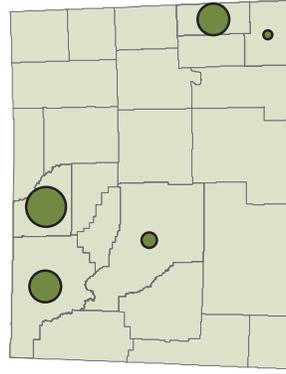
| County | (bushels) |
|----------|-----------|
| Park | 74,638 |
| Big Horn | 61,587 |
| Fremont | 36,692 |
| Weston | 22,700 |
| Crook | 21,889 |



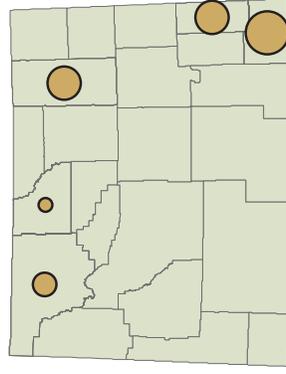
| County | (tons) |
|----------|---------|
| Park | 364,368 |
| Big Horn | 206,850 |
| Washakie | 164,297 |
| Platte | 55,763 |
| Fremont | 33,672 |



| County | (bushels) |
|----------|-----------|
| Park | 1,892,657 |
| Big Horn | 1,194,746 |
| Washakie | 1,170,672 |
| Fremont | 413,290 |
| Lincoln | 373,967 |



| County | (tons) |
|----------|--------|
| Big Horn | 12,252 |
| Park | 10,257 |
| Goshen | 8,872 |
| Fremont | 7,173 |
| Laramie | 6,623 |



| County | (bushels) |
|----------|-----------|
| Laramie | 2,223,584 |
| Goshen | 607,785 |
| Campbell | 184,676 |
| Park | 152,209 |
| Big Horn | 136,500 |



Twenty-seven percent of the state's crops are grown in the Bighorn Basin, which includes sections of Big Horn, Washakie and Park counties. This area is relatively low in elevation and receives fewer days of frost, resulting in a longer growing season. It is also heavily irrigated with water from Buffalo Bill Reservoir.

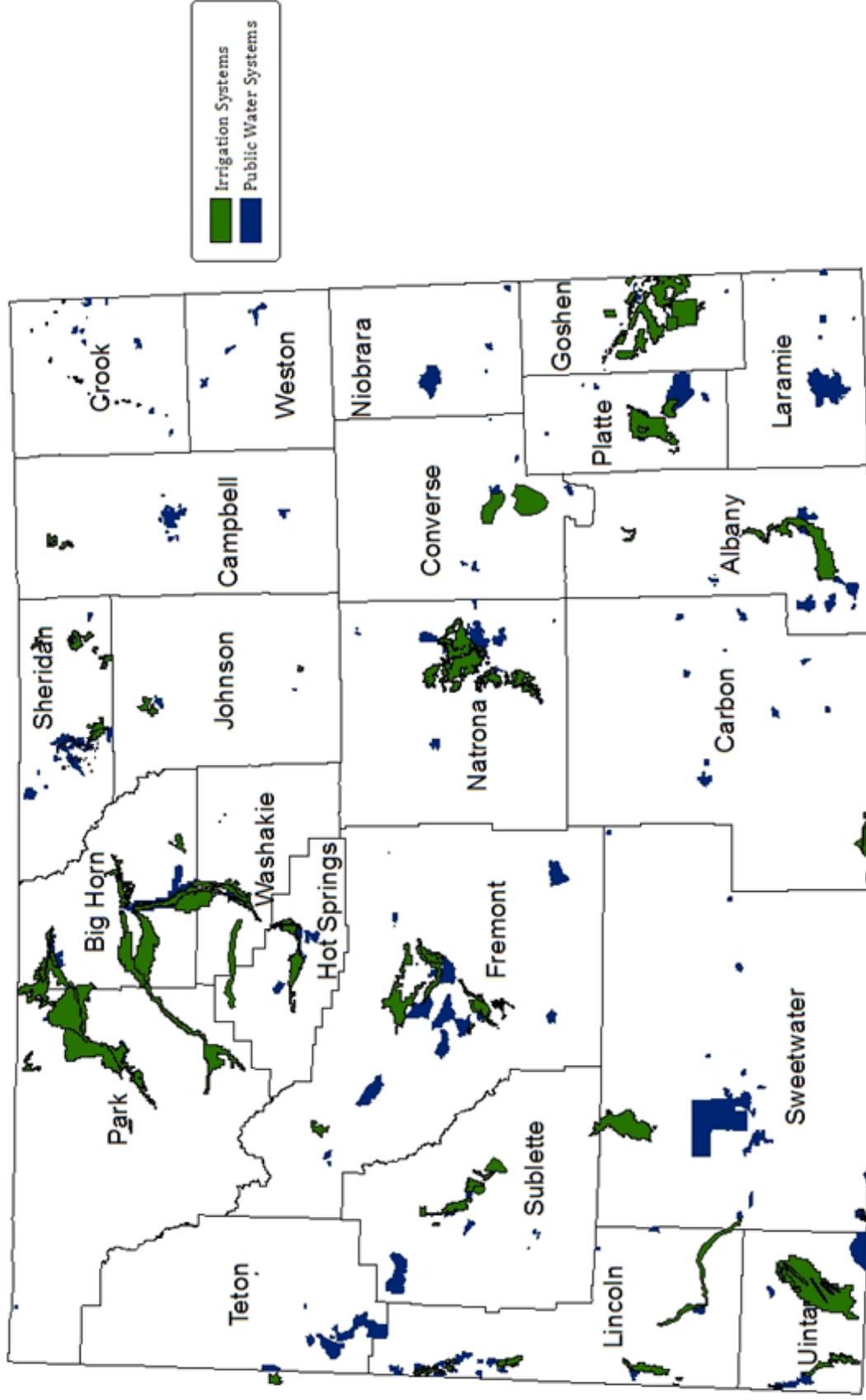


Though Wyoming produces a diverse variety of row crops, the most common "crops" are animal forages such as hay and alfalfa. These forages are suited to the dry, cool climate of Wyoming and are produced in every county of the state.

*reprinted from the Wyoming Student Atlas

Irrigation Map

Wyoming public water and irrigation systems



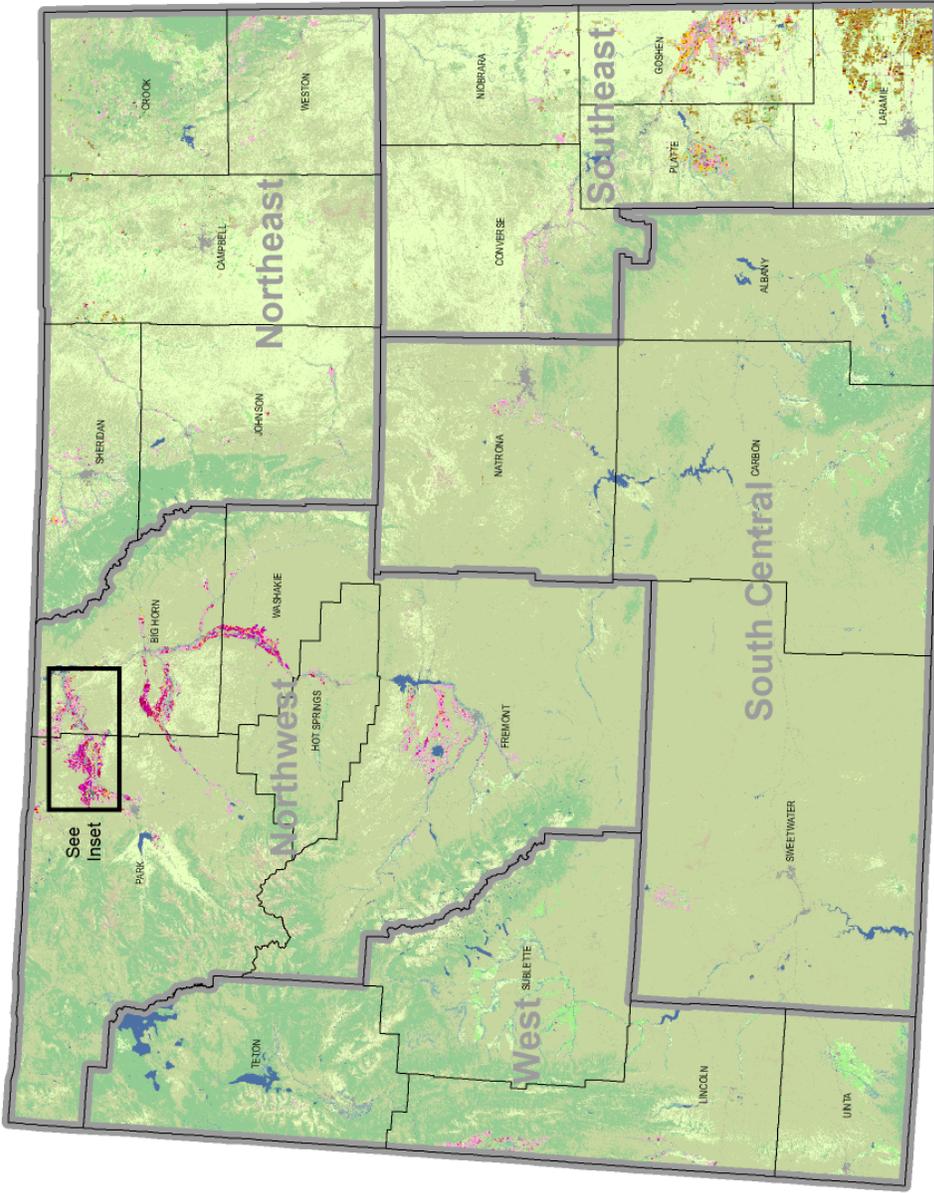
Produced by the Water Resources Data System (<http://www.wrds.uwyo.edu/>), April 2017

© 2017 Wyoming Agriculture in the Classroom Materials

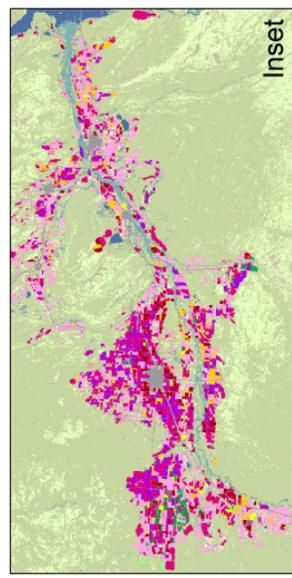




2015 Wyoming Cropland Data Layer



Produced by: U. S. Department of Agriculture, National Agricultural Statistics Service, Research and Development Division, Spatial Analysis Research Section
 Cropland Data Layer CropScape Website: <http://nassproddata.ams.usda.gov/CropScape/>
 Data Sources: Landsat 6OLI/TIRS, Dimos-1*, UK-DMC2* (Courtesy of USDA Foreign Agricultural Service)
 Image Processing: Rulequest See5 and ERDAS Imagine
 Ground Truth: The Farm Service Agency Common Land Unit for crops classes; 2011 National Land Cover Dataset (NLCD) for non-agricultural classes
 Ancillary Data: NLCD Impervious Surface, NLCD Forest Canopy, National Elevation Dataset, NASS Crop Mask
 Disclaimer: Small area crops may be less accurate, see CropScape metadata
 Cartographic Generalization: Smaller categories combined with larger categories.
 Projection: UTM zone 13, WGS84 datum.
 Map Production: ESRI/ArcGIS 10.3.



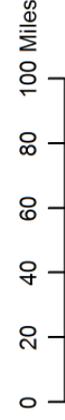
Land Cover Categories (by decreasing acreage)

AGRICULTURE

- Grassland/Pasture
- Other Hay/Non Alfalfa
- Alfalfa
- Fallow/Idle Cropland
- Winter Wheat
- Barley
- Corn
- Sugarbeets
- Dry Beans
- Other Crops
- Millet
- Oats
- Sunflower

NON-AGRICULTURE

- Shrubland
- Forest
- Wetlands
- Barren
- Developed
- Water
- Perennial Ice/Snow
- County Boundary
- ASB Boundary



*reprinted from Wyoming Agriculture Statistics 2016

3-2-1 Exit Ticket

List three factors that impact where crops are grown.

- 1.
- 2.
- 3.

List two facts about which livestock are the most common in Wyoming.

- 1.
- 2.

Write a one sentence summary about how the topography of Wyoming effects where livestock and crops are raised.



© 2017 Wyoming Agriculture in the Classroom Materials

3-2-1 Exit Ticket

List three factors that impact where crops are grown.

- 1.
- 2.
- 3.

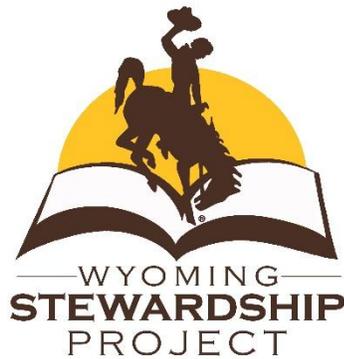
List two facts about which livestock are the most common in Wyoming.

- 1.
- 2.

Write a one sentence summary about how the topography of Wyoming effects where livestock and crops are raised.



© 2017 Wyoming Agriculture in the Classroom Materials



Lesson Three: Made for Success

Grade Level: 4th Grade

Time: 45-60 minutes

Essential Question: How can we be stewards of Wyoming's agriculture to benefit current and future generations?

Objectives: Students will:

- Read and discuss how ranchers can be good stewards.
- Create a graphic of various Wyoming animals and their structures and make a claim as to why the animals are suited to Wyoming.

Purpose: Students will understand how different animal characteristics support survival of various Wyoming livestock.

Required Materials/Resources:

- All About Livestock characteristic cards (one set of cards per group)
- Livestock Characteristics sheets (5 sheets -1 of each animal per group)
- "Make a Claim" sheet

TEACHER NOTE:
Teacher may want to laminate the information cards for use again.

Suggested Teacher Preparation:

- Copy animal graphic organizers for groups
- Prepare copies of information cards for groups.
- Copy "Make a Claim" page for students
- Familiarize yourself with the Whip Around strategy

Standards:

Science: 4-LS1-1 (Explicit)

ELA: 4.RI.1, 4.RI.2, 4.SL.1, 4.SL.2 (Practiced/Encountered)

CVE: CV5.1.4, CV5.2.3, CV5.4.1, (Practiced/Encountered)

Vocabulary:

- **Aerate** - process of introducing air into the soil to improve plant growth
- **Economy** - financial system of interaction and exchange
- **Livestock** - animals kept for use and profit
- **Oversight** - the action of overseeing or supervising something
- **Rancher** - a person who raises livestock and may also cultivate the land or crops
- **Ruminant** - animal's stomach with four components or chambers enabling it to digest plant material
- **Sustainable** - able to be maintained, able to last or continue for a long time
- **Ungulate** - hoofed mammal

Instructional Procedures/Steps:

Students will work in small groups to diagram characteristics of livestock raised in Wyoming.

TEACHER NOTE: All structures mentioned on the card should be labeled on the graphic organizer. Make sure students read before they write.

1. Begin the lesson by posing the question, **“What would be considered part of the structure of a house?”** (responses may include roof, walls, ceilings, stairs, a deck, siding, brick, etc.) Lead the discussion to distinguish between what structures would be found inside and outside of the house. **“Just like a house, animals have internal and external structures that are important to their survival. Today, we will be looking at animals raised in Wyoming. We will examine the structure of the animals that makes them well-suited for Wyoming. You will also learn about the products we use every day from each animal.”**

2.  Place students in groups of 4-5. Pass out cards and animal graphic organizers to each group. The cards are: *#1 Beef, #2 Dairy Cattle, #3 Goats, #4 Sheep, and #5 Hogs*. Make sure the animals on the cards and organizers match. **“You will have 2-3 minutes to read the information on the card carefully. After reading, you will either label one internal/external structure that is important to this animal for survival in Wyoming or a byproduct of the animal and its use. Your response needs to be different from what anyone else has written on the page. Each structure needs to be labeled by the end of the activity. At my signal, you will pass your card and organizer clockwise to the next person and then repeat the process for your new animal. We will continue until all students have read and responded to all animals.”**
3. Allow time for reading the card and writing on the organizer. Signal students when it is time to pass their materials clockwise. This activity should take approximately 20-25 minutes (4-5 minutes per card/organizer); adjust time as needed for your students.
4. After the activity is completed, have students discuss in their small groups the question, **“What important structures were labeled for each animal’s survival in Wyoming?”** Monitor group discussions to identify any missing structures or misconceptions.
5. Conduct a class Whip Around identifying all of the important structures for each animal. Each group needs to identify structures that have not already been identified to ensure all structures are named. Students may reword a response to make it unique. Be sure to discuss all animals individually that were covered in the lesson. **“Are any of these structures more important**



In this task, students will be engaged in the higher order thinking skill of synthesis by using this reading strategy. Students will read the facts on the card, determine the important structures, and label the structure on a graphic organizer.

than the other? Why or why not? As you can see, all of these animals have structures that work as a system for their survival and make them well-suited to Wyoming. If one of these structures was missing, would the animal survive in Wyoming? Somewhere else? How do you know?"

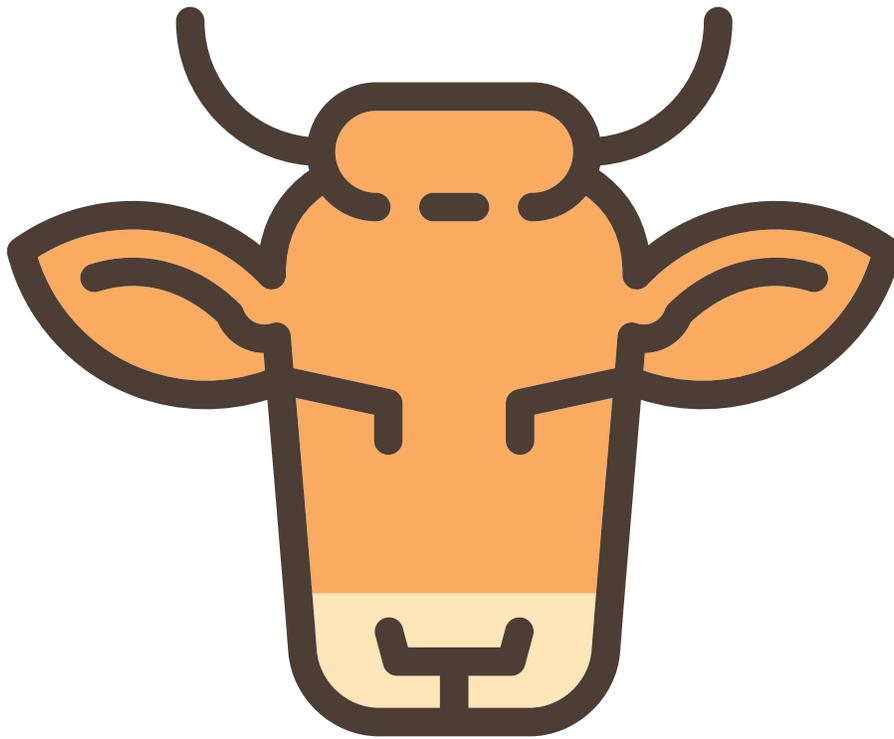
6. Ask: **"How does animal structure impact stewardship decisions?"** Responses may include: forage is reliant upon the animals selected, areas needing weed control, fire prevention, animal hooves breaking up soil, etc.

Assessment: Hand out the "Make Your Claim" sheet, go over the directions with students, and then have students complete it. Students should be able to choose an important structure and support its importance with at least 1 valid reason.

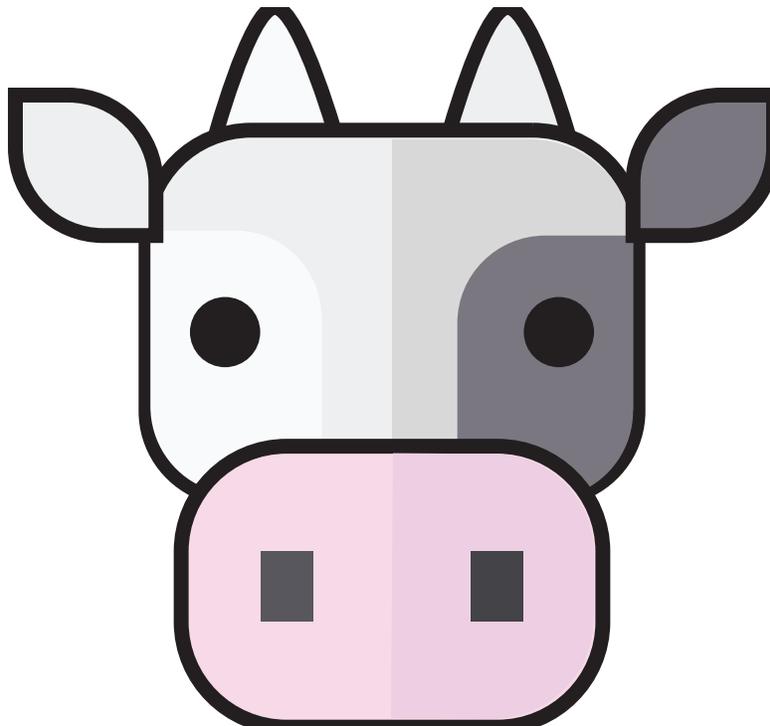
Credits/Sources:

1. Animals, A-Z. (2019). *Goats - Facts, Diet, Milk & Habitat Information*. Animal Corner. Retrieved July 9, 2019, from <https://animalcorner.co.uk/animals/goats/>
2. Animals, A-Z. (2019). *Domestic Sheep - Facts, Diet & Habitat Information*. Animal Corner. Retrieved July 9, 2019, from <https://animalcorner.co.uk/animals/domestic-sheep/>
3. Dairy And The Environment | American Dairy Association North East. (2019). *What do dairy farmers do to protect the environment?*. Retrieved July 10, 2019 from <https://www.americandairy.com/dairy-farms/dairy-and-the-environment/>.
4. *Encyclopedia Britannica*. (2019). *Cow | Mammal*. Retrieved July 9, 2019, from <https://www.britannica.com/animal/cow>.
5. Nationwide, S. (2019). Environmental Benefits. Retrieved from <https://www.sare.org/Learning-Center/Bulletins/Profitable-Pork/Text-Version/Environmental-Benefits>

6. *Pig Facts - Animal Facts Encyclopedia*. (2019). Retrieved July 9, 2019, from <https://www.animalfactsencyclopedia.com/Pig-facts.html>.
7. *Products from animals*. (2019). Retrieved on July 9, 2019, from <https://animalsmart.org/feeding-the-world/products-from-animals>.
8. Science, Live. (2019). *Facts About Goats*. Retrieved July 9, 2019, from <https://www.livescience.com/52540-goat-facts.html>.
9. Thinglink.com. (2019). *Cow Adaptations By Kishan*. Retrieved July 9, 2019, from <https://www.thinglink.com/scene/649319210098360321>.



© 2019 Wyoming Agriculture in the Classroom Materials



© 2019 Wyoming Agriculture in the Classroom Materials

All About Beef

Beef By-Products:

- Different cuts of beef:
 - Steak
 - Ground Beef
 - Roasts
- Gelatin
- Shampoo
- Marshmallows
- Footballs
- Furniture
- Make-up
- Gum
- Insulin

A 1150 pound market steer yields about 500 pounds of beef!

What Kind of Work Do Cattle Ranchers Do?:

- Oversight and Maintenance
- Cow-calf raising
- Cowboying
- Wrangling

Cattle Benefit the Environment:

- Grazing helps plants grow strong and healthy.
- Cattle aerate the ground by breaking it up with their hooves.
- Controlled and rotational grazing limit soil erosion while promoting grass and plant growth.

Adapting for Their Environment:

- Cattle stay warm by eating more.
- Some cattle have a thicker hide and coat that regulate body temperature during hot summers and harsh winters.
- Cattle are even-toed, hooved mammals.
- Cattle are adapted for grazing with a wide mouth and specialized teeth for eating tough vegetation.
- Cattle have 32 teeth but no incisors or canines. Instead they have a gummy pad that is used to rip up grass.
- Cattle are ruminant animals, with 4 chambered stomachs that help them quickly eat and digest large quantities of tough grass.
- Breeds of cattle raised in Wyoming have bigger lungs to prevent heart failure in high altitudes.

All About Dairy Cows

Dairy By-Products:

- Milk
- Cheese
- Yogurt
- Ice cream
- Sour cream
- Cottage Cheese
- Condensed milk
- Meat - mostly ground beef when the cows no longer produce milk
- Gelatin
- Leather
- Cosmetics
- Paint
- Margarine

A typical Dairy Cow produces about 7 gallons of milk each day!

What Kind of Work Do Dairy Farmers Do?:

- Oversight and Maintenance
- Herdsman
- Tanker Driver
- Milk Parlor Manager

Dairy Cows Benefit the Environment:

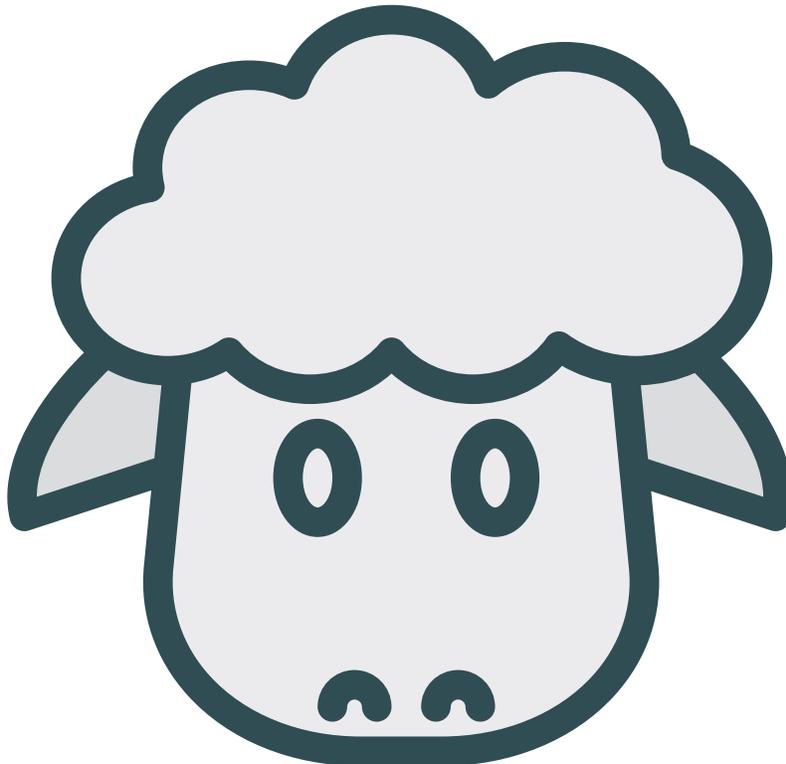
- New technology called a methane digester has been developed to collect methane gas. This methane is converted to electricity that can power the dairy and some homes.
- Manure is used to fertilize crops and grow nutritious food.

Adapting for Their Environment:

- Dairy cows have the ability to sweat and regulate body heat through changing their respiration rate.
- Cattle are even-toed, hooved mammals.
- Cattle are adapted for grazing with a wide mouth and specialized teeth for eating tough vegetation.
- Cattle have 32 teeth, but no incisors or canines. Instead they have a gummy pad that is used to rip up grass.
- Cattle are ruminant animals, with 4 chambered stomachs that helps them quickly eat and digest large quantities of tough grass.



© 2019 Wyoming Agriculture in the Classroom Materials



© 2019 Wyoming Agriculture in the Classroom Materials

All About Goats

Goat By-Products:

- Fiber (angora, mohair, cashmere)
- Milk
- Cheese
- Meat
- Hides (leather)
- Soap
- Baby Formula

Goats are related to Pronghorn Antelope!

What Kind of Work Do Goat Ranchers Do?:

- Oversight and Maintenance
- Goat handler
- Milker
- Creamery Assistant

Goats Benefit the Environment:

- Grazing goats can control invasive plants and noxious weeds, as well as helping with fire prevention.
- Goats aerate the ground by breaking it up with their hooves.

Adapting for Their Environment:

- Goats can feed on weeds that are toxic to other animals.
- Goat's jaws are specially adapted to chew weeds and grasses.
- Goats are even-toed, hooved mammals.
- As herd animals, goats have a higher chance of survival.
- Horns help regulate a goat's body temperature.
- Due to their low body mass, goats have low metabolic requirements so they can survive where there is scarce food and/or water.
- Goats store water in their rumen for times when water is scarce.
- Goats are ruminant animals, with 4 chambered stomachs that help them quickly eat and digest weeds and tough grass.

All About Sheep

Sheep By-Products:

- Meat (lamb, mutton)
- Wool
- Lanolin
- Clothing
- Tennis Ball Covers
- Leather
- Chamois
- Tape
- Brushes
- Pet Food
- Milk
- Cheese

Wyoming ranks 4th in the United States for sheep production!

What Kind of Work Do Sheep Ranchers Do?:

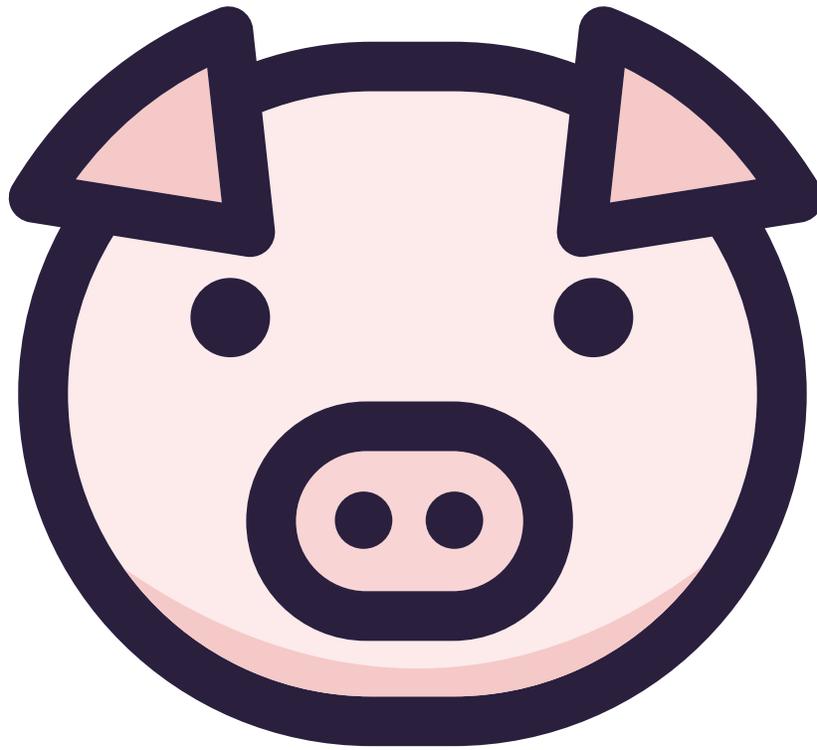
- Oversight and Maintenance
- Herding
- Shearing
- Breeding Livestock Guardian Dogs

Sheep Benefit the Environment:

- Grazing sheep can control invasive plants and noxious weeds, as well as helping with fire prevention.
- Sheep aerate the ground by breaking it up with their hooves.

Adapting for Their Environment:

- Sheep have wide-spaced eyes and rectangular pupils, giving them a large field of vision and helping them to see predators.
- Each sheep grows between 20 and 30 pounds of wool per year, which helps keep them warm in the winter.
- Sheep have a split upper lip and no teeth on their upper jaws to help them pull leaves of plants.
- Sheep are even-toed, hooved mammals.



© 2019 Wyoming Agriculture in the Classroom Materials

All About Hogs & Pigs

Hog & Pig By-Products:

- Different cuts of pork:
 - Sausage
 - Ham
 - Pork Chops
 - Bacon
 - Ribs
- Dog toys
- Lard
- Heart valves for humans
- Medicine
- Suede for clothes and shoes
- Gelatin
- Water filters
- Anti-freeze
- Make-up

A 250 pound hog yields about 150 pounds of pork!

What Kind of Work Do Hog Farmers Do?:

- Oversight and Maintenance
- Farm Laborer
- Swine Herdsmen
- Swine Breeder

Sheep Benefit the Environment:

- Hog manure contains a high amount of organic matter that helps fertilize soil.
- Hog manure and bedding can be mixed with the soil to improve organic matter content over time.

Adapting for Their Environment:

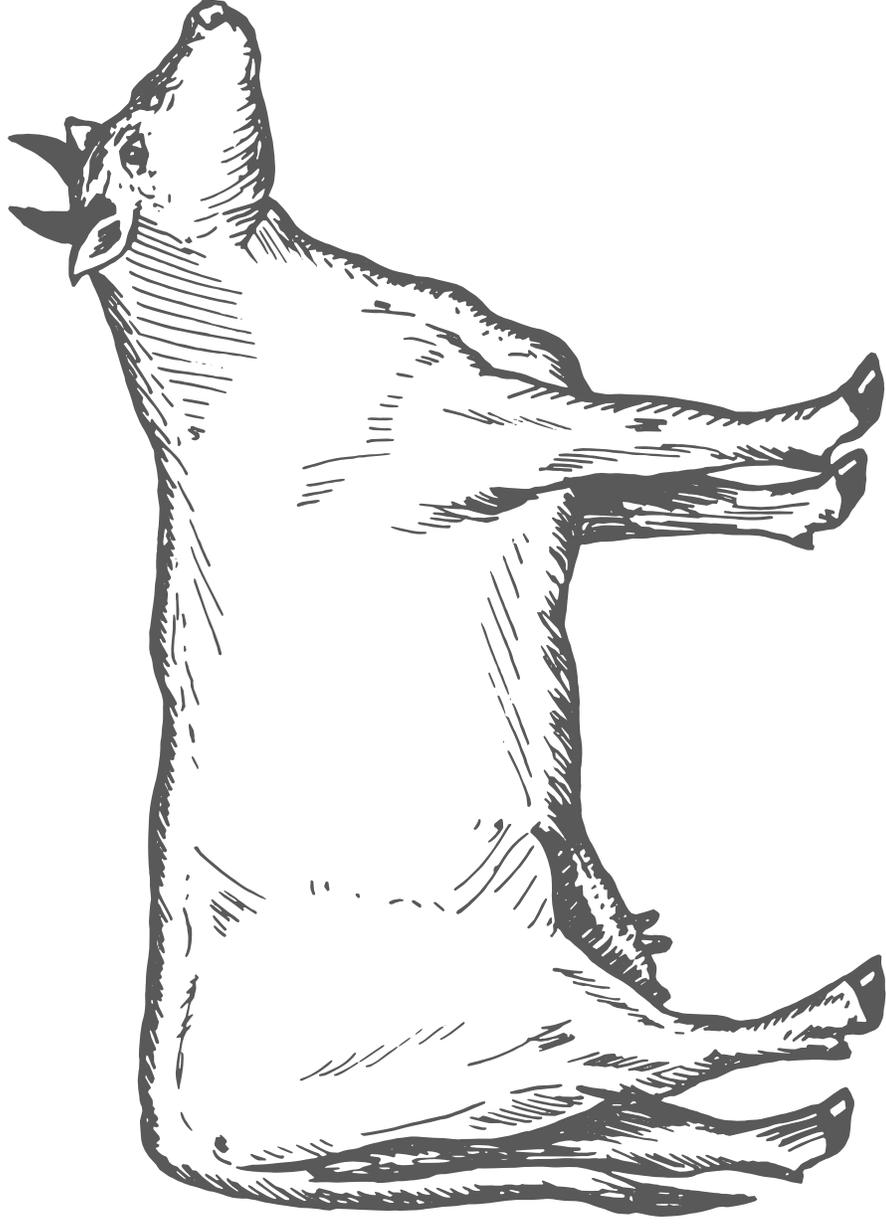
- Hogs' diet is composed mainly of corn, wheat, soy and barley; however, hogs are omnivores.
- Hogs raised in Wyoming have sparse, bristled hair, rather than the thick, woolly hair found on some breeds.
- Hogs are even-toed, hoofed mammals.
- Hogs have a single-chambered stomach, and require more nutrition than grass or hay can provide.
- Hogs wallow or roll in mud to cool off, prevent sunburn, remove parasites, and prevent bug bites.
- Hogs have a unique bone in their nose for digging. They have a blunt upper lip which is a flexible disc that is made of cartilage, covered in skin, and has lots of tactile receptors.
- The few sweat glands pigs have are in their noses.

Livestock Characteristics

Beef Cattle

Group Members: _____

Directions: Label one internal or external structure that is important to this animal for survival in Wyoming, or a by-product and its use. Your response cannot be the same as another. All structures need to be labeled.

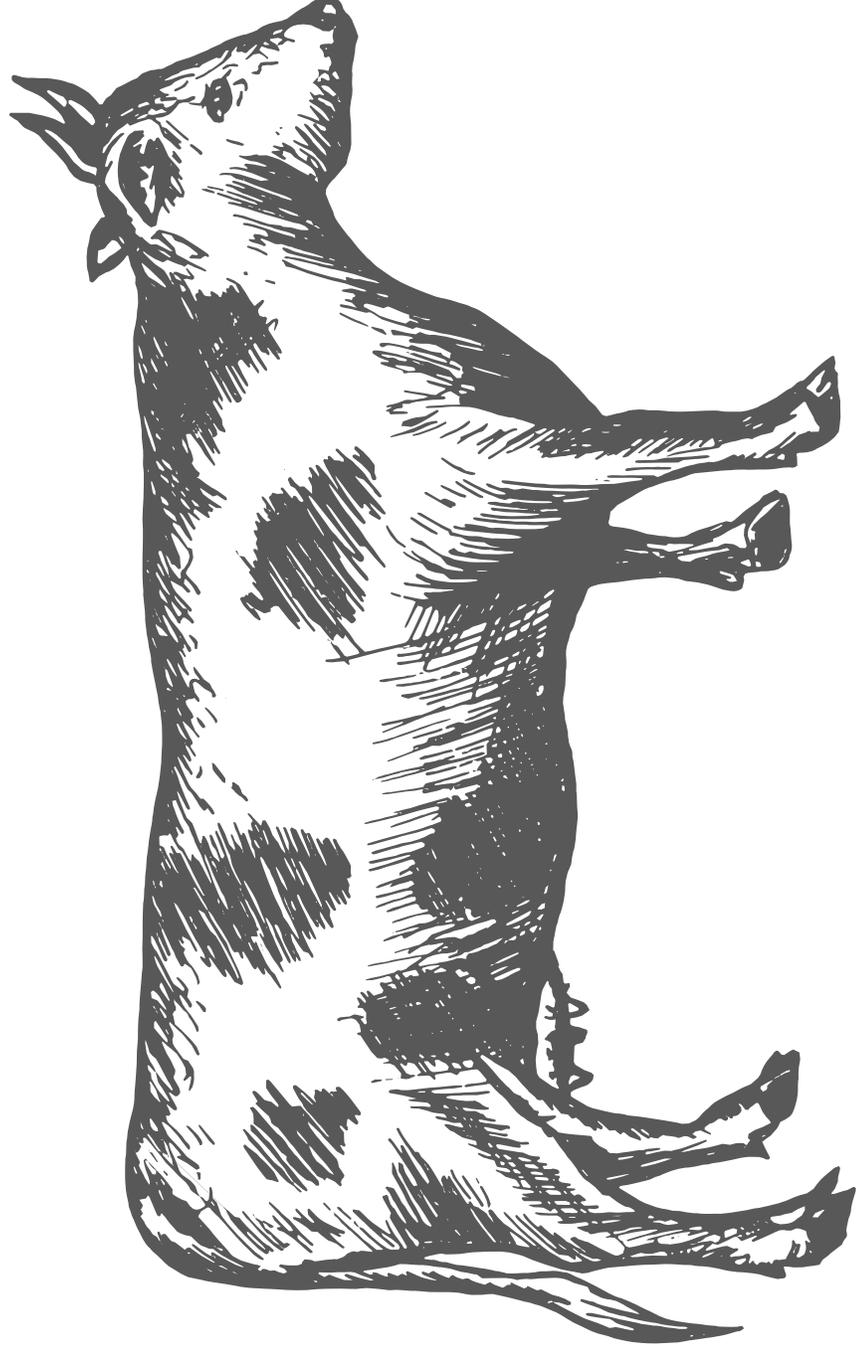


Livestock Characteristics

Dairy Cattle

Group Members: _____

Directions: Label one internal or external structure that is important to this animal for survival in Wyoming, or a by-product and its use. Your response cannot be the same as another. All structures need to be labeled.

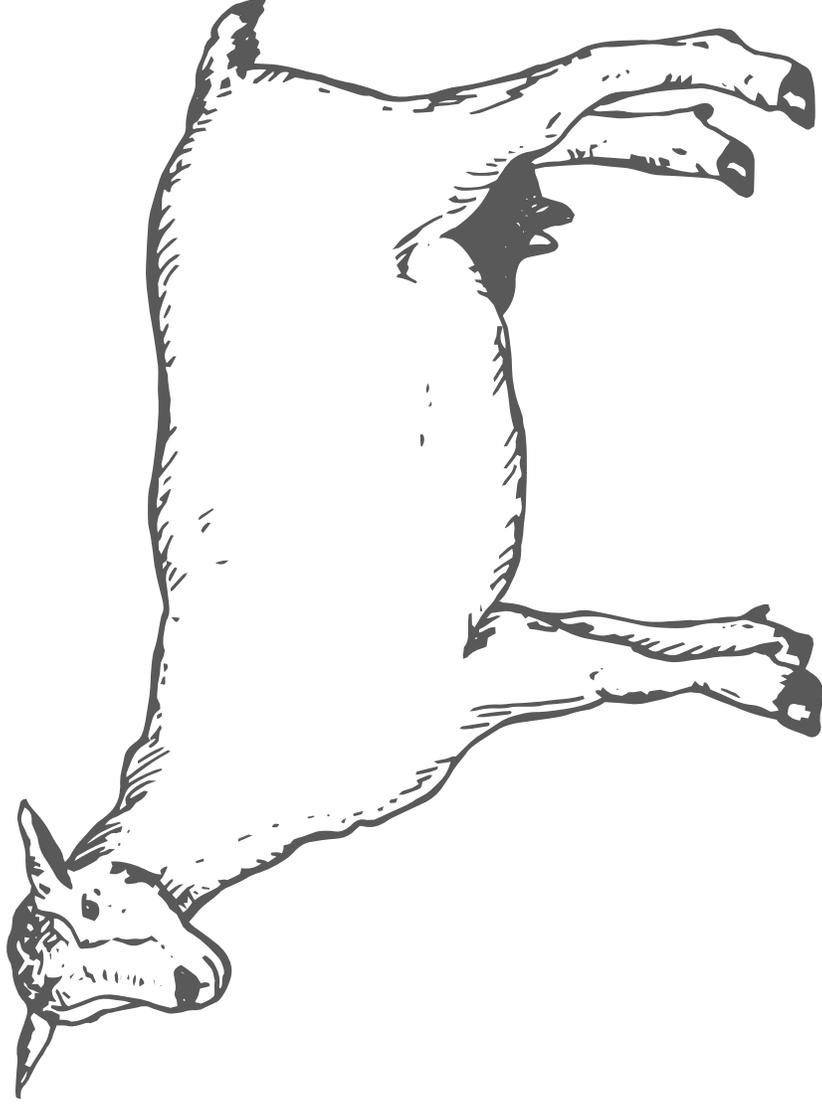


Livestock Characteristics

Goats

Group Members: _____

Directions: Label one internal or external structure that is important to this animal for survival in Wyoming, or a by-product and its use. Your response cannot be the same as another. All structures need to be labeled.

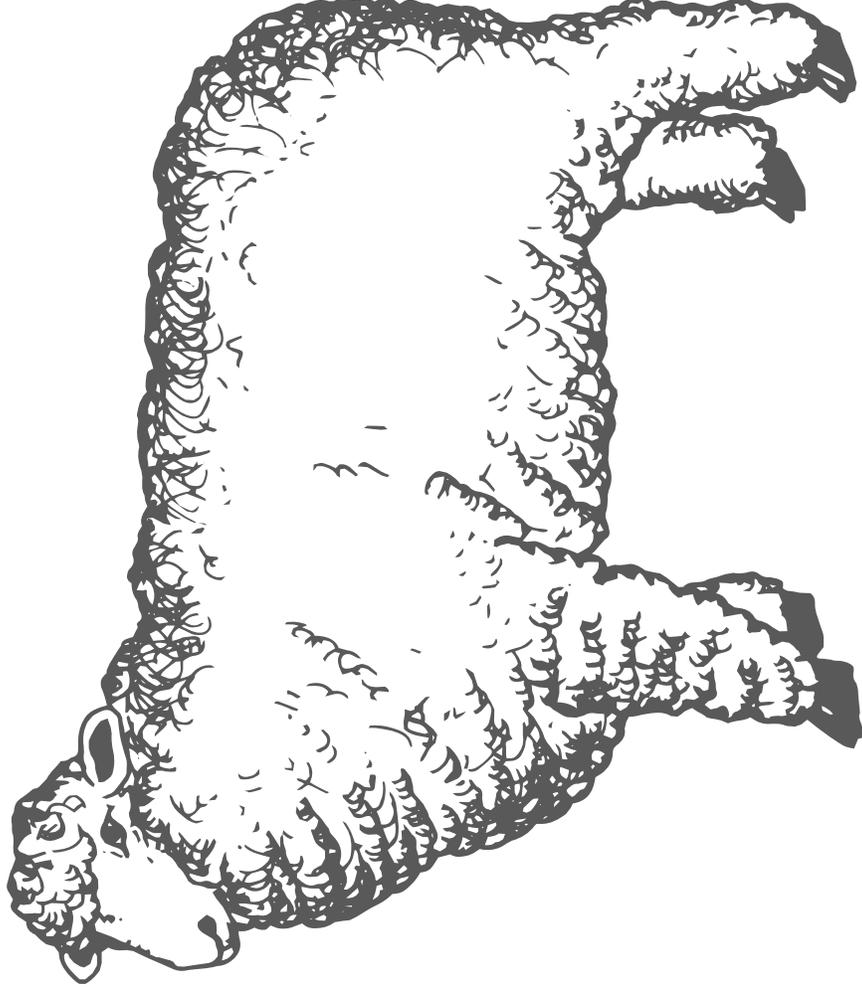


_____ Livestock Characteristics _____

Sheep

Group Members: _____

Directions: Label one internal or external structure that is important to this animal for survival in Wyoming, or a by-product and its use. Your response cannot be the same as another. All structures need to be labeled.

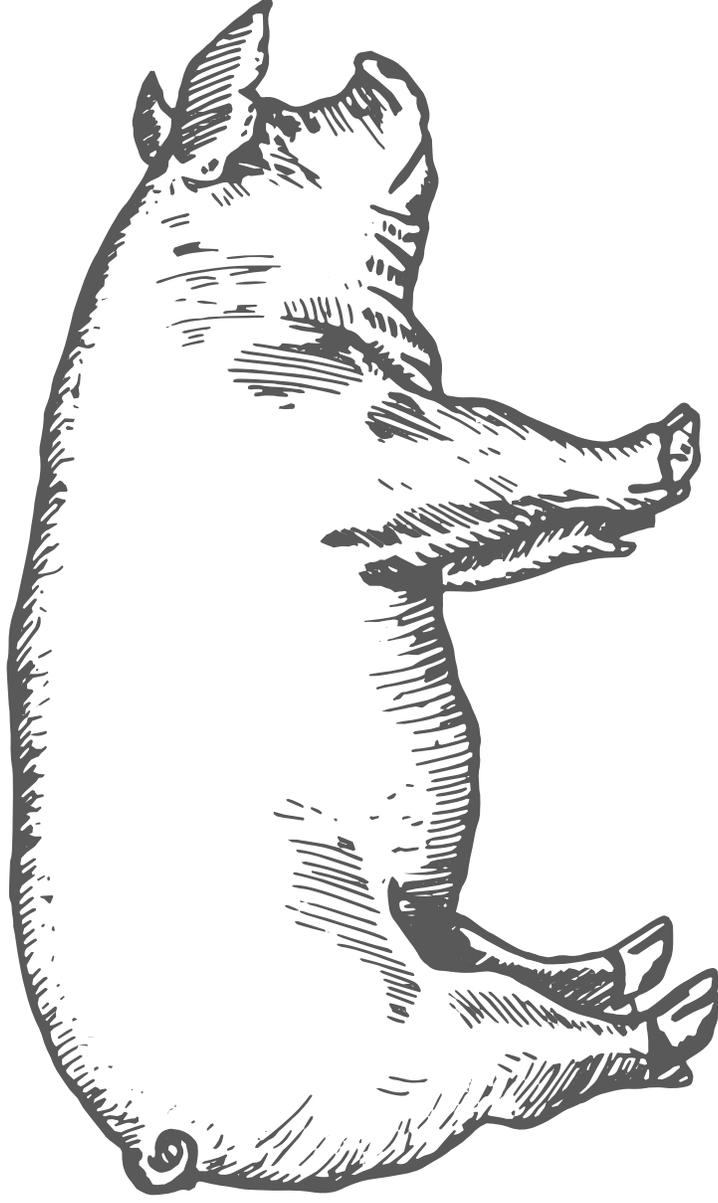


Livestock Characteristics

Hogs & Pigs

Group Members: _____

Directions: Label one internal or external structure that is important to this animal for survival in Wyoming, or a by-product and its use. Your response cannot be the same as another. All structures need to be labeled.

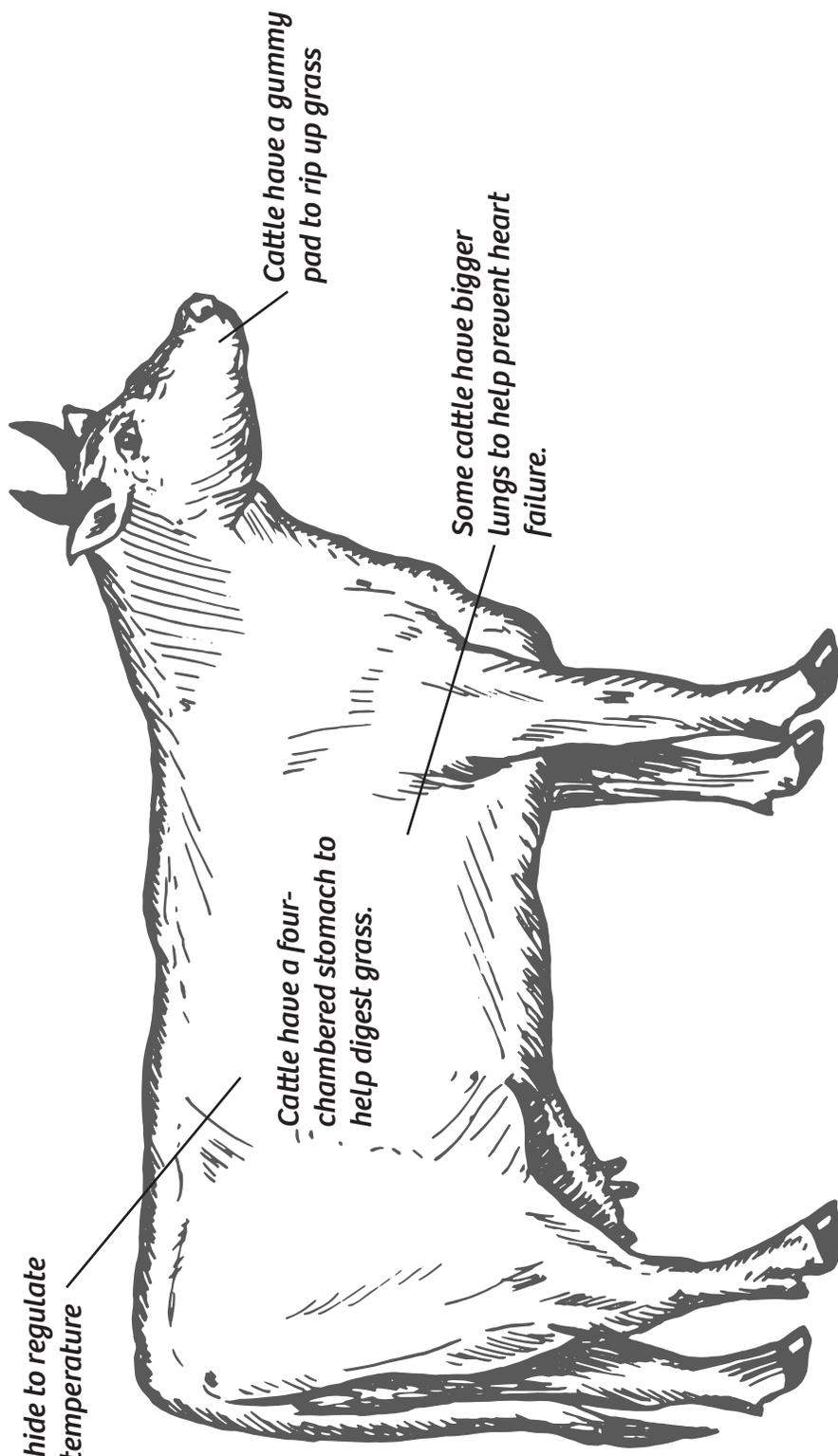


Livestock Characteristics

Beef Cattle

Group Members: Teacher Sample

Directions: Label one internal or external structure that is important to this animal for survival in Wyoming, or a by-product and its use. Your response cannot be the same as another. All structures need to be labeled.



Cattle produce several cuts of beef like steak, roast and ground beef.

Marshmallows are a by-product of beef cattle.

Football is a by-product of beef cattle.

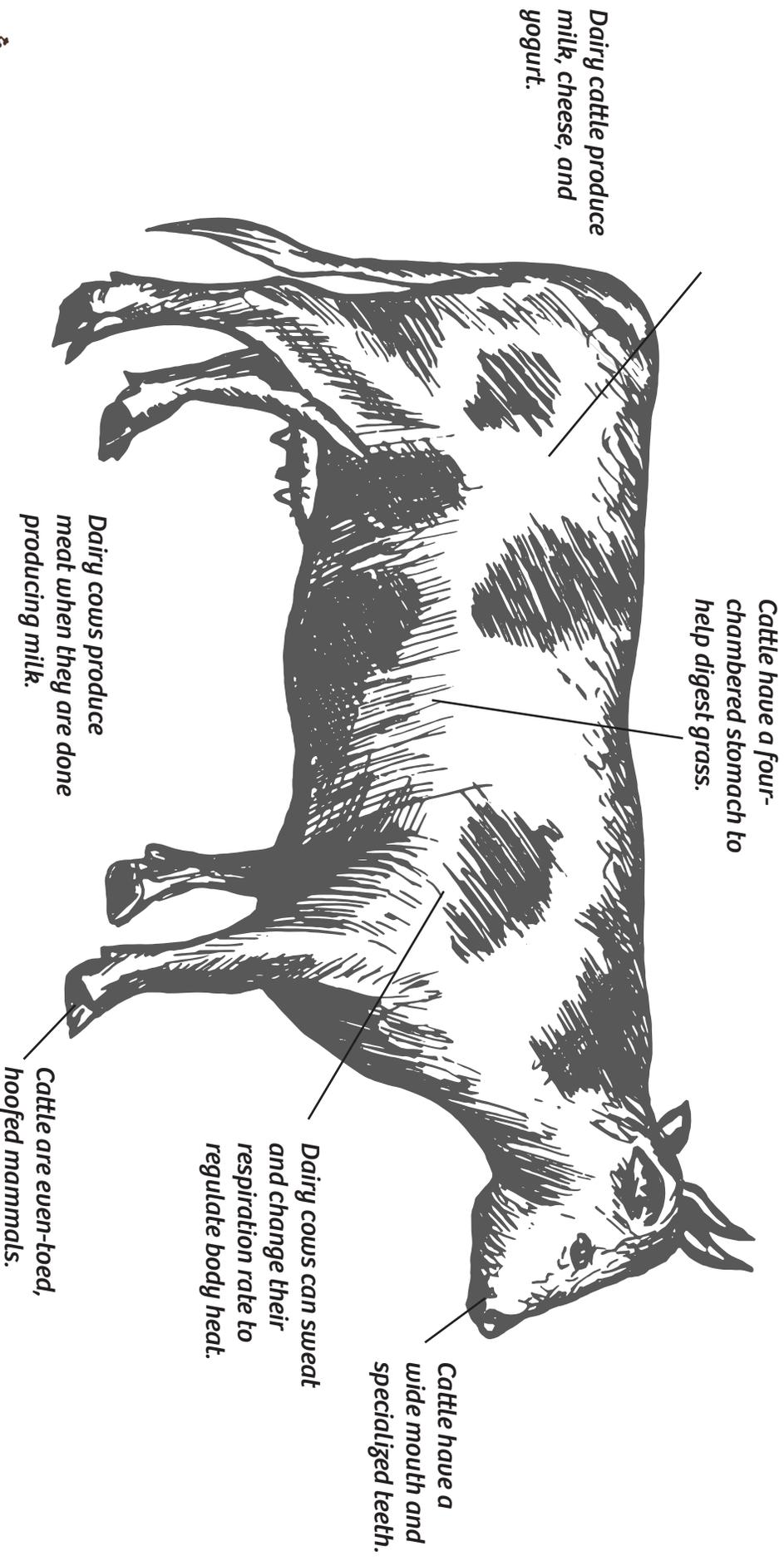


Livestock Characteristics

Dairy Cattle

Group Members: Teacher Sample

Directions: Label one internal or external structure that is important to this animal for survival in Wyoming, or a by-product and its use. Your response cannot be the same as another. All structures need to be labeled.

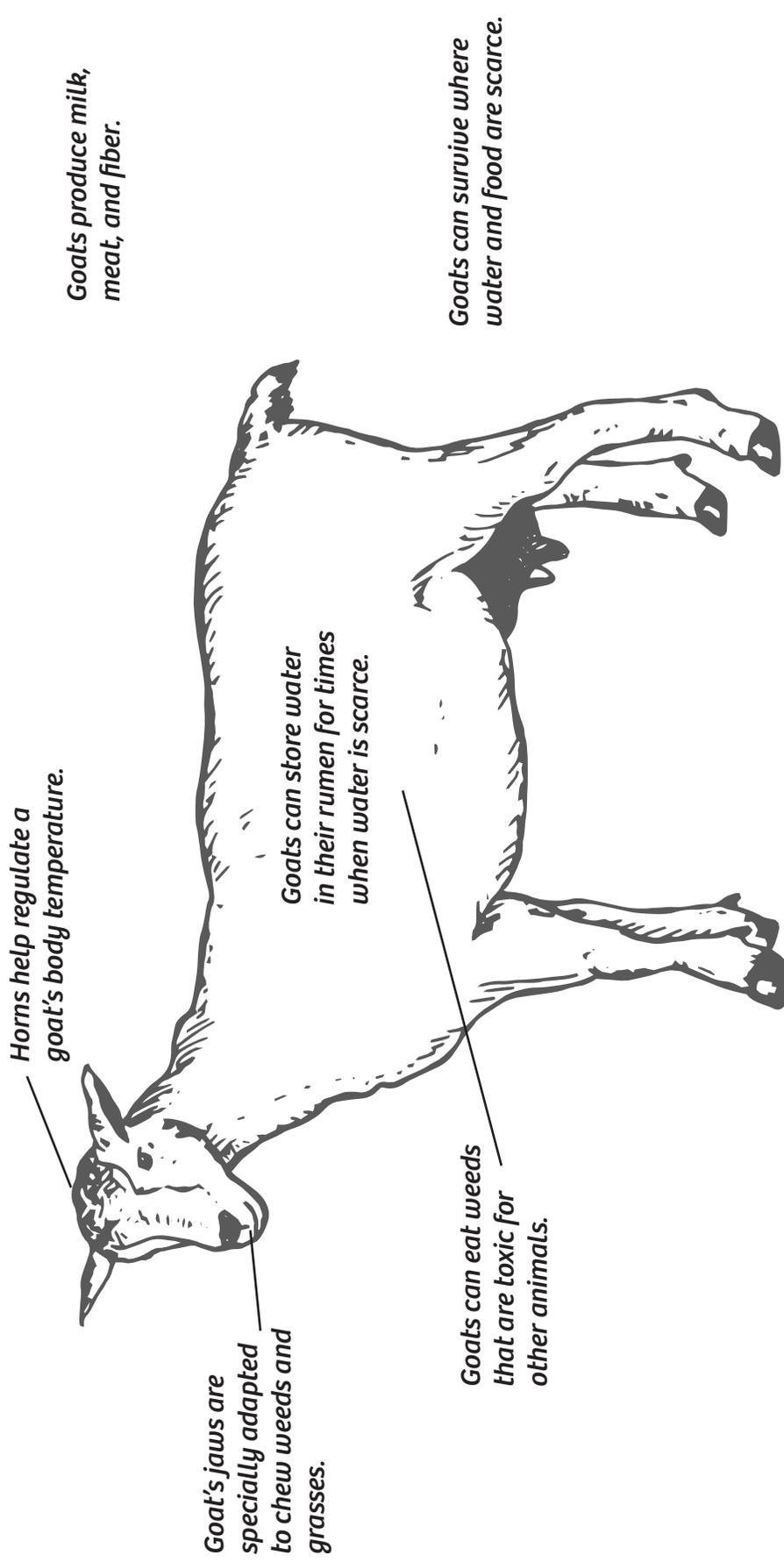


Livestock Characteristics

Goats

Group Members: Teacher Sample

Directions: Label one internal or external structure that is important to this animal for survival in Wyoming, or a by-product and its use. Your response cannot be the same as another. All structures need to be labeled.

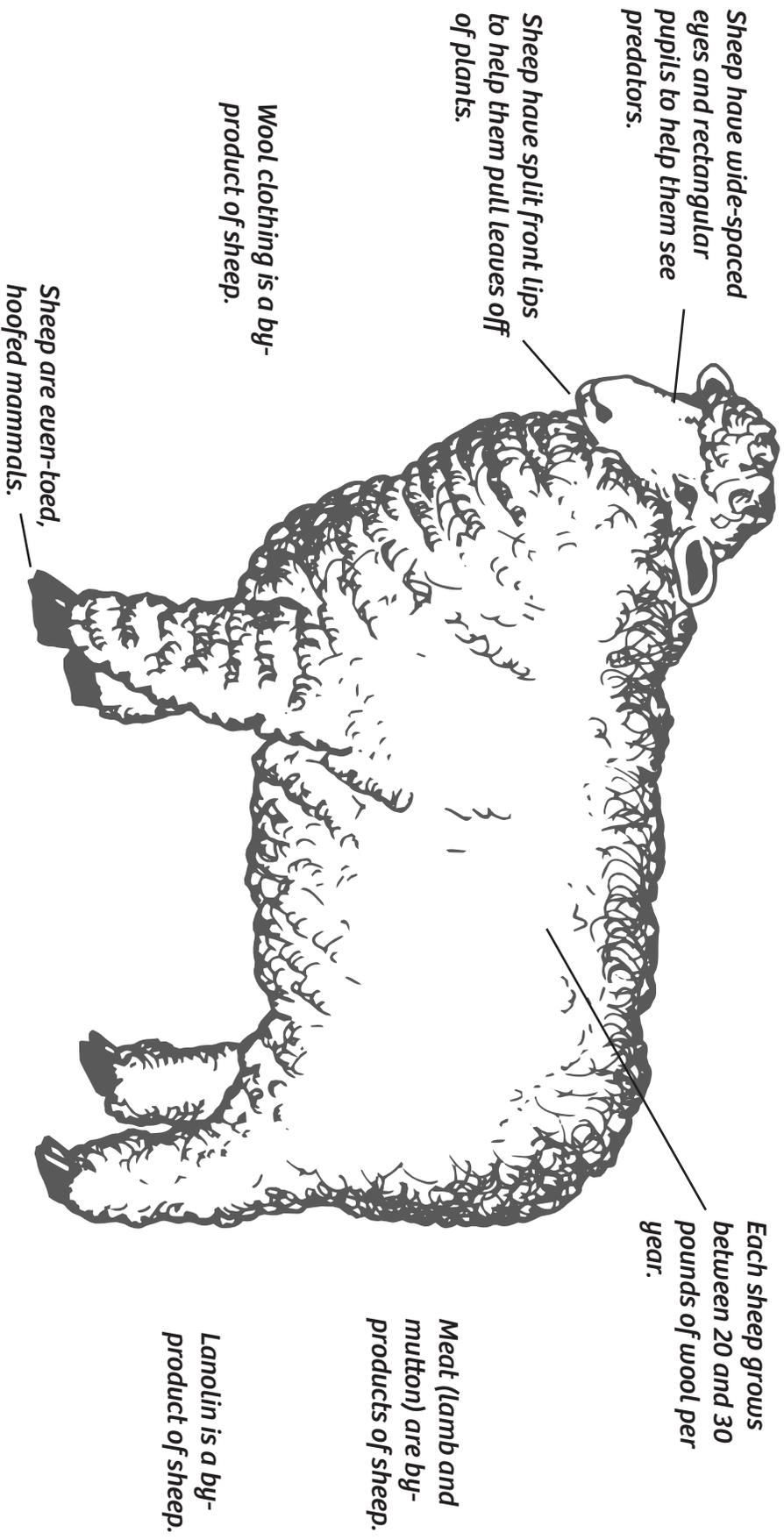


Livestock Characteristics

Sheep

Group Members: Teacher Sample

Directions: Label one internal or external structure that is important to this animal for survival in Wyoming, or a by-product and its use. Your response cannot be the same as another. All structures need to be labeled.



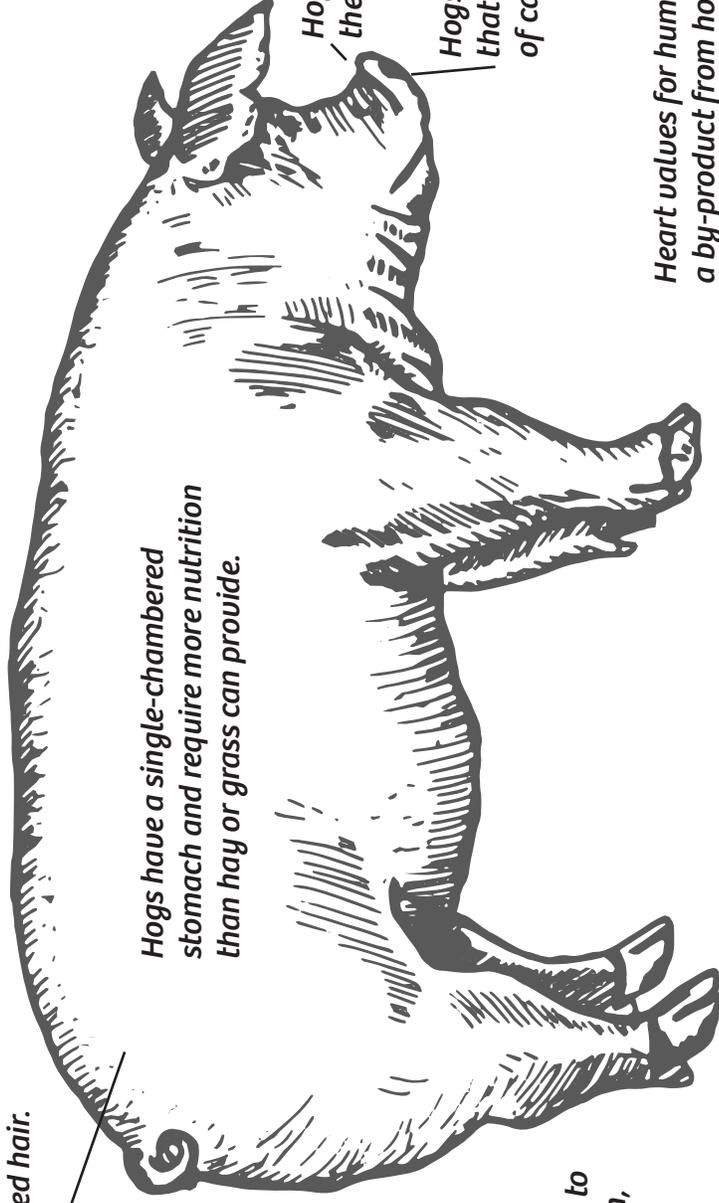
Livestock Characteristics

Hogs & Pigs

Group Members: Teacher Sample

Directions: Label one internal or external structure that is important to this animal for survival in Wyoming, or a by-product and its use. Your response cannot be the same as another. All structures need to be labeled.

Hogs raised in Wyoming have sparse, bristled hair.



Hogs have a single-chambered stomach and require more nutrition than hay or grass can provide.

Hogs have a unique bone in their nose for digging.

Hogs have a blunt upper lip that is a flexible disc made of cartilage.

Hogs wallow in the mud to cool off, prevent sunburn, remove parasites, and prevent bug bites.

Heart valves for humans are a by-product from hogs.

A few by-products from hogs are: sausage, ham, pork chops, bacon, and ribs.



Make A Claim

Select an animal from the cards and make a claim about a structure it has that is important for survival. Support your claim with at least one valid reason.



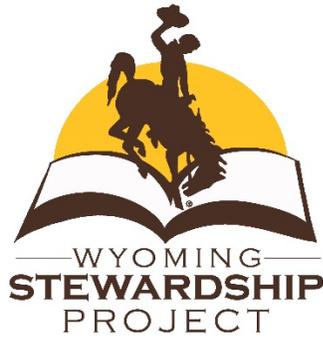
© 2019 Wyoming Agriculture in the Classroom Materials

Make A Claim

Select an animal from the cards and make a claim about a structure it has that is important for survival. Support your claim with at least one valid reason.



© 2019 Wyoming Agriculture in the Classroom Materials



Lesson Four: Crop Talk

Grade Level: 4th Grade

Time: 45-60 minutes

Essential Question: How can we be stewards of Wyoming's agriculture to benefit current and future generations?

Objectives: Students will:

- Discuss important facts about plant structures and where they are grown in Wyoming.
- Engineer various Wyoming crops and their structures.
- Predict how farmers practice stewardship of their crops.

Purpose: Students will understand how different plant characteristics support survival, growth and reproduction of various Wyoming crops.

Required Materials/Resources:

- "All About Crops" articles 1-6 about crops (Hay, Wheat, Barley, Corn, Beans and Sugarbeets); 1 set per class
- Optional: larger paper for each group to diagram crop if not constructing a model
- "Crop Challenge" sheet for each group
- Various materials for crop construction (ex: yarn, fabric, felt, straws, toothpicks, various kinds of paper, glue, tape, any other supplies on hand that may be useful)
- Highlighters or colored pencils
- Sticky notes for students to write on
- Chart paper to hold student sticky notes

Suggested Teacher Preparation:

- Copy and cut apart "All About Crops" texts
- Gather crop building supplies

- Copy and cut apart “Crop Challenge” sheets

Standards:

Science: 4-LS1-1 (Explicit)

Social Studies: SS5.2.1, SS5.5.4 (Practiced/Encountered)

ELA: 4.RI.1, 4.RI.7, 4.SL.1, 4.SL.2, 4.SL.4 (Practiced/Encountered)

CVE: CV5.1.4, CV5.2.1, CV5.2.2, CV5.2.3 (Practiced/Encountered)

Vocabulary:

- **Consume** - (1) eat or drink resource; (2) use a resource
- **Crop** - a cultivated plant that is grown for food, fiber, or livestock feed
- **Farmer** - a person who cultivates land or crops and may also raise livestock
- **Sustainable** - able to be maintained, able to last or continue for a long time

Instructional Procedures/Steps:

Students will work in small groups to build a model of one of Wyoming’s crops.

1. **“Yesterday, we discussed Wyoming livestock and their internal and external structures that make them well suited to survive in our state. Today, in groups, we are going to read about crops that are grown in Wyoming, and as you read, you will highlight important structures they have for growth, reproduction, and survival. With your group, highlight facts in the text that relate to growth structures/systems green, reproduction structures/systems pink and survival structures/systems yellow. Each group will read about a different crop grown in our state. Based on the information read and the highlighted facts about structures, you will construct a model of your crop. Once all groups are finished, you will use your model to teach the class about your crop and its structures.**

2.  Divide the class into 5 groups. Assign each group a crop and give them the corresponding All About Crops article and highlighters. **“You have 5-10 minutes to read and highlight your article. Once that time is up, we will go over the constraints of building your crop.”** Monitor discussions/reading and clarify misconceptions where needed.
3. Pull students back together after the given reading time to go over the Crop Challenge sheet. **“Your challenge is to construct a model of your crop. You may only use the provided materials.”** (Go over materials you have gathered.) **“You will have 15 minutes to plan and build. Within your planning/building time, you also need to plan what you are going to teach the class. Think about structures, products and interesting facts. When presenting, every member of the group must share at least 1 piece of information. All crops must be completed within the allotted time. Any questions?”**
4. Set a timer and periodically remind students of the remaining time so they can plan accordingly. Monitor teams as they build.
5. At the end of construction, pull students back together for crop presentations. **“Each group will now have 2-3 minutes to present their crop to the class.”** Make sure that groups have met the success criteria that was given on the “Crop Challenge” sheet. (In presentations, students should address structures and products.)
6. As preparation for tomorrow, give each student a sticky note to answer the question, **“What do you think farmers and ranchers do to be good stewards of their resources?”** Have students put their sticky note on a piece of chart paper and save for the initial discussion in tomorrow’s lesson.



In this task, students will be engaged in the higher order thinking skill of analysis by creating a representation of their crop.

TEACHER NOTE: If you are doing this lesson during nice weather, a great extension activity would be to go outside and locate plants that have similar structures to the ones that were discussed and have students identify them.



In this task, students will be engaged in the higher order thinking skill of synthesis by combining information gain from the article to about plant structure and good stewardship.

Assessment: The success criteria on the “Crop Challenge” sheet will be used as the assessment for this lesson.

Credits/Sources:

1. Casper Star Tribune. (2018). *Wyoming Sugar Beet Production Increases*. Retrieved July 10, 2019, from https://trib.com/news/state-and-regional/wyoming-sugar-beet-production-increases/article_a83e168f-01d3-5ca6-a6a2-9f5fe778edaf.html
2. Cropwatch. (2019). *Irrigation and Water Management for Corn*. Retrieved on July 10, 2019, from <https://cropwatch.unl.edu/corn/water>
3. Encyclopedia.Com. (2019). *Barley | Encyclopedia.Com*. Retrieved July 10, 2019, from <https://www.encyclopedia.com/plants-and-animals/plants/plants/barley>
4. Encyclopedia Britannica. (2019). *Corn | History, Cultivation, Uses, & Description*. Retrieved July 10, 2019, from <https://www.britannica.com/plant/corn-plant>
5. Encyclopedia Britannica. *Sugar Beet | Plant*. (2019). Retrieved July 10, 2019, from, <https://www.britannica.com/plant/sugar-beet>
6. Extension.Iastate.Edu. (2019). *Alternative Agriculture - Iowa State University*. Retrieved July 10, 2019, from <https://www.extension.iastate.edu/alternativeag/cropproduction/drybean.html>
7. Home Guides. (2018). *How Long Do Wheat Plants Take Before the Harvest?*. Retrieved July 10, 2019, from <https://homeguides.sfgate.com/long-wheat-plants-before-harvest-69823.html>
8. Home Guides. (2019). *Ideal Climate & Soil for Corn Growth*. Retrieved on July 10, 2019, from <https://homeguides.sfgate.com/ideal-climate-soil-corn-growth-37426.html>
9. Hot, dry Big Horn Basin suits dry bean crop. (2017). *Wyoming Livestock Roundup*. Retrieved from <https://www.wylr.net/the-roundup/archives/290-crops/dry-beans>
10. Cropwatch. (2019) *Dry Edible Bean Production Systems*. Retrieved July 10, 2019, from <https://cropwatch.unl.edu/drybeans/production>

11. NSW Department of Education - Learning Systems. (2019). *Anatomy And Physiology of The Wheat Plant*. Video. Retrieved July 10, 2019, from <https://www.youtube.com/watch?v=u1t6tRYHyEo>
12. The Story of Wheat for Kids Grades 3 to 5. (2011). Retrieved July 10, 2019, from <https://nebraskawheat.com/wp-content/uploads/2014/01/StoryOfWheat.pdf>
13. United States Department of Agriculture. (2019). *BARLEY*. Retrieved from https://plants.usda.gov/plantguide/pdf/ccpg_horde.pdf
14. *Uwyo.Edu*. (2019). *Timothy | Department Of Plant Sciences | College Of Agriculture And Natural Resources | University Of Wyoming*. Retrieved July 10, 2019, from <http://www.uwyo.edu/plantsciences/uwplant/forages/grasses/timothy.html>

All About Crops



All About Crops



All About Crops

Corn

Corn, a crop that is also known as maize, grows best when temperatures are warm and the days are long and full of sun. Once planted, corn takes 86-92 days before harvesting, growing in rich moist soil. Farmers wait until soil temperatures are between sixty and sixty-five degrees Fahrenheit before planting. A mixture of sand, silt, and clay, known as sandy loam, is the preferred soil used for growing corn. A better crop is produced with irrigation but is not the only way corn has to be watered. The crop does, however, need to be well drained during the growing season.

Corn is a tall, annual grass with a very stout, erect, solid stem that supports the weight of the corn cob as it grows. Two large, narrow leaves grow and spread alternately on opposite sides of the stem with a fibrous root system, with the majority of the roots growing two feet into the soil.

The majority of corn grown in the United States is also known as field corn. It is used to make cornmeal, and corn chips, but is primarily grown to feed livestock. Other corn is grown for human consumption and also used to produce biofuel.



©2019 Wyoming Agriculture in the Classroom Materials

All About Crops

Sugarbeets

Sugarbeets grow in temperate to cool climates. They can grow in a wide variety of soils from sandy loam to clay as long as the soil is deep and loose. After planting in the spring, farmers care for the sugarbeets for 8-10 weeks until they are ready to harvest. Harvest usually happens in late September to October. Part of caring for sugarbeets is ensuring that they have water through irrigation.

Sugarbeets grow close to the ground, with the top of the beet being level with the ground or sitting slightly above the soil. They have large leaves that produce sugar through photosynthesis, which is then stored in the beet. The beet itself is the root of the plant and is a tap root. A tap root is a straight tapering root growing downward from the center of a plant. Sugarbeets also have a flowering stalk that aids in reproduction. Sugarbeets are used for sugar (sucrose), livestock food (silage), and sugarbeet syrup which is similar to molasses.



©2019 Wyoming Agriculture in the Classroom Materials

All About Crops



All About Crops



All About Crops

Beans

Beans are planted in mid-June when the climate is arid, with warm days and cool nights. They have a growing period of 85-115 days depending on the type of bean being planted. Beans grow in many different soil types and do not need soil with a high content of nitrogen. Bean plants actually are nitrogen-depositing plants and are often grown in rotation with other crops that are high nitrogen using plants. This prevents disease, insects, and weed problems that could destroy the crop. Farmers practice pre-irrigation when growing beans. The soil is irrigated before the bean is planted and then not again until a month later.

Bean plants grow as a bushes or climbing plants. They have weak fibrous root systems, as they grow very shallow into the soil. Pinto bean plants produce better results because their pods are stronger and won't shatter before harvest. Some beans grown in Wyoming include dark and light kidney beans, black beans, navy beans, and pinto beans. Beans are used for consumption by both humans and livestock. In the past, beans were used as ways to vote and even as a type of currency, or money.



©2019 Wyoming Agriculture in the Classroom Materials

All About Crops

Wheat

Wheat is a type of grass that grows and thrives in cooler climates. Winter wheat is usually planted in September and harvested at the beginning of winter after a 4-month growing season. Spring wheat is planted between March and May, depending on the weather, and is harvested between September and August. Wheat grows in a wide range of soils that are sufficiently fertile and well-aerated. Wheat will require more water through irrigation the more mature it becomes. Irrigation does not have to be used for wheat except in arid areas.

Wheat grows between two and four feet tall and is made up of a head, stem, leaves, and roots. It has long skinny leaves and parallel veins. Wheat has a fibrous root system made up of numerous, fine branches all being close in length and a shallow growth. Wheat will develop flowers when it reaches full height where reproduction will take place and produce seeds. Wheat is most commonly used to feed livestock and as a main ingredient in foods that humans consume, including, breads, cookies, cakes and cereals.



©2019 Wyoming Agriculture in the Classroom Materials

All About Crops



Stephanie Russell

All About Crops



Liz Lauck

All About Crops

Hay

Hey, what's hay? Hay is an important agricultural crop that is used for both animal feed and to control erosion. All hay is not the same. Many different grasses can be considered hay. The type of hay depends on the climate of the area it is grown in. Some types of hay varieties are: Timothy, Alfalfa, Garrison, Brome, and clover. Even though there are different types, they all have similar characteristics. The plants are tall, measuring from 2 to 4 feet, with flat leaves. Finally, they all have fibrous roots, though the roots can be deep or shallow depending on the type.

How do farmers take care of hay? Hay needs to be grown in sandy or clay-rich soil. The plants must be irrigated but not too much. They thrive when they are living in a slightly dry state. Farmers harvest hay depending on the part of the state that they live in. Farmers in eastern Wyoming cut their hay in late June, while those who live in the western and central part of the state usually harvest through July.



©2019 Wyoming Agriculture in the Classroom Materials

All About Crops

Barley

Barley is a crop that is perfect for Wyoming. It grows in arid climates, and it can withstand high elevations. Farmers plant barley in March or April. It has a short growing season and only needs 60 to 70 days before it can be harvested.

Farmers can plant barley in a wide variety of soils. The fibrous roots of the plant grow out in all directions and closer to the surface of the ground. Barley can be planted as a companion plant for alfalfa. Alfalfa has a tap root, which is a straight tapering root that grows straight down in the soil. The fine mat of branching roots in the barley keeps the soil around the alfalfa from eroding away.

Barley grows up to 80 centimeters tall. The main stem produces smaller, secondary stems. All the stems are covered in long, skinny leaves. The reproductive parts of the plant are found on structures that grow above the rest of the plant, which become the seeds of the plant. The seeds are the part of the plant that is harvested. Wyoming harvests about 8,000 bushels of barley each season. Barley can be used as animal feed, but humans also use barley bread, flour, crackers, and vinegars.



©2019 Wyoming Agriculture in the Classroom Materials

Crop Challenge Sheet

Your Challenge

Construct a model of your crop using only the provided materials.

Constraints:

Materials:

- Use only the materials provided by your teacher

Time:

- 15 minutes to build and plan

Success Criteria:

- Include all structures of your crop
- Explain the purpose of each structure
- Completed within the time constraints
- Must resemble your crop



© 2019 Wyoming Agriculture in the Classroom Materials

Crop Challenge Sheet

Your Challenge

Construct a model of your crop using only the provided materials.

Constraints:

Materials:

- Use only the materials provided by your teacher

Time:

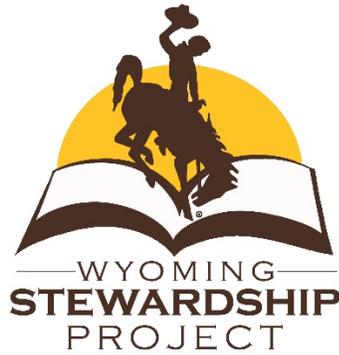
- 15 minutes to build and plan

Success Criteria:

- Include all structures of your crop
- Explain the purpose of each structure
- Completed within the time constraints
- Must resemble your crop



© 2019 Wyoming Agriculture in the Classroom Materials



Lesson Five: A New Way of Thinking

Grade Level: 4th Grade

Time: 1 Day: 45-60 minutes

Essential Question: How can we be stewards of Wyoming's agriculture to benefit current and future generations?

Objectives: Students will:

- Discuss how technology has changed and is helping farming and ranching.
- Identify examples of good stewardship decisions made by farmers and ranchers.

Purpose: Students can identify ways farms and ranches use technology to sustain, care for, and develop their crops and livestock.

Required Materials/Resources:

- Computer to play videos
- "Technology, Conservation and Sustainability" video sheet (1 per student and teacher answer sheet)
- 4 Corners examples sheet for the teacher
- 4 Corners posters
- 2015 Wyoming Leopold Conservation Award Recipient - King Ranch <https://youtu.be/OjeB38cmF9c> Video Length: 5 minutes 37 seconds
- *Brandon Hessenthaller | Soil Management on Wyoming Farms and Ranches* <https://youtu.be/PcK2ioOxOxA> Video Length: 5 minutes 56 seconds
- *Technology catches up to cows: US ranchers turn to 'precision livestock'* <https://youtu.be/CqFBjyvjtc> Video Length: 2 minutes 21 seconds

- *Farming by GPS Saves Money, Environment.* <https://youtu.be/qeyjSN9ANyY> Video Length: 2 minutes 26 seconds
- *Norman Borlaug Documentary* <https://youtu.be/fd6YmVnwNJ0> Video Length: 6 minutes 43 seconds (May stop video at 2 minutes and 55 seconds)

Suggested Teacher Preparation:

- Preview the videos and make sure they play.
- Decide whether or not to show the whole *Norman Borlaug Documentary* video or only part of the video
- Hang/place 4 Corners Posters in four different locations of your classroom.
- Review the example scenarios. (Teacher may cut out cards or select from page)
- Copy “Technology, Conservation and Sustainability” sheet (1 per student)

Standards:

Social Studies: SS5.1.1, SS5.2.1, SS5.3.3, SS5.4.2 (Explicit)

ELA: 4.RI.7, 4.SL.1, 4.SL.2 (Practiced/Encountered)

CVE: CV5.1.4 (Practiced/Encountered)

Vocabulary:

- **Sustainable** - able to be maintained, able to last or continue for a long time
- **Tillage** - the preparation of land for growing crops
- **Technology** - the application of scientific knowledge for practical purposes, especially in industry.

Instructional Procedures/Steps:

Students will watch a selection of videos about technology and stewardship of Wyoming’s agriculture.

1. Review the answers from students’ sticky notes from the previous lesson that addressed the question, “What do you think farmers and ranchers do to be good stewards of their resources?” Ask: **“If you ask your grandparents how they got their food, they might have a different answer than you think. How do you think your grandparents or great-grandparents got their food?”**

Give students a chance to answer. *Responses may include: milking a cow, gathering eggs from chickens each morning, growing vegetables, etc.* **“How do most people get their food today?”** Responses may include going to the store, gardens, etc. If gardens are mentioned, discuss how they do not supply a year’s worth of food for a whole family like they would have in the past. **“The reason we get our food in a different way today is because agriculture has changed through the development of new technology and better stewardship practices. Today, we are going to watch several videos about how technology is helping both farmers and ranchers, as well as how farmers and ranchers are taking care of their land.”**

2. Hand out the video sheets. **“While we watch the videos, you are going to listen for specific information about either the technology or stewardship practices of each video to record on your note sheet.”**
3. **“We are going to start with a video that looks at farming practices on a farm here in Wyoming.”** Go over the things that they need to watch for in order to fill out their sheet for this video. Show (*Brandon Hessenthaller | Soil Management on Wyoming Farms and Ranches*, <https://www.youtube.com/watch?v=PcK2ioOxOxA>)
4. After the video, discuss with students their answers before moving on to the next video. (Refer to teacher answer sheet as needed)
5. **“In the next video, we are going to look at the various technologies that farmers are now using to make their work easier and to increase their yields.”** Go over the things that they need to watch for in order to fill out their sheet for this video. Show (*Farming by GPS Saves Money, Environment*, <https://youtu.be/qeyjSN9ANyY>)
6. After the video, discuss with students their answers before moving on to the next video. (Refer to teacher answer sheet as needed)

7. Ask: **“How has farming changed from the past?”** (pose the question, and let students do a short Mingle or Think, Pair, Share)
8. **“Not only are farmers using new technology and managing their resources better, but so are ranchers. This next video is going to show a ranch in Wyoming who is practicing good stewardship of their land in various ways.”** Go over the things that they need to watch for in order to fill out their sheet for this video. Show (2015 Wyoming Leopold Conservation Award Recipient - King Ranch, <https://youtu.be/OjeB38cmF9c>)
9. After the video, discuss with students their answers before moving on to the next video. (Refer to teacher answer sheet as needed)
10. **“Ranchers also have new technologies that are making their jobs easier and more efficient. This video shows just one.”** Go over the things that they need to watch for in order to fill out their sheet for this video. Show (Technology catches up to cows: US ranchers turn to 'precision livestock', <https://youtu.be/CqFBjyvjltc>)
11. After the video, discuss with students their answers before moving on to the next video. (Refer to teacher answer sheet as needed)
12. Ask: **“How has ranching changed from the past?”** (pose the question and let students do a short Mingle or Think, Pair, Share)
13. Now that students have watched all of the videos and have pulled out what technologies and good stewardship practices are being used, it's time to check their understanding with a round of Four Corners.
14. Assign one corner of the room to be Farming, one to be Ranching, one to be Both and the last corner to be Neither. Tell students you are going to give them a variety of examples of either technology or practices used by farmers and ranchers. They need to decide if it is something used in farming, ranching, both, or neither and then move to the corner of their decision. Give students

examples at random from the Teacher Example Sheet. How many examples you give is up to you and your available time.

15.  Lead a short discussion about how technology has helped change stewardship in ranching and farming. In the discussion, have students predict where technology might go in the future to continue helping agriculture practices. Ask students to provide reasoning for their predictions.
16. **“To wrap up today, we will watch one last video that shows an example of someone who used both technology and good stewardship practices in order to help advance wheat production in many countries.”** Show the video (*Norman Borlaug Documentary*, <https://youtu.be/fd6YmVnwNJ0>). Feel free to stop video at 2:55 if you are short on time.
17. After the video ask: **“How has technology changed the way we ranch and farm today?”** Look for examples from the videos and previous discussion. **“Do you think technology has improved agriculture? Why or why not?”** Make sure students are supporting their claim with valid reasons.

Assessment: The Four Corners activity provides a good check for student understanding. Pay attention to the discussion for any misconceptions. Make sure students are able to make the connection between new technologies and good stewardship practices.

Credits/Sources:

1. CGTN.(2017). *Technology catches up to cows: US ranchers turn to 'precision livestock'*. Retrieved on July 11, 2019 from <https://youtu.be/CqFBjyvjltc>
2. *Everything About Wyoming - New History- Water and Irrigation*. (2017). Retrieved on July 11, 2019, from http://wyomingalmanac.com/history_of_wyoming/new_history- water and irrigation



In this task, students will be engaged in the higher order thinking skill of synthesis by combining information to make a new prediction about future technology.

3. *Norman Borlaug Documentary*. (2015). Retrieved on July from <https://youtu.be/fd6YmVnwNj0>
4. SandCountyFdn. (2015). *2015 Wyoming Leopold Conservation Award Recipient - King Ranch*. Retrieved from <https://youtu.be/OjeB38cmF9c>
5. UWyoExtension. (2016). *Brandon Hessenthaller | Soil Management on Wyoming Farms and Ranches*. Retrieved on July 11, 2019, from <https://youtu.be/PcK2ioOxOxA>
6. VOA News. (2012). *Farming by GPS Saves Money, Environment*. Retrieved on July 11, 2019 from <https://youtu.be/qeyjSN9ANyY>

Video Note Sheet

Teacher Copy

Brandon Hessenthaller:

1. **(0:30)** By reducing some of your passes, what is the benefit for you guys? It saves **fuel**, it saves **time**, and money. It saves everything.
2. **(1:30)** This field just came out of beans and will go back into what next fall? It will go into **barley** next spring.
3. **(3:10)** So you're reducing your **tillage** in both your pivot-irrigated and flood-irrigated fields? Yes.
4. **(3:20)** There was a pivot that we brought in on some **new ground** that has really **helped** the soil health.
5. **(4:00)** So do you have any fields that you graze? We do. Anything with a significant amount of **crop** residue we will put **cows** on it and let them graze.
6. **(4:25)** It's encouraging to see that it's not **costing** you anything. So to make these changes, did it require investing in any new equipment? The only new piece of **equipment** was the disc ripper.

Farming by GPS:

1. **(0:10)** Farmer Brad Usetess is tilling razor straight lines with a **GPS-guided tractor**. With the computer in control, he barely has to steer.
2. **(0:25)** Hoses deliver **precise** amounts of fertilizer right into the grooves that the tiller cuts.
3. **(0:48)** Placing seed and fertilizer together with **centimeter precision** means fewer loads of fertilizer goes on the fields. You're able to use less, so of course, you're saving the **money**, and you're getting the same **performance** out of the crop.
4. **(1:25)** Jimmy Messic also uses **GPS** when he sprays weed killer. Before, he says it was easier to miss spots or overlap.
5. **(1:40)** GPS technology is **guiding** large-scale farm equipment across the country. Some harvesters also **monitor** how much crop is produced in each part of the field.
6. **(2:15)** It's hands-free technology that's saving **money** and saving the **environment**.



Video Note Sheet

Teacher Copy

King Ranch:

1. **(0:53)** Kendall Roberts is a **2nd** generation rancher at the King Ranch.
2. **(1:33)** Our open spaces have provided so much for those **animals** and that they continue to come back.
3. **(1:40)** We're like everyone else. We like clean **water**, clean **air**, and have a place to live. You can't **abuse** your resources and expect to sustain a family.
4. **(2:28)** We have lots of **conservation** practices at the ranch. We try to use the wind and the **sun**. We use **solar** generation to pump water. I think what's important when it comes to the water is not only the quantity but also the **quality**.
5. **(3:33)** New irrigation has saved them **60%** of their power bill, **20%** on their water and produces the same results with incredibly less **labor**.
6. **(3:40)** You can always work the land so that it's **smarter** and not harder.
7. **(4:48)** Ranching does provide a great opportunity for land conservation, and land preservation and managing all those important factors like **water**, **grass**, and **open spaces**.

Technology catches up to cows:

1. **(0:15)** This bovine has Marlene's **constant attention**, even when Marlene is not by its side.
2. **(0:25)** It can check it's **internal temperature**, and the outdoor temperature, how many steps they've taken, how many times she's come into water, and how far out in the pasture she is going. How exactly? Using these **ear tags**.
3. **(0:40)** One day she was visiting some ranchers and they started talking about their **big problem** which was **gathering data** from the animals tags when the animals were out in pasture. It's nearly impossible. Not anymore. With the help of **bluetooth technology**, cattle owners can learn much more about their cows and steers activity and health.
4. **(1:15)** When it comes to livestock, **technology** is making its presence felt more and more.
5. **(1:35)** Rancher Mark Fraiser uses this device to **manage** his cattle and most importantly their weight. Now I have the ability to track back and find which animals grew well for use and which animals didn't. I can use that in making **purchasing decisions**. That's something that just simply wasn't possible **15** or **20** years ago.



Video Note Sheet

Brandon Hessenthaller:

1. By reducing some of your passes what is the benefit for you guys? It saves _____, it saves _____, and money. It saves everything.
2. This field just came out of beans and will go back into what next fall? It will go into _____ next spring.
3. So you're reducing your _____ in both your pivot irrigated and flood irrigated fields? Yes.
4. There was a pivot that we brought in on some _____ that has really _____ the soil health.
5. So do you have any fields that you graze? We do. Anything with a significant amount of _____ residue we will put _____ on it and let them graze.
6. It's encouraging to see that it's not _____ you anything. So to make these changes did it require investing in any new equipment? The only new piece of _____ was the disc ripper.

Farming by GPS:

1. Farmer Brad Usetess is tilling razor straight lines with a _____. With the computer in control he barely has to steer.
2. Hoses deliver _____ amounts of fertilizer right into the grooves that the tiller cuts.
3. Placing seed and fertilizer together with _____ means fewer loads of fertilizer goes on the fields. You're able to use less, so of course you're saving the _____ and you're getting the same performance out of the crop.
4. Jimmy Messic also uses _____ when he sprays weed killer. Before he says it was easier to miss spots or overlap.
5. GPS technology is _____ large-scale farm equipment across the country. Some harvesters also _____ how much crop is produced in each part of the field.
6. It's hands-free technology that's saving _____ and saving the _____.



Video Note Sheet

King Ranch:

1. Kendall Roberts is a _____ generation rancher at the King Ranch.
2. Our open spaces have provided so much for those _____ and that they continue to come back.
3. We're like everyone else. We like clean _____, clean _____, and have a place to live. You can't _____ your resources and expect to sustain a family.
4. We have lots of _____ practices at the ranch. We try to use the wind and the _____. We use _____ generation to pump water. I think what's important _____ when it comes to the water is not only the quantity but also the _____.
5. New irrigation has saved them _____ of their power bill, _____ on their water and produces the same results with incredibly less _____.
6. You can always work the land so that it's _____ and not harder.
7. Ranching does provide a great opportunity for land conservation, and land preservation and managing all those important factors like _____, _____, and _____.

Technology catches up to cows:

1. This bovine has Marlene's _____ even when Marlene is not by its side.
2. It can check it's _____, and the outdoor temperature, how many steps they've taken, how many times she's come into water, and how far out in the pasture she is going. How exactly? Using these _____.
3. One day she was visiting some ranchers and they started talking about their _____ which was _____ from the animals tags when the animals were out in pasture. It's nearly impossible. Not anymore. With the help of _____, cattle owners can learn much more about their cows and steers activity and health.
4. When it comes to livestock, _____ is making its presence felt more and more.
5. Rancher Mark Fraiser uses this device to _____ his cattle and most importantly their weight. Now I have the ability to track back and find which animals grew well for use and which animals didn't. I can use that in making _____. That's something that just simply wasn't possible _____ or _____ years ago.



Four Corners

Farming



Four Corners

Ranching



Four Corners

Both



Four Corners

Neither

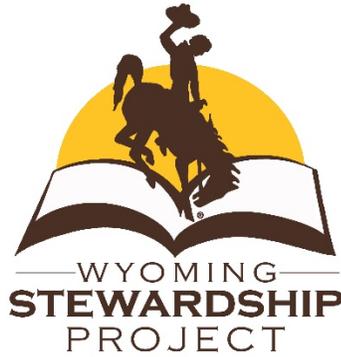


Four Corners

Example Sheet

| Ranching | Farming | Both | Neither |
|---|--|---|---|
| Solar power to pump water for livestock | Crop rotation: planting crops in different fields each year | Manage land for use by livestock | Cattle graze the same pasture all year |
| Use ear tags to gather data about animals | Use GPS tractor to plant fields | Provide an opportunity for land conservation and management | Grow the same crop in one field for 10 years |
| Use bluetooth technology to detect sick livestock | Use technology to precision plant seeds and apply fertilizer to use less of each | Water conservation | Focus only on making money |
| Use technology to track animal growth | | Share space with wildlife | Use as much fertilizer as possible on a field at inconsistent times |





Lesson Six: Making Dollars and Cents

Grade Level: 4th Grade

Time: 45-60 minutes

Essential Question: How can we be stewards of Wyoming's agriculture to benefit current and future generations?

Objectives: Students will:

- Compare and contrast the cost/benefit of crops and livestock as they apply to our state.
- Ensure sound stewardship practices for both the land and livestock of Wyoming.

Purpose: Students gain an understanding of stewardship in agriculture and economy through activities based on cost/benefit.

Required Materials/Resources:

- Wyoming Agriculture Commodity Cards - These MUST be printed back to back to ensure that the correct information on the back lines up with its corresponding crop/livestock. (Source 1)
 - If there are more cards than students, give multiple cards to different students. If there are more students than cards, give one card to every pair of students, or make multiple copies of some of the cards.
 - Beans will be the example that you will model, so do not assign it.
- Commodity posters
- Cost/Benefit recording sheet (one per student)

TEACHER NOTE:
Prices are reported by five-year averages due to the fact there are always fluctuations in market prices. We realize that there are laws, regulations, and other factors that impact the number/amount of livestock or crops per acre. However, students will focus only on the economic revenue. The math was simplified to help students focus on the cost/benefit aspect of this lesson.

TEACHER NOTE:
Save students'
Cost/Benefit
sheets for Lesson
6.

- Media device to play music
- Pencils
- Timer (optional)
- Scratch paper made available to work problems if needed

Suggested Teacher Preparation:

- Preview the Cost/Benefit sheet answer key.
- Decide how you are distributing the Wyoming Agriculture Commodity Cards.
- Print six animal/crop posters.
- Set up the room for Meet in the Middle activity. Place the six Commodity posters on opposite walls of the classroom. Place Bison across the room from Beef; Corn across from Goats; and Hogs across from Sugarbeets. *The Meet in the Middle activity is adapted from the Four Corners activity (Source 2).*

Standards:

Social Studies: 5.3.2 (Explicit)

ELA: 4.RI.1, 4.RI.7, 4.SL.1, 4.SL.2, 4.SL.4 (Practiced/Encountered)

Math: 4.NBT.4 (Practiced/Encountered)

CVE: CV5.2.2 (Practiced/Encountered)

Vocabulary:

- **Benefit** - an advantage or profit gained from something
- **Cost/benefit** - the study of how much money a business earns compared to how much money it spends
- **Overgraze** - a situation where too much of the forage in an area has been eaten, causing a negative effect on the plants
- **Profit** - money that is made in a business after all costs and expenses are paid
- **Revenue** - money that is made by or paid to a business or an organization

Instructional Procedure/Steps:

Day 1:

1. Say: **“Today we are going to study the costs and**

benefits of different crops and livestock.” Ask: “What do you think cost/benefit is?” Let students respond. Say: **“Cost/benefit is the study of how much money a business earns compared to how much money it spends.”** Ask: **“Why do ranchers and farmers need to look at cost/benefit?”** *Ranchers/farmers need to be able to decide what to plant/raise in order to make the most profit on their land. They aren’t going to plant/raise something that is going to cost more to develop than what they are going to potentially earn from the sale of it.*

2. Pass out the Cost/Benefit recording sheet. Show students the Beans Commodity card. Model for students where to locate the information for the Cost/Benefit recording sheet using Beans as an example.
3. Say: **“We will be playing a game called ‘Find Someone Who.’ This game allows you to complete column two and three on the Cost/Benefit sheet. Don’t worry about column 4 right now. We will get to it later. Everyone** (or pair depending on how cards have been distributed) **will receive a card that has two sides: one side has a picture of a type of livestock/crop and the other side has the information needed in order to fill out the Cost/Benefit recording sheet. I will play music. When it stops, find a partner** (or another pair) **and exchange information to fill out columns two and three on your sheet. We will continue this process until everyone has completely filled out columns two and three on your sheets. We will deal with column four in a little bit. Questions?”**
4. Pass out pencils and the Commodity cards. Begin the game. Play music for 15-20 seconds. When the music stops, students stop where they are and find a partner. Give the students 45 seconds to a minute to record the information needed for their Cost/Benefit recording sheet. If necessary, display a timer for each round.

5. Continue playing 'Find Someone Who' until everyone has completed columns 2 and 3 on the Cost/Benefit recording sheet. At the end of the activity, ask: **"Is anyone missing any livestock or crop data?"** If so, have them buddy check with a neighbor to get the information needed.

6. Model how to calculate the profit for the fourth column using the Beans example again. Demonstrate how you need to subtract the cost from the income to find out how much money was made for each livestock or crop. Have students calculate the profit in the fourth column for the benefit/income per head/acre either by themselves or with a partner. You may need to support them with the math. When all students are finished, have them share their findings with a partner (or another pair) to confirm the profit numbers.

7. Have a class discussion about each commodity and allow students to share their thinking about the profit for each crop and livestock. Afterwards, pose the following questions to the students:
 - **If farmers only worry about their profit, is that good stewardship?**
 - **How can farmers be good stewards and still make a profit?**
 - **If ranchers overgraze their pastures to make more profit, is that being a good steward?**
 - **Does the crop or livestock need special conditions to thrive? Think about irrigation, precipitation, topography and other factors we discussed in Lesson 2.**
 - **How can ranchers be good stewards and still make a profit?**

8.  Introduce the Meet in the Middle activity. Draw student attention to the 6 posters hanging around the room. Using the poster choices and the data and concepts from the Cost/Benefit recording sheet and discussion, give students 30 seconds to decide which livestock or crop they would choose to raise.
9. After the allotted think time, students walk to the location of their choice. All students gathered under each poster should discuss their reasoning for their selection including information from the Cost/Benefit recording sheet. For example, students selecting beef, discuss with others that also selected beef.

10.  After 1 minute, students meet the group from the opposite side of the classroom in the middle of the room. Students justify their livestock/crop selection with the opposing group. Allow 1-2 minutes for sharing; all students must share at least one idea.

11.  After the Meet in the Middle sharing is finished, collect the Cost/Benefit recording sheets, and ask the following questions to the whole group:
- **Who would select the same animal or crop? Why?**
 - **Who would make a different choice? What would you choose, and why?**
 - **How does your choice relate to being a good steward?**

Assessment: Assess student understanding of Cost/Benefit during the Meet in the Middle discussions, and check that students' calculations are correct on the Cost/Benefit recording sheets. Save the Cost/Benefit recording sheets because students will use them in the next lesson.



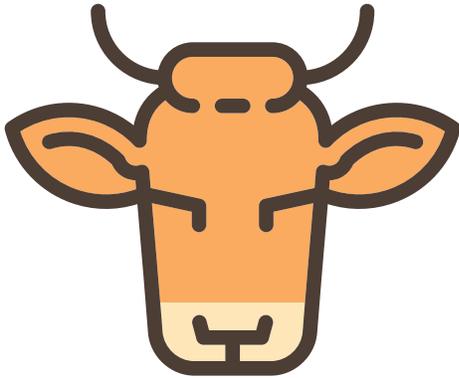
In this task, students will be engaged in the higher order thinking skill of evaluation by comparing ideas, evaluating outcomes, and defending claims in Meet in the Middle activity.

Credits/Sources:

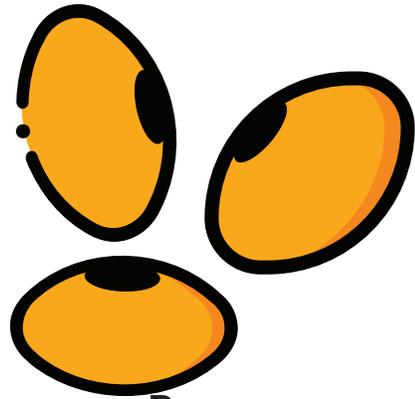
1. Commodity Costs and Returns. (n.d.). Retrieved October 5, 2017, from <https://www.ers.usda.gov/data-products/commodity-costs-and-returns/commodity-costs-and-returns/#Current%20Costs%20and%20Returns:%20All%20commodities>
2. theteachertoolkit. (n.d.). *Four Corners*. Retrieved August 6, 2018, from <http://www.theteachertoolkit.com/index.php/tool/four-corners>
3. Crop Enterprise Budget: Alfalfa Hay Baled, Wheatland Area. (June 1992). Retrieved October 17, 2018 from <http://www.wyomingextension.org/agpubs/pubs/WYMP72-1.PDF>

Wyoming Agriculture

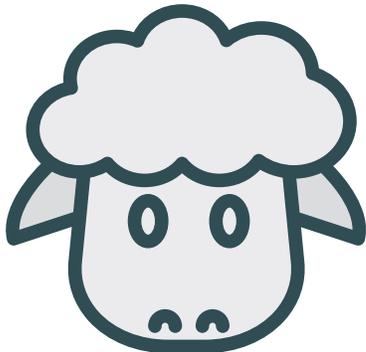
Commodity Cards



Beef



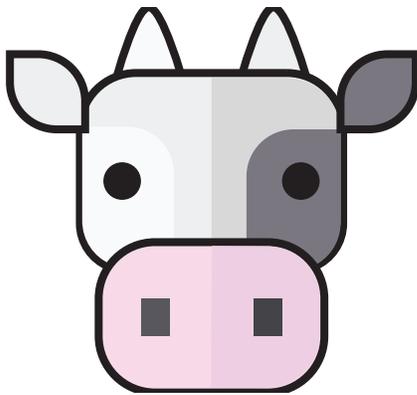
Beans



Sheep



Corn



Dairy



Goats

Wyoming Agriculture

Commodity Cards

Income of beans per acre:

\$359

Cost of beans per acre:

\$124

Source 1

Income of beef per head:

\$736

Cost of beef per head:

\$577

Source 1

Income of corn per acre:

\$693

Cost of corn per acre:

\$332

Source 1

Income of sheep per head:

\$279

Cost of sheep per head:

\$164

Source 1

Income of goats per head:

\$96

Cost of goats per head:

\$91

Source 1

Income of dairy per head:

\$3,790

Cost of dairy per head:

\$3,610

Source 1

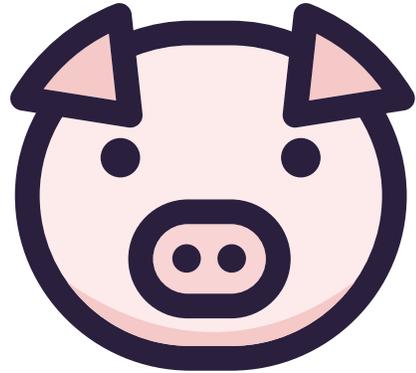


Wyoming Agriculture

Commodity Cards



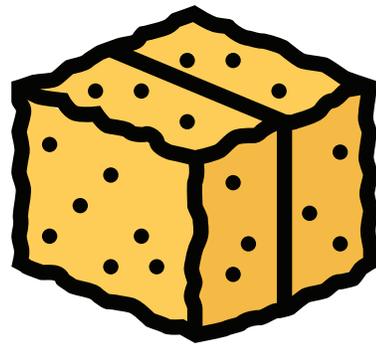
Grains



Hogs



Sugarbeets



Alfalfa Hay

Wyoming Agriculture

Commodity Cards

Income of hogs per head:

\$90

Cost of hogs per head:

\$39

Source 1

Income of grains per acre:

\$800

Income of grains per acre:

\$380

Source 1

Income of alfalfa hay per acre:

\$350

Cost of alfalfa hay per acre:

\$312

Source 3

Income of sugarbeets per
acre:

\$920

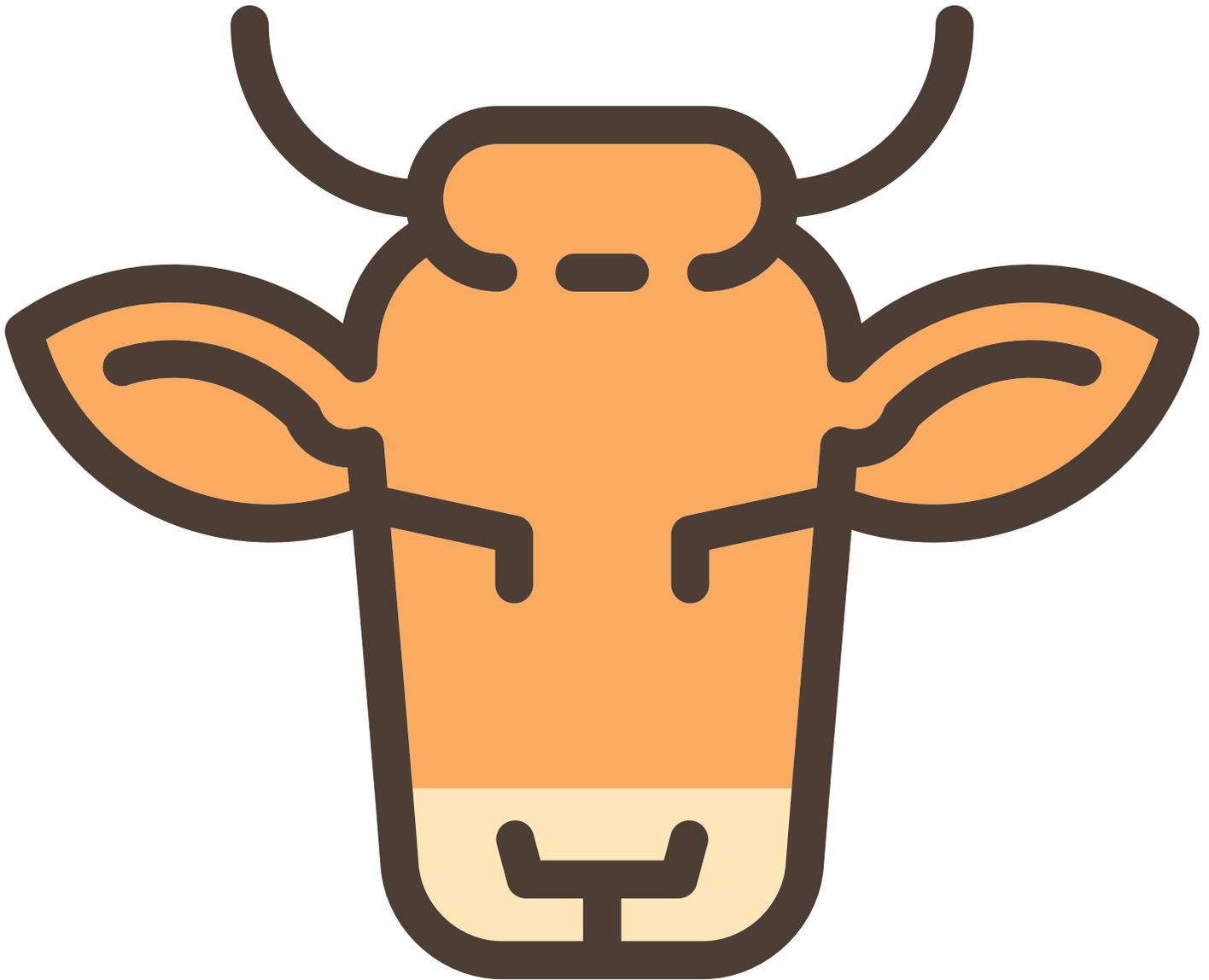
Cost of sugarbeets per acre:

\$400

Source 1



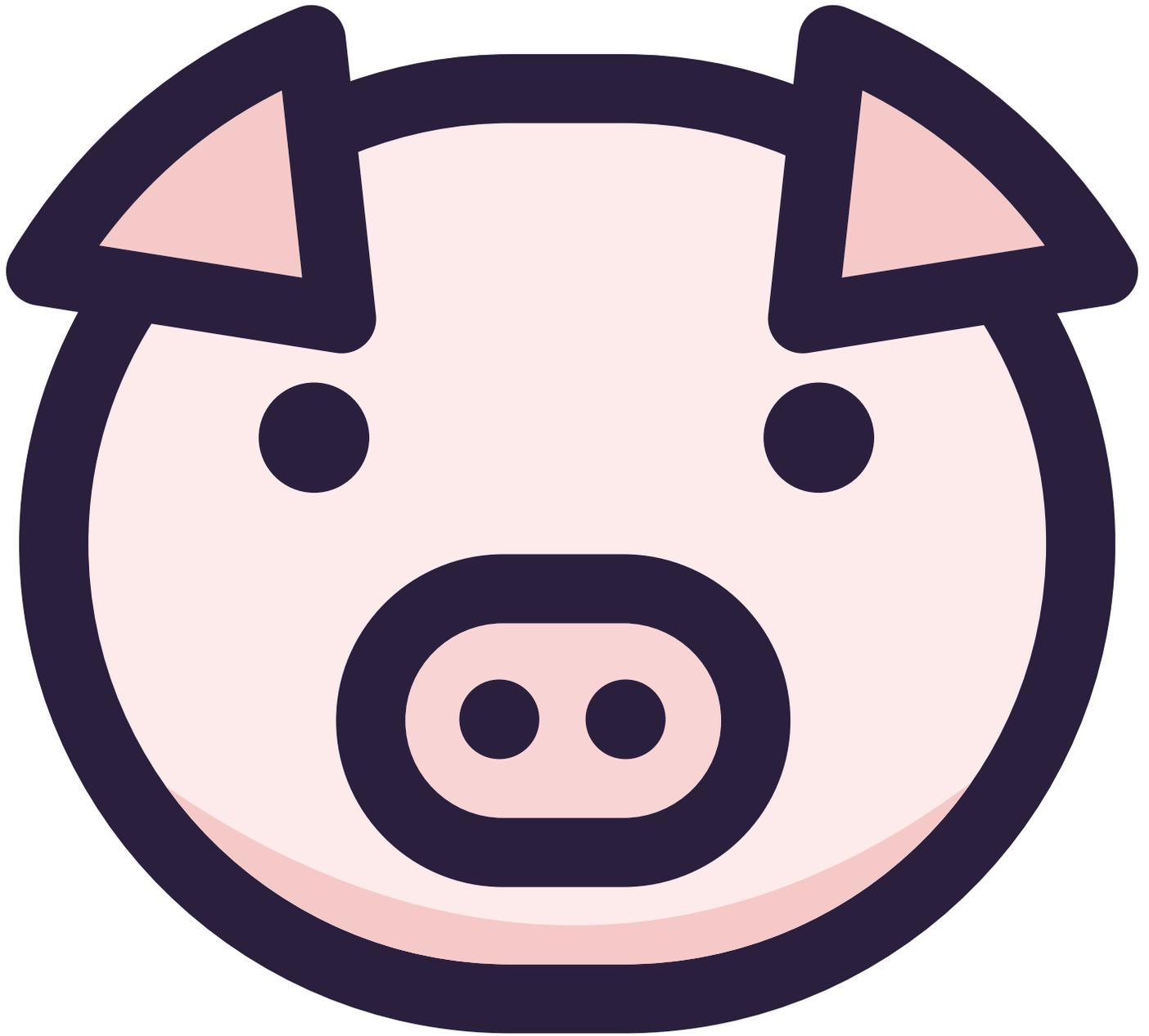
Beef



Corn



Hogs



© 2018 Wyoming Agriculture in the Classroom Materials

Sheep



© 2018 Wyoming Agriculture in the Classroom Materials

Goats



© 2018 Wyoming Agriculture in the Classroom Materials

Sugar Beets



© 2018 Wyoming Agriculture in the Classroom Materials

Cost/Benefit

Name: _____

| Name of Livestock/ Crop | Income of Crop per Acre Income of Livestock per Head | Cost of Crop per Acre Cost of Livestock per Head | Income - Cost = Profit |
|------------------------------------|---|---|-----------------------------------|
| Beans | \$359 | \$124 | \$235 |
| Beef | | | |
| Corn | | | |
| Dairy Cow | | | |
| Goats | | | |
| Grain | | | |
| Hay (Alfalfa) | | | |
| Hogs | | | |
| Sheep | | | |
| Sugar Beets | | | |



Cost/Benefit

Name: **Answer Key**

| Name of Livestock/ Crop | Income of Crop per Acre Income of Livestock per Head | Cost of Crop per Acre Cost of Livestock per Head | Income - Cost = Profit |
|--------------------------------|---|---|-------------------------------|
| Beans | \$359 | \$124 | \$235 |
| Beef | \$736 | \$577 | \$159 |
| Corn | \$693 | \$332 | \$361 |
| Dairy Cow | \$3,790 | \$3,610 | \$180 |
| Goats | \$96 | \$91 | \$5 |
| Grain | \$800 | \$380 | \$420 |
| Hogs | \$90 | \$39 | \$51 |
| Hay (Alfalfa) | \$350 | \$312 | \$38 |
| Sheep | \$279 | \$164 | \$115 |
| Sugar Beets | \$920 | \$400 | \$520 |





Lesson Seven: Seeking New Management

Grade Level: 4th Grade

Time: 3 Days (30-40 minutes each day)

Essential Question: How can we be stewards of Wyoming's agriculture to benefit current and future generations?

Objectives: Students will:

- Understand Wyoming's agriculture and the complexity of decisions that people in this industry make on a regular basis.
- Create positive stewardship practices for our state.

Purpose: Students will construct a design of a ranch or farm that demonstrates stewardship of Wyoming to create the most profit.

Required Materials/Resources:

- Maps from Lesson 2 (one set per group)
- Completed Cost/Benefit recording sheets from Lesson 6 (each student/pair will get their own)
- Agriculture Scenario sheets (one per group)
- Acre sheets (one set of the acre papers per group)
- Livestock Cost/Profit Conversion (one per group)
- Budget Summary sheet (one per group)
- Butcher paper (one large piece for each group)
- Glue/tape and scratch paper for each group
- Quick Write (one per student)

TEACHER NOTE:

Students will be tasked with becoming a ranch/farm manager of a 10-acre, undeveloped, plot of land.

Groups will use all resources and products from the previous lessons to determine what their land will raise, grow, or both raise and grow. Students will have certain constraints to follow to make sure the land is stewarded appropriately.

Explain to the students these constraints need to be followed to ensure that the land is not overgrazed, and livestock has sufficient amount of food and water year-round. Students need to keep in mind that if their land is in a drier, non-irrigated area, some acreage should be kept open only for grazing.

Suggested Teacher Preparation:

- Decide whether to put students into new groups or have them stay in the groups from previous lessons.
- Choose the Wyoming county all groups will use for the project.
- Read the teacher note about the constraints and expectations of the culminating activity.

Standards:

Science: 4-ESS2-2, 3-5-ETS1-1 (DCI,SEP), 3-5-ETS1-2 (DCI,SEP) - (Practiced/Encountered)

ELA: 4.SL.1, 4.SL.2, 4.SL.4 (Practiced/Encountered)

Math: 4.NBT.4 (Practiced/Encountered)

CVE: CV5.1.4, CV5.2.1, CV5.2.2, CV5.2.3, CV5.3.2, CV5.3.3, CV5.4.1 (Practiced/Encountered)

Vocabulary: No new vocabulary is introduced

Instructional Procedure/Steps:

Day 1:

1. Place students into groups of 2-4. Provide each group with an Agriculture Scenario sheet explaining the culminating activity.
2. With the whole group, review the Agriculture Scenario sheet and the following constraints for setting up their ranches/farms. Say:
 - **“Today, you get to be the managers of your new ranch/farm. Please give your ranch/farm a name. To be good stewards of this property, you will need to consider everything we have learned about so far. Think about the topography and climate of your ranch/farm, and the responsibility involved in caring for your livestock and crops.”**

- **“The 10 acres can be managed as one large piece of land, or it can be broken into smaller pieces that are each managed differently. For example, you could use 3 acres for cropland and 7 acres of rangeland for grazing. Acre plots can be configured in various ways but must share at least one common border with no space between.**
- **Each acre may have only one type of crop or livestock grown or raised on it.**
- **If crops are grown on an acre, livestock cannot be raised in that acre.**
- **If livestock is raised in an acre, crops cannot be grown in that acre.**
- **You will use the information from Lesson 5’s Cost/Benefit recording sheet to complete the Livestock Cost/Profit Conversion and Budget Summary sheets.”**

Spend some time reviewing that too many livestock on the grass can cause overgrazing and multiple years of farming on a certain acre can damage the soil quality. Students will need to take this into consideration when planning how to use their land for the best profit. Field and pasture rotations are stewardship strategies used to maintain the health of the land.

3.  Assign the Wyoming county that ALL groups will be using. For example, if you pick Laramie County, all students will use Laramie County for the ranch/farm simulation. Students will then need to look at/review the maps from Lesson 2 to determine what topography, climate, and precipitation may affect that county. They will also need to look at the irrigation map to determine if the county has that resource. All of these maps will help the groups decide what livestock or crops should be grown/raised on their land.



In this task, students will be engaged in the higher order thinking skill of evaluation by critiquing information gained from the whole unit. Students will also compare ideas about stewardship with peers to evaluate and strategically plan their ranch or farm to demonstrate good stewardship.

4. Give students time to start planning ideas. When time is up, collect any thoughts/ideas groups have created, so they are not lost/forgotten before the next day.

Day 2:

TEACHER NOTE:

Make sure to point out to students that their Cost/Benefit recording sheet profit is per head of livestock, so if they have multiple animals, they will need to multiply that profit by the total number of livestock. For crops, the profit is calculated per acre, so no additional math is necessary.

1. Pass out the Acre sheets, any thoughts/ideas students had the day before, and all resources from other lessons to each group.
2. Let students begin to work on the project. Each group will fill out what crop(s) or livestock(s) will be raised on each individual acre. Students should color code each acre or create their own map key to represent the choices for the acres. Individual Acre sheets can be cut out and re-assembled on the butcher paper for presentation when students have completed their project.
3. Groups complete the Livestock Cost/Profit Conversion sheet.
4. When all 10 acres have been developed, groups should complete the Budget Summary sheet.
 - List the crop/livestock grown on each acre.
 - Fill in the cost per acre for each crop/livestock.
 - Calculate the profit per acre.
 - Calculate the totals for the cost column, profit column, and total ranch/farm profit.
5. Collect all groups' Acre sheets and materials at the end of the time period. When groups finish, have students tape the sheets together to represent their 10 acres and attach it to the butcher paper. Have students do this on the final day if you are giving them extra time to finish before they

TEACHER NOTE:

The cost and income per acre for all crops will be found on the Cost/Benefit sheet from Lesson 6. The cost and income per acre for all livestock will be found on the Livestock Cost/Profit conversion sheet.

present.

Day 3:

1. Have students finish their acre sheets and attach them to the butcher paper if you gave them extra time to complete their project.
2. When each group has completed their ranch/farm project, hang them around the room. Each group will have a chance to share their completed ranch/farm project with the class by using the gallery walk technique. Half of the groups stand by their sheets and present while the other groups rotate and listen. When all groups have been heard, flip and complete the process again. Each group will share what they grew and/or raised and explain why they made the decisions that they did.
3. After all groups have presented, reconvene the whole class and ask the following question: **“After looking at everyone’s ranch/farm project, are there any changes that you would make on your property, why or why not?”** Allow all groups to share their thoughts.
4. After students have discussed their ranch/farm projects, have them take out the maps from Lesson 2. Point out that while the ranch/farm project managed 10 acres, the average size of farms and ranches in Wyoming is over 2,600 acres. Some are smaller, and others are much larger. Using the map resources from Lesson 2, discuss how the size of ranches, when combined with the precipitation, topography, and irrigation potential of an area, are all factors that ranchers and farmers must consider when managing their businesses.
 - Ask students to share what they notice about where larger numbers of crops and livestock are raised or grown when comparing the maps



In this task, students will be engaged in the higher order thinking skill of synthesis by combining information gained from the maps to learn about good stewardship and economic decisions.



In this task, students will be engaged in the higher order thinking skill of evaluation by critiquing information gained from the whole unit. Students will also compare ideas about stewardship with peers to evaluate and strategically plan their ranch or farm to demonstrate good stewardship.

side-by-side.



- Say: **“How might your decisions have been different with a larger ranch/farm size and/or your ranch/farm was in a different county.”** Draw student’s attention to the fact that you wouldn’t run a cattle ranch on 10 acres, though 10 acres may be enough for a small farm.



Assessment: Pass out Quick Write sheets, on which students answer the following question: **“When planning how to use your 10 acres, what things did you need to consider in order to be a good steward of your land in Wyoming?”** *In their Quick Writes, students should make the connection that they needed to look at their environment (topography, precipitation, irrigation) to decide what crops/livestock would be the best to raise on their land. They should also write about crop rotation, which takes care of the soil, and how many animals they could raise on the land to avoid overgrazing. They should include the economic impact of the different options and how they made land use decisions that would also be profitable. Finally, they should identify that all of these decisions are good stewardship practices.*

Credits/Sources: Not applicable

Agriculture Scenario Sheet

Group Members:

Congratulations! Your group has been selected to be managers of your own ranch/farm, a 10-acre property in Wyoming. You will need to plead a case for whether the land should be used for crop production, raising livestock, or both. In order for the land to be productive, yet ensure good stewardship practices, you will use all the information gathered from the previous lessons one through five.

Here are a few reminders when you are planning your ranch/farm. Use the checklist below to use as a guide:

- The 10 acres can be kept whole, or it can be broken into smaller sections that are each managed differently.
- Each acre may have only one type of crop or livestock grown or raised on it.
- If crops are grown on an acre, livestock cannot be raised in that acre.
- If livestock are raised in an acre, crops cannot be grown in that acre.
- To prevent overgrazing (good stewardship practices), there is a limit to how many head of livestock can be raised on each acre. The number of livestock that can be raised on each acre are listed in the chart at the bottom of this page.
- You have already determined the cost and profit of livestock per head. Now you will need to figure out how the total cost and income of livestock per acre.
- Crops can only be grown in a section for one year. Then, they must rotate to a new section to be farmed the following year (good stewardship practices). You will need to take this into consideration when planning how to use your land for the best profit. This means that you can grow each crop on no more than 5 acres.

| Livestock | Number of livestock allowed per acre |
|------------------|---|
| Beef | 1 |
| Hogs | 25 |
| Sheep | 10 |
| Dairy Cow | 1 |
| Goats | 5 |



Acre Sheet

Choose which crop or livestock you will raise or grow on each acre. Create a color code or draw symbols to represent each crop or livestock in the key below, then fill in each acre with the symbol or color you have chosen.

Key:

Acre 1

Acre 2



Acre Sheet

Acre 3

Acre 4

Acre 5

Acre 6



Acre Sheet

Acre 7

Acre 8

Acre 9

Acre 10



Livestock Cost/Profit Conversion

To determine the total cost and profit for livestock on each acre, you will need to multiply the number of livestock allowed per acre by the amount of profit they can earn. The profit per head can be found by looking at your Cost/Benefit sheet.

| Livestock | Number of livestock allowed per acre | Profit per head | Total profit of all livestock for ONE acre (profit x number of livestock allowed per acre) |
|-----------|--------------------------------------|-----------------|---|
| Beef | 1 | \$ | \$ |
| Hogs | 25 | \$ | \$ |
| Sheep | 10 | \$ | \$ |
| Dairy Cow | 1 | \$ | \$ |
| Goats | 5 | \$ | \$ |

| Livestock | Number of livestock allowed per acre | Cost per head | Total cost of all livestock for ONE acre (profit x number of livestock allowed per acre) |
|-----------|--------------------------------------|---------------|---|
| Beef | 1 | \$ | \$ |
| Hogs | 25 | \$ | \$ |
| Sheep | 10 | \$ | \$ |
| Dairy Cow | 1 | \$ | \$ |
| Goats | 5 | \$ | \$ |

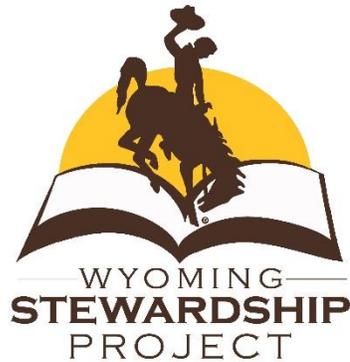


Budget Summary

Record which crop or livestock you chose to grow or raise on each acre. Fill in the income and cost per acre by looking at your cost/benefit sheets, and your Livestock Cost/Profit Conversion sheets.

| | Crop/Livestock | Income per Acre | Cost per Acre | Profit per Acre (Income - Cost) |
|----------------|----------------|------------------------------|----------------------------|------------------------------------|
| Acre 1 | | | | |
| Acre 2 | | | | |
| Acre 3 | | | | |
| Acre 4 | | | | |
| Acre 5 | | | | |
| Acre 6 | | | | |
| Acre 7 | | | | |
| Acre 8 | | | | |
| Acre 9 | | | | |
| Acre 10 | | | | |
| Totals: | | Total Income per Acre | Total Cost Per Acre | Total Ranch/Farm Profit |





Glossary

| | |
|----------------------|---|
| Acre | a unit of land area (about the size of a football field); a unit of measure to describe areas of land 66' x 660' or 1/640 mi ² |
| Aerate | Process of introducing air into the soil to improve plant growth |
| Agriculture | cultivating of the soil, producing of crops, and raising of livestock |
| Benefit | an advantage or profit gained from something |
| Biotechnology | the use of living organisms to produce products for humans |
| Census | the official process of counting the number of people in a country, city, or town, and collecting information about them |
| Commercial | buying and selling of goods and services |
| Commodities | something of use, advantage, or value |
| Consume | (1) eat or drink resource; (2) use a resource |
| Cost/Benefit | the study of how much money a business earns compared to how much money it spends |
| Crop | a cultivated plant that is grown for food, fiber, or livestock feed |
| Economy | financial system of interaction and exchange |
| Export | to send a product to be sold |

| | |
|--------------------------|---|
| Farmer | a person who cultivates land or crops and may also raise livestock |
| Harvest | (1) gather a crop; (2) process an animal for consumption |
| Inhabitant | a person or animal that lives in a particular place |
| Irrigation | the process of delivering water to crops |
| Livestock | animals kept for use and profit |
| Modernization | to make something modern and more suited to present styles or needs |
| Overgraze | a situation where too much of the forage in an area has been eaten, causing a negative effect on the plants |
| Precipitation | the amount of water an area receives through weather; example: rain and snow |
| Process (Animals) | to turn a live animal into products that can be easily used by humans |
| Processing plant | a facility where live animals are turned into food products that can be easily used by the consumer |
| Profit | money that is made in a business after all costs and expenses are paid |
| Rancher | a person who raises livestock and may also cultivate the land or crops |
| Rangeland | land used for livestock and/or wildlife grazing |
| Revenue | money that is made by or paid to a business or an organization |
| Rural | living outside of a city |
| Steward | an individual who manages areas or resources |
| Stewardship | As Wyoming citizens, we are stewards entrusted with the responsible development, care, and use of our resources to benefit current and future generations |
| Surpassed | to be better or greater than someone or something |

| | |
|--------------------|---|
| Sustainable | able to be maintained; able to last or continue for a long time |
| Sutler | a person who followed an army or maintained a store on an army post to sell to soldiers |
| Technology | the application of scientific knowledge for practical purposes |
| Tillage | |
| Topography | the features such as mountains and rivers in an area of land |
| Trichinosis | a disease resulting from uncooked pork |
| Ungulate | hoofed mammal |
| Urban | living in a city |