3

ANIMALS

MODULE 3 | Investigating Rangeland Systems and Practices

SKILL LEVEL

Middle School: Grades 6, 7, 8

KEY TERMS

Herbivore, digestion, absorption, cellulose, ruminant, non-ruminant

EDUCATION STANDARDS

SD Science:

- MS-LS1-6
- MS-LS1-7

NGSS:

- MS-LS1-6
- MS-LS1-7

TIME NEEDED

Activity 1: 30 min
Activity 2: 20 min + followup
Activity 3: 50 min
Activity 4: 50 min
Activity 5: 10-15 min

MATERIAL LIST

- Chalkboard or whiteboard
- Print items in Appendices
- Computer w/ projector
- Materials listed for each activity

FUNDING ACKNOWLEDGEMENT

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This material was created by the following South Dakota State University employees:

- *Krista Ehlert, Ph.D. – Assistant Professor, Extension Range Specialist*
- *Christine Wood – Extension 4-H STEM Field Specialist*
- *Jessalyn Bachler, Former Extension Range Field Specialist*

For questions, contact Ehlert: krista.ehlert@sdstate.edu

EXPECTED LEARNER OUTCOMES

OBJECTIVE 1

Students will be able to identify the components of a scientific journal entry and use descriptive writing in their entries.

OBJECTIVE 2

Students will learn about grassland birds, the role grazing, and ranching have in creating bird habitat, and practice observing grassland birds.

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OBJECTIVE 3
Students will further investigate the role photosynthesis has in allowing plants to grow, which rangeland animals eat and digest, adding to the cycling of matter and the flow of energy.

OBJECTIVE 4
Students will learn the functions of the basic components of an animal's digestive system, with emphasis on ruminant and non-ruminant systems.

OBJECTIVE 5
Students will compare the lengths and volumes of digestive organs in an outdoor demonstration.

Figure 1. Black and red angus cattle on a rangeland in South Dakota. (Source: Krista Ehlert, SDSU).

BACKGROUND

The ability to observe is critical to the development of scientific skills and lifelong learning. Scientists use lab notebooks and field journals to document their activities and observations. Lab notebooks are kept so that there is a record of the experiments being conducted – why is the experiment happening? What is the research question? What materials are needed? What is the outcome of the experiment? In a similar sense, field journals are kept by scientists as a record of their observations – "the who, what, where, when, why, and how" aspects. Both lab notebooks and field journals allow a scientist to come back to their work and reflect on what worked or what didn't work, and it also can provide evidence of changes over time, such as observing an animal like a bird in the winter versus the summer. Activity #1 focuses on having students learn what a field journal is, why it is important, and the components of a strong entry. Activity #2 helps

connect a real-world experience of observing a bird, to what students learned in the classroom about journal entries, solidifying and repeating key concepts.

Activities #3 and #4 transition students to learning about two types of digestive systems that are found in animals that utilize rangelands – a ruminant digestive system (e.g. a cow) and a non-ruminant digestive system (e.g. a horse). The role of ruminants such as cows in rangelands is critical. As students learned in Module 1: Overview of Rangelands, there are rangelands all over the world and not all land is suited for farming – which is where grazing animals such as cows come in. Thus, ruminants act as efficient converters of forages like grass, and they transform it into edible energy and protein by humans. This is done through the process of photosynthesis (Module 2: Plants). Plants perform photosynthesis as their way of making food from the sun's energy, carbon dioxide, and water. During photosynthesis, carbon dioxide and water combine with solar energy to create glucose, a carbohydrate ($C_6H_{12}O_6$), and oxygen. In fact, photosynthesis is directly involved in the cycling of matter and the flow of energy into and out of organisms. Ruminants like cows keep ecosystems healthy by grazing plants – cows eat plants, digest them, and poop and pee out nutrients that all started with the process of photosynthesis. The nutrients from cow poop and pee are then incorporated into the soil and used by plants to grow and perform photosynthesis – completing the cycle.

VOCABULARY

HERBIVORE: an animal that feeds on plants

DIGESTION: the process of breaking down food

ABSORPTION: the movement of nutrients, water, and electrolytes through the wall of the intestine

CELLULOSE: the main part of plant cell walls

RUMINANT: an ungulate mammal that chews the cud regurgitated from its rumen; can digest cellulose with the help of bacteria

NON-RUMINANT: an animal with a single chambered stomach; cannot digest cellulose

ACTIVITY #1: FIELD JOURNALS

ESTIMATED TIME: 30 MIN

Materials

- Copies of William Strong Journal Example (1 per student)
- PowerPoint Presentation "How do scientists keep track of their work?"

1. Hand each student a copy of William Strong's journal entry and give them a few minutes to look over the journal entry.
2. Ask students the following discussion questions:
    a. What kind of book do you think this came from?
    b. Who would have written something like this?
    c. Who would this journal entry be useful to?
    d. Students might compare the Strong journal entry to a diary. If so, you can prompt them with these questions:
    e. In what ways is it similar to a diary entry?
    f. In what ways is it different from a diary entry?
    g. What does William Strong describe in his journal entry?
3. Transition to showing the students the PowerPoint Presentation "How do scientists keep track of their work?"
4. Ask students the following discussion questions:
    a. What is the same about all these examples?
    b. What is different?
    c. Why is it important that the journal entries are easy to read and understand? (Answer: So experiments can be replicated, and other people can learn from your observations).
    d. What type of information should a journal entry include?
5. Answers: Name of observer, date, description of where you are, description of what you see (observe), description of what you smell (if applicable), drawings of your observations - including labels and colors, scientific data, graphs if necessary, calculations or results, conclusion.

ACTIVITY #2: GRASSLAND BIRDS

ESTIMATED TIME: 20 MIN + 15-20 MIN THE FOLLOWING CLASS PERIOD

Materials

- The Pocket Guide to Northern Prairie Birds (1 per student)
- Handout #1 – Grassland Birds (1 per student)

Now that students understand what a scientific journal entry is, they will create their own journal entry after learning about grassland birds that are found in our South Dakota rangelands.

Wildlife populations are regulated by the availability of food, water, and cover. The closer these three components occur to one another, there is typically greater diversity in wildlife species. Range management plays a key role in wildlife populations by promoting habitat diversity. Livestock such as cattle can diversify wildlife habitat when they graze, as the act of grazing helps open dense stands of vegetation and serves to change plant community composition. Different wildlife species require different habitats - some like to live in tall grasses, while other need alleyways between plants so that they can easily move around.

This is particularly true for the bird species that call South Dakota's rangelands home. In South Dakota, three species of prairie grouse exist in rangelands: the sharptail, the ruffled grouse, and the prairie chicken. Sharptail and prairie chickens are found east of the Missouri River and west of the Missouri River from Haakon and Stanley counties south toward the Nebraska border. Ruffled grouse find their home in the Black Hills in western South Dakota.

The sharptail grouse will become showy and noisy for a short time in the spring. This is when the birds group together at traditional dancing grounds, called leks, at dawn. At the leks, the males will perform a strange courtship dance, with their end goal being to woo as many females as possible. During their dance, the male sharptail will lower his head and raise his tail while making a low "booming" sound from air in inflated sacs on the sides of their necks (Figure 1). The sharptail grouse has mottled feathers (marked with spots) and the male's sacs are purple. In addition to living in South Dakota, the sharptail grouse can be found in open woodlands and grasslands across North America and east to Michigan.

Figure 2. A male sharptail grouse displaying his mating dance posture - lowered head, raised tail.

The ruffled grouse is grey in color, with feathers that are barred and dappled to help them hide in the forests of the Black Hills. The female ruffled grouse is smaller than the male, which is about the size of a bantam chicken (Figure 2). The Native Americans called the ruffled grouse the "carpenter bird." This is because they thought it drummed by beating its wings against a log. In actuality, the sound is made when the male bird cups his wings and rapidly beats them against the air. The male will usually do this when he stands on a drumming post, usually an old log. The ruffled grouse prefers a habitat like the black hills where buds, leaves, and twigs can easily be found.

Figure 3. A male ruffled grouse. Note the dappled pattern of his feathers.

Finally, male greater prairie chicken has multiple colors (Figure 3) - the upper portions of the bird are brown, with buffy white under portions - both areas of the bird have feathers that are heavily barred with dark brown. Both sexes have a tuft of stiff, elongated feathers along the side of their neck. The male is about 19 inches long, and the female is smaller. Mating occurs in the spring, when groups of male birds meet at dawn and perform their courting ritual while the females watch. A booming sound is produced by the male birds - this sound is made by the orange sacs at the sides of the neck inflating and deflating. In addition, during their courting ritual, the stiffened feathers above the sacs are erected, their wings drop, and their feet patter while their head and neck bob. It is quite a visual!

Figure 4. A male greater prairie chicken. Note the brightly colored sacs alongside his neck.

This video and exercise will expand on the idea of how important rangeland and ranching is to grassland bird species such as the sharptail, the ruffled grouse, and the greater prairie chicken, in addition to other upland bird species. Students will learn to use their descriptive writing skills to document other grassland bird species that live in South Dakota.

1. After you have shared with the students the background information on grassland birds, show them this YouTube: https://www.youtube.com/watch?v=Zf1WbCFRpl8&feature=emb_title "Audubon Conservation Ranching" (5 minutes).
2. Ask students:
   a. What did they think of the video?
   b. Who and what was featured in the video?
   c. What were their feelings watching the video?
3. Provide each student with a copy of the Pocket Guide to Northern Prairie Birds. Task your students with the following homework assignment: Go to a nearby park or grassy area with your scientific journal and record an entry in your journal. Your journal entry should include an observation of a bird that can be found in the Pocket Guide to Northern Prairie Birds.
   a. Note: The Pocket Guide does include prairie birds, but among those included are birds found in common urban and suburban parks: Canada goose, mallard duck, blue-winged teal duck, great blue heron, Eurasian collared-dove, red-headed woodpecker, black-billed magpie, American crow, and many others!
   b. Make sure that students use the information in the Pocket Guide such as the range map (where each bird species can be found during different times of year) and identification notes and include that information in their journal entries.
4. Next class period (15-20 minutes): Ask students to share with the class what birds they observed and have them show the class their journal entry page(s).
   a. Challenge students to notice that even if they observed the same bird as someone else, there might be differences between:
      i. Where they observed the bird
      ii. What the bird was doing (eating, browsing, flying, standing, sitting, grooming its feathers)
      iii. What they heard the bird doing (flapping its wings, making sounds)
      iv. How they personally felt observing the bird (happy, interested, curious)

ACTIVITY #3: RUMINATING ON THE DIGESTIVE SYSTEM

ESTIMATED TIME: 50 MIN

In addition to grassland birds, other animals that we find on rangelands are horses and cattle. Both species are considered herbivores, animals that are physically and anatomically adapted to eating plant material. As a result of eating plants, herbivores mouths are adapted to rasping or grinding plant material. In addition, these animals have unique digestive systems that are different compared to humans – the digestive systems of horses and cattle have special features that help these animals break down plant material and use it for energy and growth.

Materials

For the teacher

- One apple (for visual purposes)
- Handout #2 - Herbivore Digestive System (as an overhead projector copy, or as a PDF that you can annotate with colors)
- Appendix B - Herbivore Digestive System: Teacher Answer Key
- Two Strategies of Digestion in Hoofed Mammals Info Sheet

For the students

- Colored pencils or markers (1 pack per 2 students)
- Handout #2 - Herbivore Digestive System

Prep: Reference the "Two Strategies of Digestion in Hooved Mammals" Info Sheet that is provided. Review it to make sure that you as the teacher understand the difference between a ruminant and a non-ruminant digestive system.

1. Background Knowledge probe: Give students 1-2 minutes and have them write down on a piece of paper what they remember about the process of photosynthesis. At the same time, also have students write down what they know about the digestive systems of horses and cows.
2. Ask students to review photosynthesis with you.
   a. The process can be summarized as:
      in the presence of sunlight, carbon dioxide + water → glucose + oxygen.
   b. Glucose, the main product of photosynthesis, is a sugar that acts as the "food" source for plants. The glucose is then converted into usable chemical energy, ATP, during cellular respiration. The oxygen formed during photosynthesis, which is necessary for animal life, is essentially a waste product of the photosynthesis process.
   c. Almost all organisms obtain their energy from photosynthetic organisms. For example, if a bird eats a caterpillar, then the bird gets the energy that the caterpillar gets from the plants it eats. The bird indirectly gets energy that began with the glucose formed through photosynthesis. The same is true for horses and cows that eat plants – they get their energy from plants, which in turn, have gotten their energy from the original source of sunlight. Therefore, the process of photosynthesis is central to sustaining life on Earth.
3. Now, take the apple and hold it in your palm, and ask students:
   a. If I hold this apple long enough, will my hand soak up all the nutrients and sugars from the apple? (As you work through this with students, make sure they are familiar with the terms: digestion and absorption.)

        1. Answer: No! Your body needs to digest food, like apples, which means that your body breaks food down into smaller bits and pieces that are easier to be used by individual cells.
        2. Digestion: the ability to breakdown food into substances that can be used by the body.
        3. Those substances then undergo the process of absorption: a process that occurs after digestion (the breakdown of food), that results in molecules passing through cell membranes of the lining of the small intestine into the blood or lymph capillaries. This is called nutrient absorption.
4. Think-Pair-Share: Have students turn toward a partner and discuss what fruits and vegetables they've eaten recently. Ask students:
    a. What happens to fruits and vegetables as they move through your body?
    b. What plant parts can you eat and why are they good for you?
    c. What about the parts you throw away?
5. Introduce the term cellulose to students.
    a. Cellulose: the most abundant molecule in nature, it is a critical component of plant cell walls. Cellulose is insoluble (does not dissolve) and humans do not have an enzyme (cellulase) that can break down cellulose to its individual molecules.
    b. Explain how humans lack the ability to break down cellulose and communicate to students that animals such as horses and cattle have special bacteria in their digestive system that helps them break down cellulose, a key component of plant material. Animals that can break down cellulose are called ruminants and non-ruminants.
    c. Ruminant: an herbivore that gets its nutrients from plant material and uses a specialized stomach with multiple compartments. The compartments allow the animal to ferment food, which requires them to chew, regurgitate, and chew their food (cud) again.
        1. Examples: horses, pigs, hippopotamus.
    d. Non-ruminant: an herbivore that gets its nutrients from plant material, but it only has one stomach compartment where food is broken down into needed nutrients.
        1. Example: cows, sheep, goats, antelope, deer.
6. Distribute Handout #2 - Herbivore Digestive System to students, along with the colored pencils or markers.
7. Using your own copy of Handout #2 (either on an overhead projector or as a PDF you can annotate and project to the screen), take time to fill out the upper right portion of Handout #2.
    a. Answer: The purpose of the digestion system is to break down food and absorb nutrients into the blood.
    b. Answer: Bacteria help because they can digest cellulose, a sugar found in the cell walls of plants.
8. Inform students that today you are going to cover the digestive system of herbivores, specifically comparing ruminants versus non-ruminants. Make sure that students have a clear understanding of the difference, as well as the example animals outlined above.
9. Set up with students how to color code the legend on Handout #2. As you color-code each organ, have a discussion of its function:
    a. Mouth: grinds food
    b. Esophagus: transports food
    c. Stomach
        1. horse = digests protein

2. cow = bacteria in the stomach digest cellulose and the stomach is where the cud is stored

d. Small intestine: digest and absorb nutrients

e. Cecum:
   1. horse = bacteria digest cellulose
   2. cow = bacteria help with digestion

f. Large intestine:
   1. horse = absorbs some nutrients and lots of water, packs poop
   2. cow = absorbs water and packs poop

10. Work your way through the cow before moving onto the horse. As the class moves through labeling each organ, have then write down words that describe what that organ is responsible for. Have students add a star next to the organs that contain bacteria "helpers."
11. Lastly, discuss with students the concept that on the worksheet, the organs are curled up and are not stretched out (because they must fit inside the animal!). How long are the small intestine and large intestine? Have students provide some guesses (in feet or meters) and record them to reference in the next class period.

ACTIVITY #4: RUMINATING ON THE DIGESTIVE SYSTEM, CONTINUED

ESTIMATED TIME: 50 MIN

Materials

For the teacher

- Handout #3 - Length and Volume of Digestive Systems (as an overhead projector copy, or as a PDF that you can view on screen)

For the students

- 1 meter stick (yard stick)
- Colored chalk (a few packs)
- 2 hula hoops
- Handout #3 - Length and Volume of Digestive Systems (1 per student)

1. Head outside with students for the demonstration. Be sure to bring the meter stick and chalk. Note: if you are doing this in the winter, or on a rainy day, a good alternative location would be to use the gymnasium and use tape instead of chalk.
2. Provide each student with a copy of Handout #3. They should reference the handout during this exercise.
3. At one end of the schoolyard, use chalk to write "Ruminant Digestive System: COW". Write the word "Mouth" and draw a circle around it. The mouth is the entrance to the digestive tract, which the class will draw on the blacktop.
4. Lay down the meter stick and model how to take one big pace to represent one meter. Draw a thin, tube-like esophagus of this length. Likewise, students will estimate distances using wide paces while others follow at their heels to mark the ground with chalk.
5. Build the cow's digestive system one organ at a time, reviewing the function of each part, by assigning student to teams to measure, draw, and label subsequent organs:
    a. Stomach: Draw as a large circle or sac.
    b. Small Intestine: Because the organ is so long, students show loop back and forth to fit it in a tighter space. A thin tube is appropriate.
    c. Cecum: Draw as a circle or sac.
    d. Large Intestine: Make a wider width than the small intestine, but with similar curves.
6. Repeat with the data for the horse to construct a "Non-Ruminant Digestive System: HORSE".
7. Ask students if they recall where bacteria are housed in each animal.
8. Have students place a hula hoop around the cow's rumen and the horse's cecum, respectively, to visually remind students where these important microorganisms help by digesting cellulose.
9. Return to the classroom with the students.
10. Using Handout #3 – Length and Volume of Digestive Systems, along with Handout #2 – Herbivore Digestive Systems, have a discussion with students to promote critical thinking. Discussion questions can include:
    a. Why does the cow's stomach hold so much food?
        1. Answer: Needs to store in between ruminating sessions; houses bacteria for digestion; four parts.
    b. Why does the small intestine need to be so long?
        1. Answer: Absorption only occurs through the wall of the tube, so food in the center would be wasted unless it has time to float in a liquid to the edge.

    c. How does this contrast with the esophagus?
        1. Answer: The esophagus is just for transport, like a pipe. No digestion or absorption occurs here, so surface area of the pipe wall is not important.
    d. Why does the large intestine need to be so long?
        1. Answer: The animal needs to reabsorb all the water it put into the digestive tract to dissolve food but needs to do it slowly because blood vessels are narrow.
    e. How is the horse's stomach different, and what does this mean for the animal?
        1. Answer: One compartment; doesn't store for too long since doesn't regurgitate; small, so needs to eat many small meals each day; less bacteria here, uses own stomach juice to digest protein but can't break down cellulose.
11. Why is the horse's cecum fuller than that of the cow, even though it's the same size?
    a. Answer: This is the site of bacterial digestion for the non-ruminant.
12. How might the plant matter in the large intestine of the horse be different than that in the cow?
    a. Answer: More fibrous since bacteria never completely broke down the sugar.
13. What is role of the small intestine? Why is this organ so much longer in the cow?
    a. Answer: Absorption of nutrients; ruminant has more food available to absorb since bacteria finished the work upstream.
14. Conclude your class time by completing the Classroom Assessment for Activities #3 and #4.

ACTIVITY #5: CLASSROOM ASSESSMENT

ESTIMATED TIME: 10-15 MIN

Applications Cards for Activities #1 and 2

1. Hand out an index card to each student.
2. Ask students to write down at least one possible, real-world application for what they learned about journal entries.
3. This will allow you to tell quickly how well students understand the possible applications of what they have learned in Activities #1 and #2.

ESTIMATED TIME: 10 MIN

Minute Paper and Think-Pair-Share for Activities #3 and #4

1. Have students get out the piece of paper that they recorded their "Background Knowledge" on.
2. Ask students to write down 2-4 things that they learned about the digestive systems of hooved mammals.
3. Finally, have students turn to a partner and share two similarities and two differences between the digestive system of a horse compared to that of a cow.
4. Select a few students to share with the class what they discussed with their partner.

GRASSLAND BIRDS

Name: _____

Wildlife populations are regulated by the availability of food, water, and cover. The closer these three components occur to one another, there is typically greater diversity in wildlife species. Range management plays a key role in wildlife populations by promoting habitat diversity. Livestock such as cattle can diversify wildlife habitat when they graze, as the act of grazing helps open dense stands of vegetation and serves to change plant community composition. Different wildlife species require different habitats - some like to live in tall grasses, while other need alleyways between plants so that they can easily move around.

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Figure 2. A male sharptail grouse displaying his mating dance posture - lowered head, raised tail.

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stands on a drumming post, usually an old log. The ruffled grouse prefers a habitat like the black hills where buds, leaves, and twigs can easily be found.

Figure 3. A male ruffled grouse. Note the dappled pattern of his feathers.

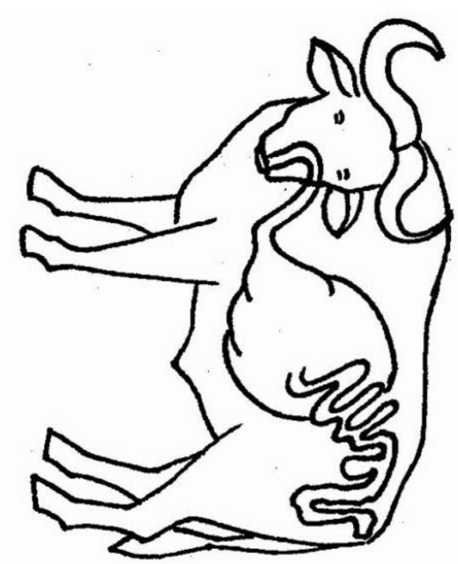
Finally, male greater prairie chicken has multiple colors (Figure 3) - the upper portions of the bird are brown, with buffy white under portions - both areas of the bird have feathers that are heavily barred with dark brown. Both sexes have a tuft of stiff, elongated feathers along the side of their neck. The male is about 19 inches long, and the female is smaller. Mating occurs in the spring, when groups of male birds meet at dawn and perform their courting ritual while the females watch. A booming sound is produced by the male birds - this sound is made by the orange sacs at the sides of the neck inflating and deflating. In addition, during their courting ritual, the stiffened feathers above the sacs are erected, their wings drop, and their feet patter while their head and neck bob. It is quite a visual!

Figure 4. A male greater prairie chicken. Note the brightly colored sacs alongside his neck.

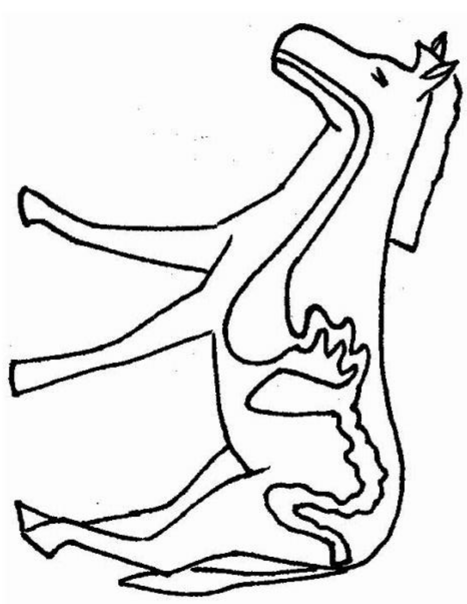
HERBIVORE DIGESTIVE SYSTEM

The Herbivore Digestive System

Cow
Ruminant:



Horse
Non- Ruminant:



Name________________

The purpose of the digestion system is to
____
____.

Bacteria help because they can digest
____________________, a sugar found
in the cell walls of ______________.

What is the name for the largest section of a ruminant's stomach?
____

Organ Color Key
- ☐ Mouth
- ☐ Esophagus
- ☐ Stomach
- ☐ Small Intestine
- ☐ Cecum
- ☐ Large Intestine

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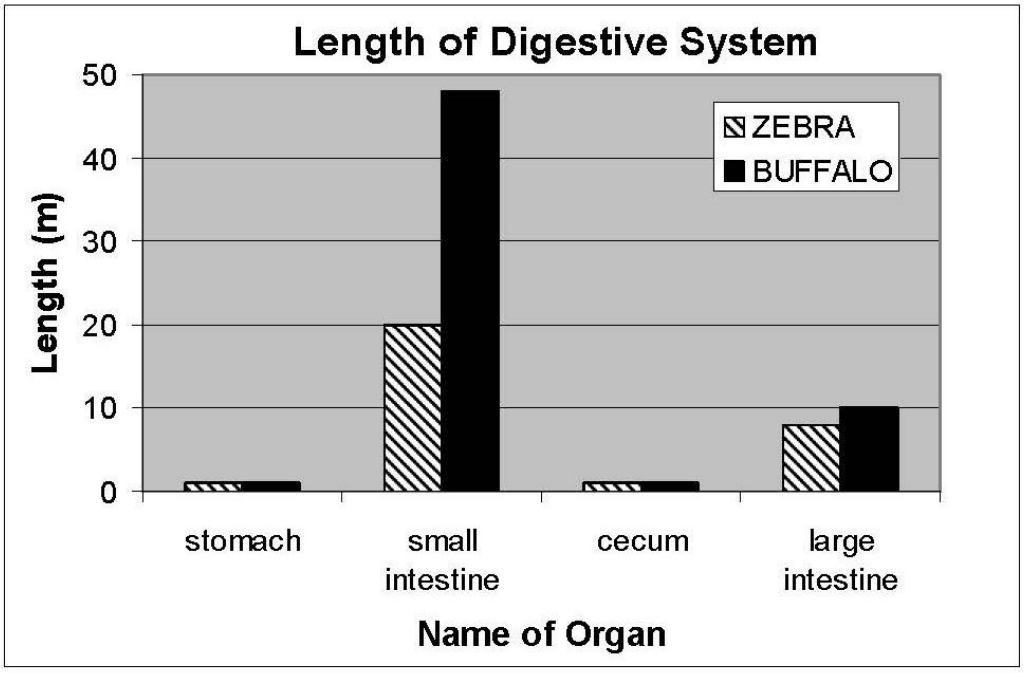
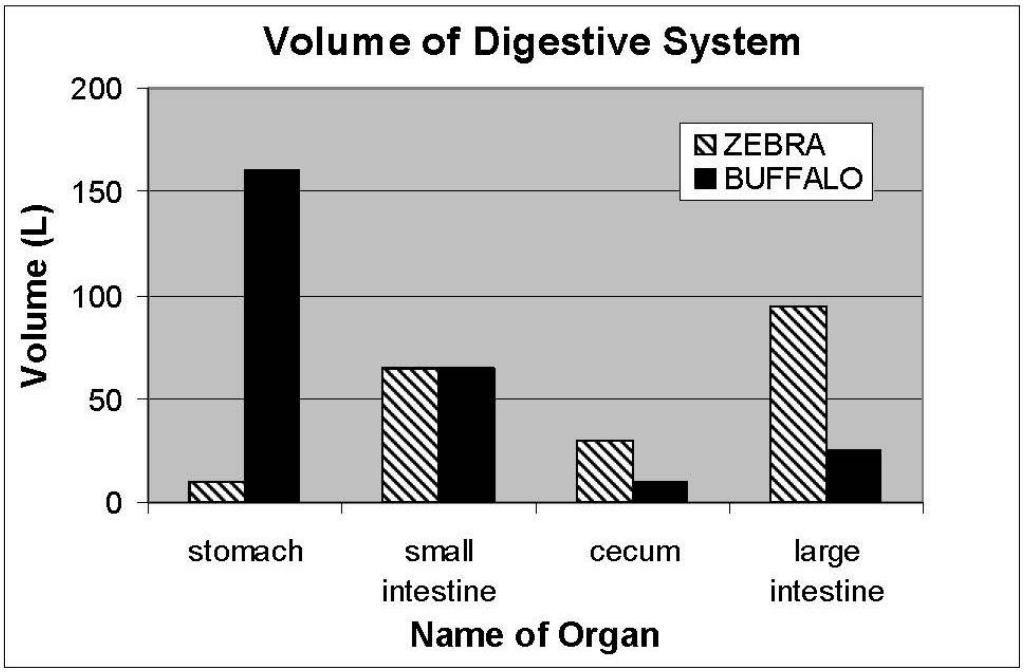
LENGTH AND VOLUME OF DIGESTIVE SYSTEMS

Name: _____

Ruminating on the Digestive System
Graphical Representations

CALIFORNIA ACADEMY OF SCIENCES





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APPENDIX A: RESOURCES FOR ACTIVITY #2

Figure 2. A male sharptail grouse displaying his mating dance posture - lowered head, raised tail.

Figure 3. A male ruffled grouse. Note the dappled pattern of his feathers.

Figure 4. A male greater prairie chicken. Note the brightly colored sacs alongside his neck.

HERBIVORE DIGESTIVE SYSTEM: TEACHER ANSWER KEY

The Herbivore Digestive System

Name TEACHER ANSWER SHEET

The purpose of the digestion system is to break down food and absorb nutrients into the blood.

Bacteria help because they can digest cellulose, a sugar found in the cell walls of plants.

Cow

Ruminant: a hoofed mammal that regurgitates its cud to chew it again

Organ Color Key
- Mouth
- Esophagus
- Stomach
- Small Intestine
- Cecum
- Large Intestine

What is the name for the largest section of a ruminant's stomach?

Rumen

Horse

Non-Ruminant: a hoofed mammal that doesn't regurgitate its food

REFERENCES

Angelo TA and KP Cross. 1993. Classroom assessment techniques: A handbook for college teachers. Second edition. Jossey-Bass: San Francisco, CA.

California Academy of Sciences. Ruminating on the digestive system. Accessed on 1 December 2020. https://www.calacademy.org/educators/lesson-plans/ruminating-on-the-digestive-system

Knasiak L. What is a field journal? Accessed on 1 November 2020. https://betterlesson.com/lesson/620851/what-is-a-field-journal?from=search

Knasiak L. Field journals: Descriptive writing and scientific drawing. Accessed on 1 November 2020. https://betterlesson.com/lesson/620856/field-journals-descriptive-writing-and-scientific-drawing?from=search