

A Source Unit for Colorado Teachers

RANGE AND PASTURE MANAGEMENT

Developed by

James Hannebaum
Graduate Student
Colorado State University

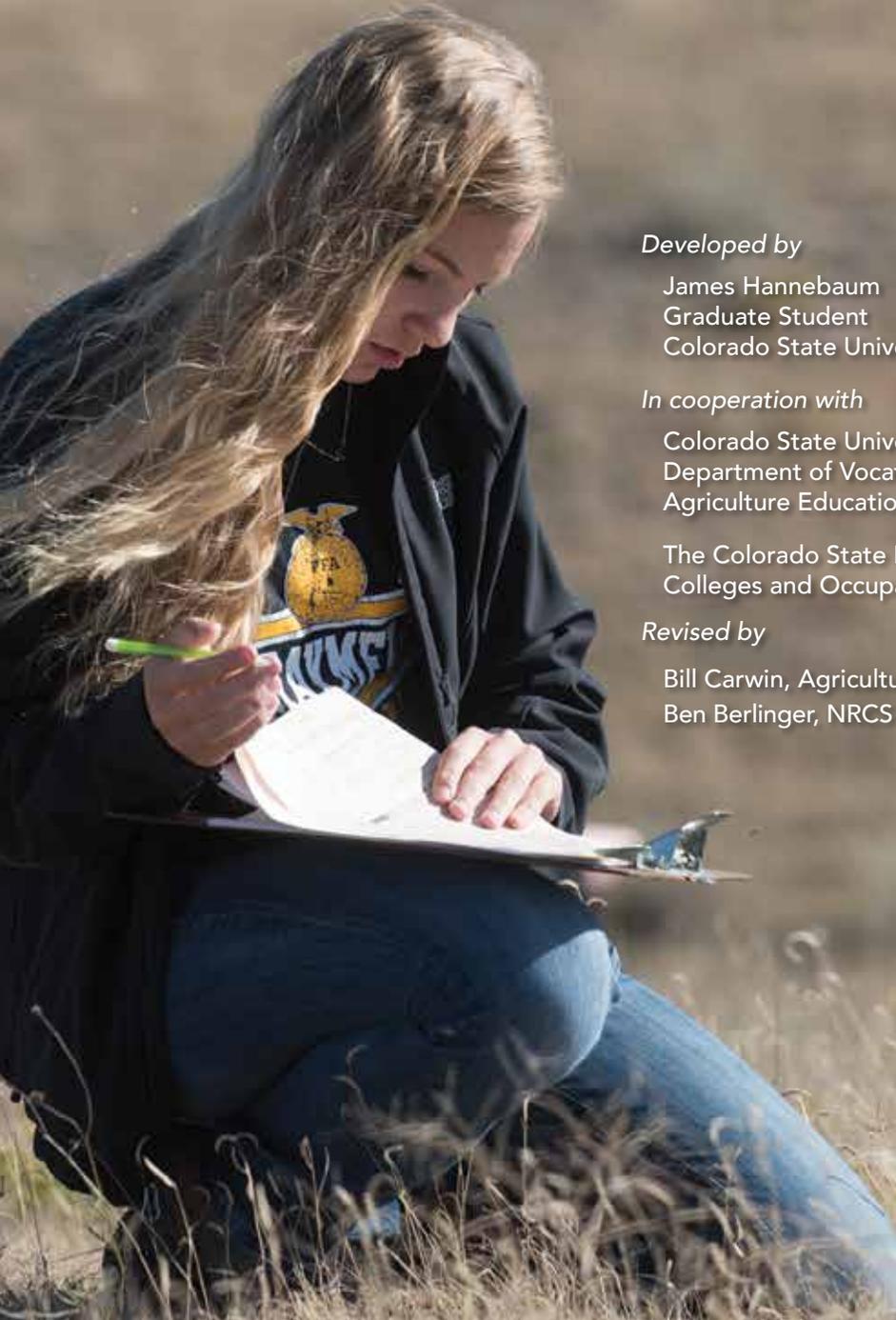
In cooperation with

Colorado State University
Department of Vocational Education
Agriculture Education Division

The Colorado State Board for Community
Colleges and Occupational Education

Revised by

Bill Carwin, Agriculture Instructor, Pritchett High School
Ben Berlinger, NRCS Rangeland Management Specialist (ret.), La Junta



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*Colorado Agriculture Education Teachers (CAET) can access
a PDF of this book on the CAET Moodle site.*

A PDF is also available at

https://drive.google.com/open?id=1lI7HACPwc6A7bp6cC7FDPm_xj3xhf6H

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9-7-2018

DEDICATION

This third edition is dedicated to all those who teach,
and to all those who care for the range.



*A true conservationist is a man
who knows that the world is not
given by his fathers, but borrowed
from his children.*

-John James Audubon

ACKNOWLEDGMENTS

The revision of the Range and Pasture Management Source Unit was suggested by Bill Carwin, Agriculture teacher and FFA Advisor at Pritchett High School. Bill's father, Dutch Carwin, was a well-known agriculture teacher and FFA advisor in northeast Colorado. Bill has taught agriculture for 30 years and, as a rancher himself, has always used the Source Unit as his curriculum for teaching range management to his students. The original document, as developed by Jim Hannebaum in 1975, was in need of updating to current range management concepts and terminology. As a local natural resources professional for southeast Colorado, Ben Berlinger worked closely with Bill and other Agriculture teachers in the area to help them bring range management into their classrooms. This was accomplished through promoting rangeland judging and range plant identification as a career development exercise (CDE) involving teacher's workshops and field sessions with agriculture students. The need for a more updated version of the Source Unit became apparent if more Agriculture teachers were to include range management into their classrooms. This revised source unit provides a practical guidance document for the education of high school students in the discipline of range and pasture management.



Clipping plots is one tool to determine total annual plant production.

*We come and go, but the land is
always here. And the people who love
it and understand it are the people
who own it - for a little while.*

-Willa Cather

INTRODUCTION

The following source unit in range and pasture management was prepared as a guide for vocational agriculture teachers in Colorado.

Suggested objectives, motivation techniques, study guides, and plans of action are presented in the following source unit for use in teaching a unit in range and pasture management to vocational agriculture students.

The purpose of this guide is to help teachers in vocational agriculture analyze the area of range and pasture management and to organize lesson units for instruction. It is not intended that this guide will be used either as a course of study or as an outline for instruction in any local vocational agriculture department. Strictly speaking, this guide is intended to serve as a source unit for course construction and instructional planning. It is considered sound that course outlines and instructional plans will be based on local situations and needs. The thought that a course outline in vocational agriculture for a local community should be planned by any person not familiar with the local community has never been accepted in the past and is not accepted in the present-day thinking.

This source unit was prepared in cooperation with Dr. Ramsey Groves of the Agricultural Education Division of the Department of Vocational Education of Colorado State University. It was revised and updated in 2016 by Bill Carwin, Agriculture Instructor at Pritchett High School, and Ben Berlinger, NRCS Rangeland Management Specialist (ret.), La Junta, Colorado.



*Land health is the capacity for
self-renewal in the soils, waters,
plants, and animals that collectively
comprise the land.*

-Aldo Leopold

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*Teachers affect eternity; no one can
tell where their influence stops.*

-Henry Brooks Adams

A Source Unit for Colorado Teachers

Job One

BECOMING FAMILIAR WITH RANGE AND PASTURE MANAGEMENT

Situation

Describe the particular circumstances related to this job

Objectives

1. To develop an understanding of the importance of range management.
2. To illustrate how much land is used for range in the U. S. and in Colorado.
3. To develop an appreciation for range management.

Motivations

1. Ask the class how many acres of land are in Colorado? (66,700,000)
2. Ask the student in the class if they know how much land is used for cropland (22,140,000), how much is used for mountain range (28,000,000), and how much land is used for plains area range (15,860,000).

Study Guides

1. What is range management?
2. Of what importance is range management?
3. How much land is used for range in the United States?
4. How much land is there in Colorado? How much of this land is rangeland?
5. In Colorado, how is the range land acreage divided between mountain and plains areas?
6. How does rangeland and cropland compare in our area?
7. What are the three primary uses of rangeland?
8. What are the goals of range management?

References

- » Colorado 4H Range Management Guide, CSU, Cooperative Extension, 1M 6-75 pp. 2-6
- » Society for Range Management (www.rangelands.org)

Analysis

1. Range management is the care and use of rangeland to get the highest continuous yield of ecosystem goods and services without endangering the range, soil, and water resources and other important attributes of the range.
2. Range management is important for:
 - » Livestock production
 - » Watershed conservation
 - » Wildlife habitat
 - » Recreation
 - » Open space
3. There is approximately 770,000,000 acres of range in the U. S. with most rangeland found in the 17 western states. This amounts to over one-third of the land area of the United States. Rangelands include grasslands or prairies (short-grass, mid-grass and tall-grass prairies), savannas, shrublands, deserts, tundras, marshes (wetlands) and native meadows
4. There are 66,700,000 acres in Colorado of which about 43,100,000 acres are used primarily for rangeland (65%). About 17,803,000 acres of Colorado rangeland are in private ownership (40%) while 25,300,000 acres are in public ownership (60%).
5. In Colorado approximately 27,500,000 acres of range is found in the mountain areas while 15,600,000 acres are found in the plains area. See Appendix A for the general “types” of rangeland in Colorado.
6. (Depends upon local area) Have students determine with the use of a survey the number of acres in their particular area of rangeland and cropland.
7. Grazing, watershed, and wildlife conservation are the three main benefits obtained from rangelands.
8. The goals of range management include:
 - » To keep our ranges covered with good forage plants
 - » Increase livestock and wildlife products
 - » Maintain a range feed reserve
 - » Increase the holding and “even” the flow of water
 - » Control soil erosion
9. Rangelands are lands on which the native vegetation is predominantly grasses, grass-like plants, forbs or shrubs and are managed as a natural ecosystem using ecological principles.
10. Rangelands provide society with many products and services that support our standard of living and quality of life. These products can be visualized as ecosystem services. They include:
 - » Food
 - » Forage
 - » Purification of air and water
 - » Flood and drought mitigation
 - » Biodiversity
 - » Open space
 - » Soil fertility
 - » Pollination
 - » Nutrient cycling

- » Climate stabilization
- » Aesthetic beauty

11. Globally, rangelands occur on every continent (excluding Antarctica) covering about 45 percent of the earth's land surface. The top countries for rangeland area in descending order include: Australia, Russia, China, United States, Canada, Kazakhstan, Brazil, Argentina and Mongolia.

Plan of Action

1. Secure the necessary number of references from the extension service.
2. Apply the above analysis to your home county. Discuss the results with a Rangeland Management Specialist at your local Natural Resources Conservation Service (NRCS) office.



Tap root of annual sunflower.

Job Two

BECOMING FAMILIAR WITH RANGE PLANTS AND PLANT STRUCTURES

Situation

Describe the particular circumstances related to this job

Objectives

1. To develop an understanding of the importance of learning range grass parts.
2. To develop the ability to identify range plants.
3. To develop an understanding of grazing response and growth habits.

Motivation

Bring in a sample of a grass, a grass-like plant, a forb, and a shrub found on rangelands in your particular area. Divide the class in half and have the students compete to identify as many differences between each plant as they can.

Study Guides

1. What are the four different kinds of plants found on range sites? Describe each.
2. What is a range site or an ecological site?
3. Other than plant structure, what are three other ways in which range plants are classified?
4. What are the main parts of a plant and the function of each part?
5. What is a rhizome and what is its function?
6. What is a stolon and what is its function?
7. What is an inflorescence? List three types of inflorescences.

References

- » Colorado 4H Range Management Guide, CSU, Cooperative Extension, 1M 6-75 pp. 6-13

Analysis

1. Four different kinds of plants found on range sites include: grasses, grass like plants, forbs, and shrubs. (For description see chart on page x).
2. A range site or ecological site is an area of rangeland that has similar soil, slope, and moisture and produces distinctive kinds and amounts of vegetation.
3. Other than structure, three other ways in which range plants are classified are:
 - a. Life span
 - I. Annual – lives for only one season, does not come up a second year.
 - II. Biennial – lives for two years, produces seed the second year.
 - III. Perennial – lives over from year to year from same crown or roots.
 - b. Origin
 - I. Native – those plants which have not been introduced from outside North America
 - II. Introduced – plants which have been brought in from outside North America
 - c. Growth Season
 - I. Cool season – plants which make their principal growth during the cool weather (spring and late fall).
 - II. Warm season – plants which make their principal growth during the frost free period and develop seed in the summer or early fall
4. The main parts of a plant and its function include:
 - a. Root – take up water and minerals and anchor the plant
 - b. Stem – transport water from roots to leaves and support the
 - c. Leaves and inflorescence, some photosynthesis
 - d. Leaves – is the medium for photosynthesis
 - e. Seedhead (inflorescence) – reproductive or flowering part
5. A rhizome is an underground stem which stores food and reproduces in new plants (western wheatgrass).
6. A stolon in an above-ground stem which stores food and reproduces new plants (buffalograss).
7. An inflorescence is the reproductive or flowering part of the plant. The three basic inflorescences include:
 - a. Spike
 - b. Raceme
 - c. Panicle

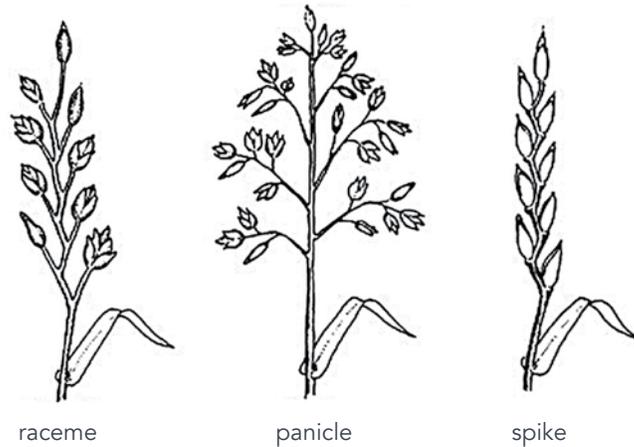
Plan of Action

1. Prepare handout material on plant structures and hand out to students.
2. Discuss the differences between the structures of the four types of plants found on ranges.

Evaluation

Have a sample of each of the types of plants available for the students to tell the difference between the four types of plants as you discuss their structure. Have them bring in a sample of the four types for an assignment.

Inflorescence. Grass inflorescence occurs in one of three types. In a raceme, spikelets are borne on short stalks, called pedicels, coming off the rachis. A spike has its spikelets attached directly to the rachis. The panicle has its spikelets spaced along spreading or compressed branches.



raceme

panicle

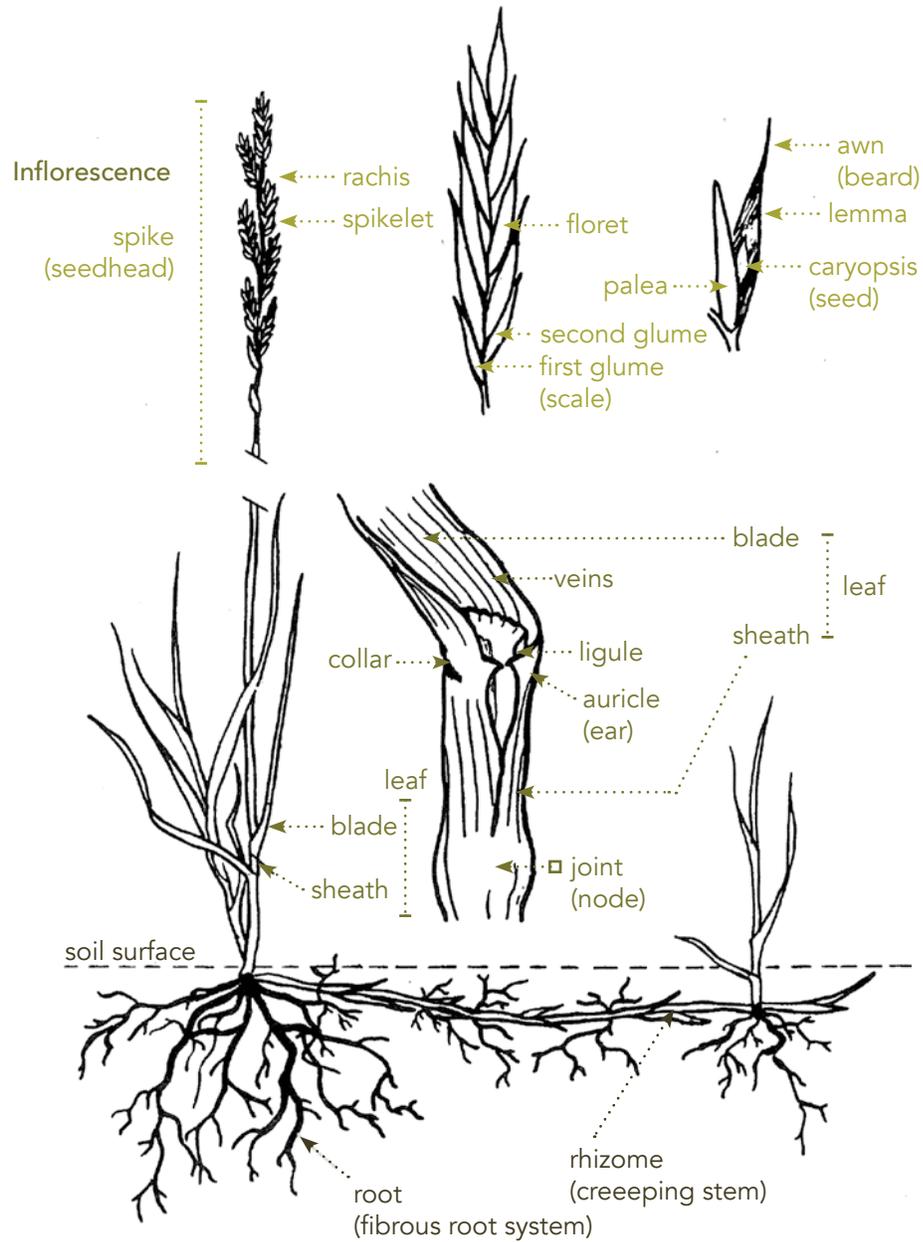
spike

Important Range Plant Groups: Grasses, Grass-likes, Forbs and Shrubs

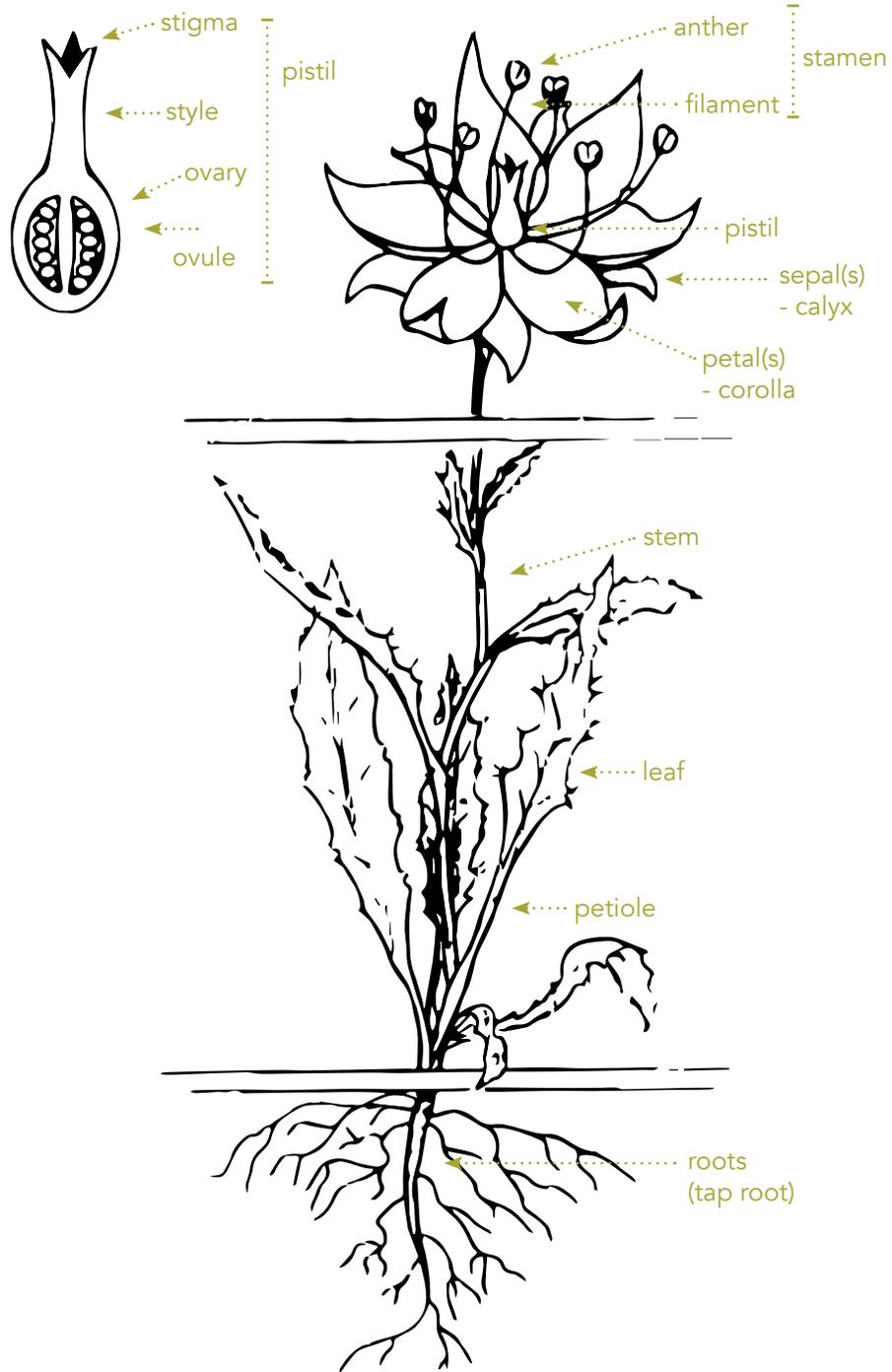
IMPORTANT RANGE PLANT GROUPS					
	GRASSES	GRASSLIKE		FORBS	SHRUBS
		Sedges	Rushes		
STEMS	Jointed Hollow or Pithy	Solid Not Jointed		Solid	growth rings Solid
LEAVES	Parallel Veins			"Veins" are netlike	
	Leaves on 2 sides of stem	Leaves on 3 sides of stem	Leaves on 2 sides of stem, rounded		
FLOWERS	(floret)	stamen ovary male female (may be combined)		Usually showy	
EXAMPLE	Western Wheatgrass	Threadleaf Sedge	Wire Rush	Yarrow	Big Sagebrush (twig)

Grass Structure. Illustrates inflorescence (seedhead), vegetative characteristics, and underground structures (roots and modified grass plant stems or rhizomes).

Parts of a Typical Grass Plant



Forb Structure



Prairie coneflower

Job Three

BECOMING FAMILIAR WITH COMMON RANGE TERMS

Situation

Describe the particular circumstances related to this job

Objectives

1. To develop the ability to match the terms associated with range management to the correct definition.
2. To develop the ability to understand common terms used in range management work.

Motivation

Secure a sod grass and bunch grass and have them on display when the class arrives. Ask the students to describe the differences in the two plants and then explain that one is a bunch grass and one is a sod former. Conduct a discussion as to why it is important to know various range terms.

Study Guides

What are some common terms used in range management? Explain their meaning.

Common terms:

- | | |
|--|--|
| <input type="checkbox"/> Range management | <input type="checkbox"/> Plant vigor |
| <input type="checkbox"/> Rangeland ecology | <input type="checkbox"/> Density |
| <input type="checkbox"/> Ecosystem | <input type="checkbox"/> Litter |
| <input type="checkbox"/> Ecological site | <input type="checkbox"/> Range site |
| <input type="checkbox"/> Short-grass | <input type="checkbox"/> Reference plant community |
| <input type="checkbox"/> Mid-grass | <input type="checkbox"/> Range condition or similarity index |
| <input type="checkbox"/> Tall-grass | <input type="checkbox"/> Key plants |
| <input type="checkbox"/> Bunch grass | <input type="checkbox"/> Palatability |
| <input type="checkbox"/> Sod grass | <input type="checkbox"/> Range use |
| <input type="checkbox"/> Decreasers | <input type="checkbox"/> Proper use |
| <input type="checkbox"/> Increases | <input type="checkbox"/> Prescribed grazing |
| <input type="checkbox"/> Invaders | |

References

- » Colorado 4H Range Management Guide, CSU, Cooperative Extension, 1M 6-75 pp. 55
- » Colorado Native Grasses, CSU, Bulletin 450-A, p. 30 [out of print]
- » USDA-NRCS, Field Office Technical Guide, Prescribed Grazing, 2005.

Analysis

1. Range term definitions:

Range management—the orderly and planned utilization of range forage for the continuous production of forage and livestock. Range management guidelines are based on the ecological principles of nutrient cycles, water cycles, living community succession, and energy flow.

Rangeland ecology—the study of the interrelationships of organisms with the rangeland environment.

Ecosystem—organisms together with their abiotic environment, forming an interactive and interdependent system, inhabiting an identifiable space.

Ecological Site—a distinctive kind of land with specific physical and biological characteristics that differs from other kinds of lands in its ability to produce a distinctive kind and amount of vegetation and in its ability to respond to management actions and natural disturbances. An ecological site can be rangeland or forest land.

Short-grass—grasses normally growing less than 18 inches in height, such as buffalograss or blue grama.

Mid-grass—grasses normally growing from 2-4 feet in height, such as western wheatgrass, sand dropseed or alkali sacaton.

Tall-grass—grasses that normally grow over 4 feet high, such as switchgrass or Indian grass.

Bunch grass—grasses that grow in definite upright bunches, and reproduce by seed; they do not form a sod. Examples include switchgrass, Indian ricegrass, and alkali sacaton.

Sod grass—grasses that form a mat or turf and reproduce mainly by runners. Examples include prairie sandreed, prairie cordgrass, and western wheat grass.



Decreasers—plants that are reduced in the composition as a result of heavy use.

Increasers—plants that increase in percentage of composition as a result of heavy grazing and during the first stages of range deterioration. They decrease in percent of composition under continuous heavy grazing.

Invaders—plants that are present in small quantity or not present under ideal condition; invaders increase with deteriorating range condition.

Plant vigor—a measure of the health of the plant.

Density—the percent of the ground covered by growing vegetation.

Litter—plant material or residue left on the ground to improve soil health and fertility (nutrient cycling).

Range site—an area of rangeland in which the soil, climate, and topography produce distinct kinds and amount of vegetation.

Reference Plant Community—the plant community that existed at the time of European immigration and settlement. It is the plant community that is best adapted to the unique combination of environmental factors associated with the site. It is in dynamic equilibrium with its environment and is resilient and resistant to disturbances that naturally occur within the area occupied by the site.

Range condition—or similarity index is a comparison of the vegetation now growing on the site with the reference plant community the site can support—it indicates the health of a range.

Key plants—principal forage plants used to determine proper utilization and management. These are plants that give clues to changes of the range condition in response to grazing management.

Palatability—the relative degree of an animal's desire to graze or not to graze a certain plant.

Range use—the degree to which the forage has been used; usually expressed as moderately used, lightly used, or over used.

Proper use—using the plants to a degree that they will maintain or improve their vigor.

Prescribed grazing—an adaptive grazing management strategy that controls the time, number and area of grazing (i.e. proper stocking and rotation of livestock). The basic principles are shortest possible grazing periods, with longest possible rest or recovery periods, together with highest possible numbers of livestock, in one pasture at a time (i.e. highest possible stock density).



Job Four

BECOMING FAMILIAR WITH HOW PLANTS GROW AND INDICATE GRAZING RESPONSE

Situation

Describe the particular circumstances related to this job

Objectives

1. Understand how plants make food for growth, and how grass growth rates and nutrient value is affected by stage of maturity.
2. To develop an understanding of the grazing response of plants.
3. To develop an understanding of the importance of learning to identify indicator plants.
4. To learn what plants are indicators of range condition and similarity index.
5. To develop the ability to utilize indicator plants on the home farm range.

Motivation

Encourage a discussion on how plants grow, what grazing response is and how it effects both plants and livestock. Ask them how they can tell if their rangeland is in top condition.

Study Guides

1. What is meant by range condition or similarity index?
2. What is a decreaser plant? Briefly describe and give an example.
3. What is an increaser plant? Briefly describe and give an example.
4. What is an invader plant? Briefly describe and give an example.
5. List the four range condition classes and give the similarity index that make up each class.
6. What is a high successional plant (formerly climax plant)?
7. Describe what happens to an excellent range when it is continuously grazed for a long period of time without allowing the grazed plants to recover. Explain the reaction of increaser, decreaser, and invader plants.

References

- » Colorado 4H Range Management Guide, CSU, Cooperative Extension, 1M 6-75 pp. 23-27, 55.
- » USDA-NRCS, Field Office Technical Guide, Prescribed Grazing conservation practice, 2007.
- » Understand Grass Growth: The Key to Profitable Livestock Production, Steven S. Waller, Lowell E. Moser, Patrick E. Reece, 1985.

Analysis

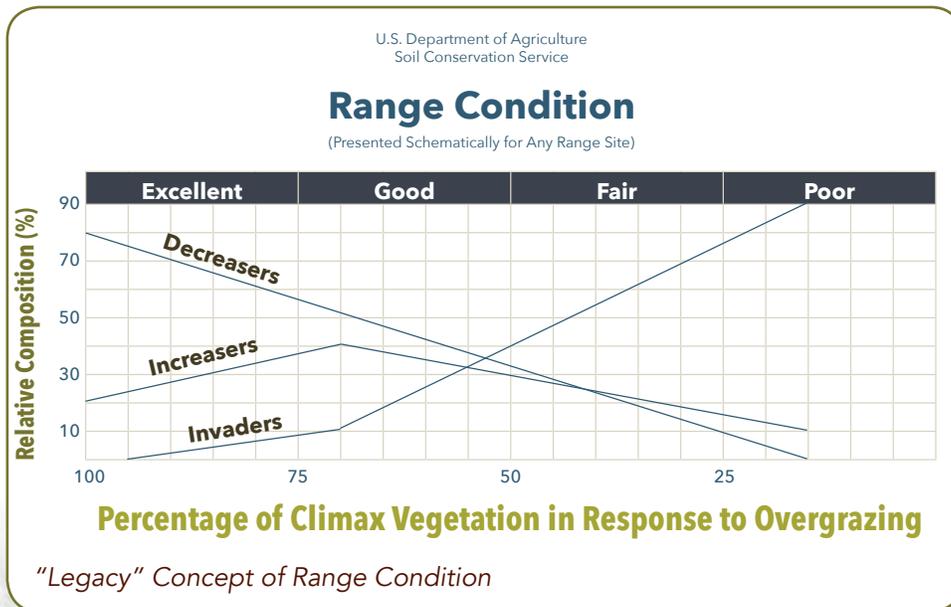
1. Grass Makes Food for growth in the “food factory” in its leaves. It uses food stored in the roots to live on while it is dormant and to make new growth in the spring or after its leaves are grazed or cut. If leaves are grazed or cut too closely, or the plant is not allowed sufficient opportunity to recover from being grazed or cut, the plant cannot manufacture enough food to maintain a thriving root system, a thick stand, and good top growth. Roots are the highways that bring water and nutrients from the soil to the food factory in the leaves. Leaves get carbon from the air and release oxygen.

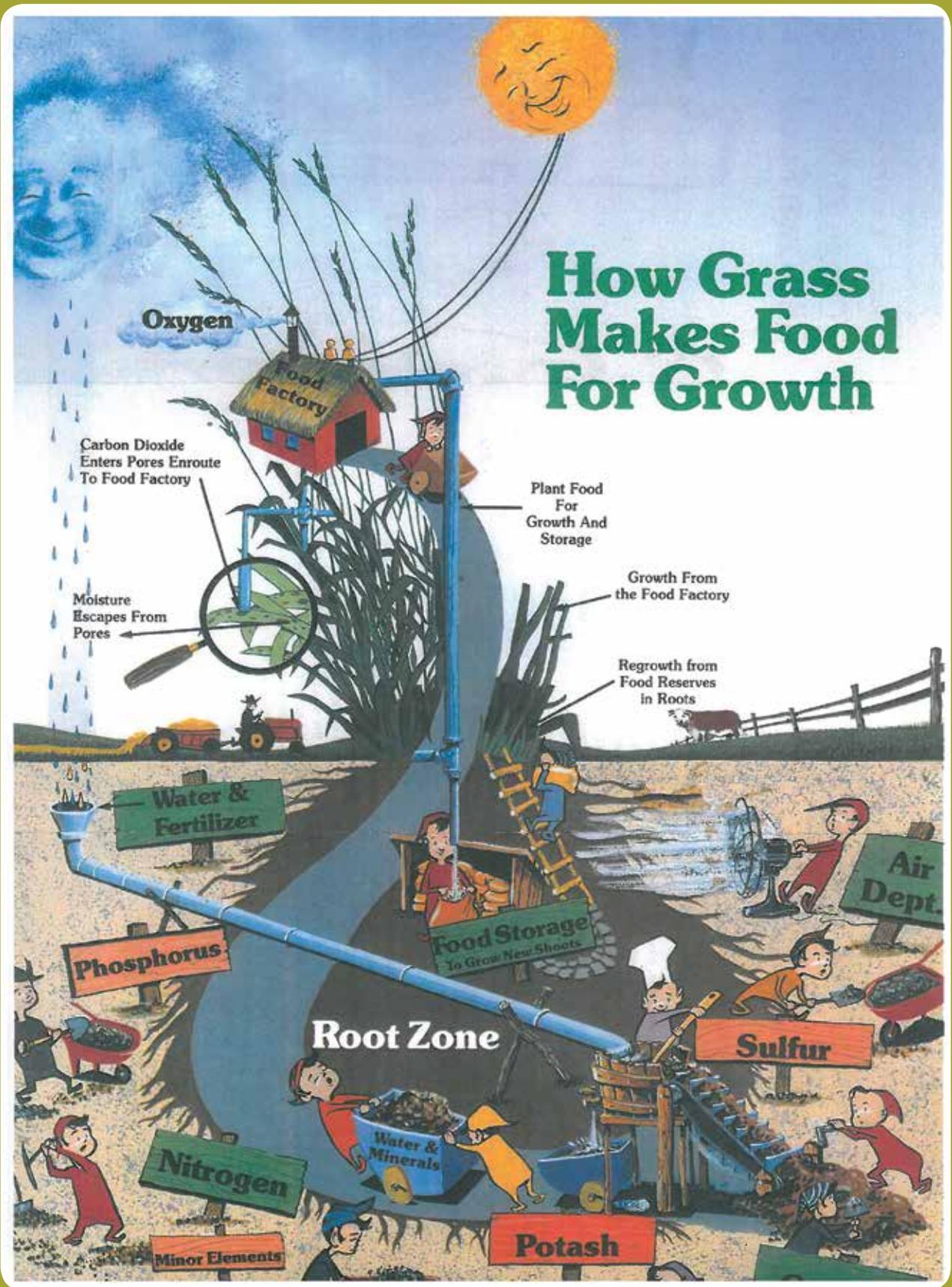
Using energy from the sun, the food factory combines all these elements into the sugars, starches, proteins, oils, and fats that the grass plant uses to grow and to reproduce itself. The process is called photosynthesis. Thick, healthy, deep-rooted grasses give better protection from wind and water erosion and provide better livestock feed than do weak stands. Anyone who values grass keeps plenty of leaf growth so the food factory can work properly.

Appendix J illustrates how grass growth rate and nutrient value changes as the grass plant matures.
2. Range condition or similarity index is a comparison of the soil and the vegetation currently growing on a range site or ecological site with the reference plant community stage of soil development and plant growth the site can support.
3. A decreaser plant is a plant that is reduced in numbers or composition as a result of heavy continuous grazing without allowing recovery to occur. An example is sideoats grama, big bluestem.
4. An increaser plant is one that increases in percentage of composition during the first part of heavy continuous grazing as the range condition or similarity index is on the decline. Continued heavy grazing will cause these plants to decrease in composition. Some examples include blue grama, salt grass, buffalograss, and sand dropseed.
5. An invader plant is one that is present only in small numbers or not present at all under the reference condition. Invader plants increase in composition on an extremely heavily continuously grazed range or one that is in deterioration. Examples are barnyard grass, cheat grass, Russian thistle, tumblegrass.
6. Four range condition classes can be recognized. Similarity indices can be likewise interpreted:
 - a. Excellent100-75%
 - b. Good75-50%
 - c. Fair.....50-25%
 - d. Poor25-0%
7. A high successional plant (formerly called climax plant) is usually a native plant that composes a high percentage of the plant cover of a range in top condition. High successional plants are the most permanent kinds of plants under ideal conditions and decrease under continuous use.
8. On a range in top condition the decreaser plants will be the first to decline under heavy grazing, due to the animal’s palatability (high forage preference) for these plants. During this time the increaser plants will increase in composition. Under continued heavy grazing, they too will decline in composition. Eventually, under heavy continuous use, the invader plants will result. Proper range management techniques (i.e. prescribed grazing) prevent this from happening. [See illustration on page17].

Plan of Action

1. Secure the necessary materials to prepare a chart to show the effect of continued heavy grazing upon the increaser, decreaser, and invader plants.





How Plants Grow. [See analysis section for discussion.] Source: USDA Soil Conservation Service, Ag Information Bulletin No. 223 (out of print)

Job Five

BECOMING FAMILIAR WITH DECREASER PLANTS

Situation

Describe the particular circumstances related to this job

Objectives

1. To learn and be able to correctly identify the plants that are classified as decreasing in response to disturbances (decreaser plants).
2. To learn the various characteristics of decreaser plants (i.e. the type of plant, palatability base on cattle preference, season of growth, and life span).

Motivation

Ask the students what a decreaser plant is and how it differs from an increaser plant. Ask them if the decreaser plants have the same type of characteristics that increasers have. Create a discussion on the importance of knowing the decreaser plants.

Study Guides

Note: Study guides will vary depending upon locality

1. Identify the type of plant, its palatability (cattle), its season of growth, and list any additional information that might help you in identifying each of the following decreaser plants:

<input type="checkbox"/> Alkali sacaton	<input type="checkbox"/> Leadplant amorphia
<input type="checkbox"/> Arizona/Idaho fescue	<input type="checkbox"/> Little bluestem
<input type="checkbox"/> Big/sand bluestem	<input type="checkbox"/> Mountain brome
<input type="checkbox"/> Bluebunch wheatgrass	<input type="checkbox"/> Mountain mahogany
<input type="checkbox"/> Four-wing saltbush	<input type="checkbox"/> Prairie cordgrass
<input type="checkbox"/> Green needlegrass	<input type="checkbox"/> Prairie junegrass
<input type="checkbox"/> Indian ricegrass	<input type="checkbox"/> Sideoats grama
<input type="checkbox"/> Indiangrass	<input type="checkbox"/> Western wheatgrass
2. Have the students review the power point slide show (*available on CAET Moodle site*) on the decreaser or "GREEN" labeled plants.

References

1. Colorado 4H Range Management Guide, CSU, Cooperative Extension, 1M 6-75, pp. 17-20.
2. Handbook of Colorado native Grasses, CSU, Bulletin 450-A
3. Pasture and Range Plants, Phillips Petroleum Company
4. Range Plant Handbook, U. S. Forest Service, Washington D. C., PB 168 589
5. FFA Range Judging Master Plant List, E. Colorado State Contest, 2016-2020
6. FFA Range Judging Master Plant List, Western Colorado, draft 2015

Analysis

Plant Name	Major Type	Palatability (Cattle)	Season of Growth	Life Span	Other
Alkali sacaton	grass	high	warm	perennial	
Arizona/Idaho fescue	grass	high	cool	perennial	
Big/Sand bluestem	grass	high	warm	perennial	
Bluebunch wheatgrass	grass	high	cool	perennial	
Fourwing saltbush	shrub	high	warm	perennial	
Green needlegrass	grass	high	cool	perennial	
Indian ricegrass	grass	high	cool	perennial	<i>See note below</i>
Indiangrass	grass	high	warm	perennial	
Leadplant amorphia	shrub	high	warm	perennial	
Little bluestem	grass	high	warm	perennial	
Mountain brome	grass	high	cool	perennial	
Mountain mahogany	shrub	high	warm	perennial	
Prairie cordgrass	grass	high	warm	perennial	
Prairie junegrass	grass	high	cool	perennial	<i>See note below</i>
Sideoats grama	grass	high	warm	perennial	
Western wheatgrass	grass	high	cool	perennial	

Note: Some decreaser plants may also be classified as increasers depending upon the condition of the range site or ecological site, the site's potential, season of grazing, and species of grazing animal.

Plan of Action

1. Have the various decreaser plants found in a grazed pasture available for the students to view. Discuss each plant with them and point out key factors to look for in identify in each plant. Have them list any points that they might note to help them to identify the plant in the OTHER column.
2. Have the students explore the grazing practices being used by the rancher in the pasture where the increaser plants were obtained. Discuss how the grazing management may have affected the presence and abundance of the decreaser plants.

Job Six

BECOMING FAMILIAR WITH INCREASER PLANTS

Situation

Describe the particular circumstances related to this job

Objectives

1. To learn the different types of plants that are classified as increaser plants.
2. To be able to identify increaser plants by viewing.
3. To learn the various characteristics of increaser plant (i.e. their type, origin, growth habit, and life span).

Motivation

Bring in several different increaser plants and have the students try to identify the plant. Use commonly known plants as well as the more difficult ones. Create a discussion on why it is important to know how to identify the increaser plants.

Study Guides

NOTE: Study Guides will vary depending upon locality

1. Identify the type of plant, its palatability (cattle), its season of growth, and the life span of the following plants. List any additional factors that might be helpful to you in identifying the following increaser plants:

- | | |
|--|--|
| <input type="checkbox"/> Annual buckwheat | <input type="checkbox"/> Locoweed |
| <input type="checkbox"/> Baltic rush | <input type="checkbox"/> Louisiana sagewort |
| <input type="checkbox"/> Big sagebrush | <input type="checkbox"/> Needleandthread |
| <input type="checkbox"/> Blowout grass | <input type="checkbox"/> Rabbitbrush |
| <input type="checkbox"/> Blue grama | <input type="checkbox"/> Red threeawn |
| <input type="checkbox"/> Bottlebrush squirreltail | <input type="checkbox"/> Sand dropseed |
| <input type="checkbox"/> Broom snakeweed | <input type="checkbox"/> Sand sagebrush |
| <input type="checkbox"/> Buffalograss | <input type="checkbox"/> Scarlet globemallow |
| <input type="checkbox"/> Cactus (prickly pear, cholla) | <input type="checkbox"/> Slender wheatgrass |
| <input type="checkbox"/> Death camas | <input type="checkbox"/> Sun sedge |
| <input type="checkbox"/> Foxtail barley | <input type="checkbox"/> Threadleaf sedge |
| <input type="checkbox"/> Fringed sagebrush | <input type="checkbox"/> Western ragweed |
| <input type="checkbox"/> Galleta | <input type="checkbox"/> Western yarrow |
| <input type="checkbox"/> Hairy goldaster | <input type="checkbox"/> Woolly Indianwheat |
| <input type="checkbox"/> Hairy grama | <input type="checkbox"/> Wyethia (Mules ear) |
| <input type="checkbox"/> Inland saltgrass | <input type="checkbox"/> Yucca |

2. Have the students review the power point slide show (available on CAET Moodle site) on the increaser or "YELLOW" labeled plants.



References

- » Colorado 4H Range Management Guide, CSU, Cooperative Extension, 1M 6-75 pp. 17-20.
- » Handbook of Colorado Native Grasses, CSU, Bulletin 450-A
- » Pasture and Range Plants, Phillips Petroleum Company
- » Range Plant Handbook, U. S. Forest Service, Washington D. C., PB 168 589

Analysis

Plant Name	Major Type	Palatability (Cattle)	Season of Growth	Life Span	Other
Annual buckwheat	forb	low	warm	annual	
Baltic rush	grass-like	low	cool	perennial	
Big Sagebrush	shrub	medium/low	warm	perennial	
Blowout grass	grass	low	warm	perennial	
Blue grama	grass	high	warm	perennial	
Bottlebrush squirreltail	grass	medium	cool	perennial	
Broom snakeweed	shrub	low/poisonous	warm	perennial	
<i>Buffalograss</i>	grass	high	warm	perennial	
Cactus (prickly pear, cholla)	shrub	low	warm	perennial	
Death camas	forb	poisonous	cool	perennial	
Foxtail barley	grass	medium/low	cool	perennial	
Fringed sagebrush	shrub	low	cool	perennial	
Galleta	grass	medium	warm	perennial	
Hairy goldaster	forb	low	warm	perennial	
Hairy grama	grass	high	warm	perennial	
Inland saltgrass	grass	low	warm	perennial	
Locoweed	forb	poisonous	cool	perennial	
Louisiana sagewort	forb	low	warm	perennial	
Needleandthread	grass	high	cool	perennial	<i>See note below</i>
Rabbitbrush	shrub	medium/low	warm	perennial	
Red threeawn	grass	low	warm	perennial	
Sand dropseed	grass	medium	warm	perennial	
Sand sagebrush	shrub	low	warm	perennial	
Scarlet globemallow	forb	medium	cool	perennial	
Slender wheatgrass	grass	medium/high	cool	perennial	
Sun sedge	grass-like	high	cool	perennial	
Threadleaf sedge	grass-like	medium	cool	perennial	
Western ragweed	forb	low	warm	perennial	
Western yarrow	forb	low	cool	perennial	
Woolly Indianwheat	forb	low	cool	annual	
Wyethia (Mules ear)	forb	low	warm	perennial	
Yucca	shrub	low/medium	cool	perennial	

Note: Some increaser plants may be classified as decreasers depending upon the condition of the particular range site or ecological site, the site's potential, the season of grazing, and the species of grazing animal.

Job Seven

BECOMING FAMILIAR WITH INVADER PLANTS

Situation

Describe the particular circumstances related to this job

Objectives

1. To learn how to correctly identify the range plants classified as invaders
2. To learn the various characteristics of invader plants (i.e. their type, origin, growth habit, and life span).

Motivation

Ask the students what an invader is. Ask them how an invader would related to plants and what would cause invader plants to be plentiful on a range site.

Study Guides

1. Identify the type, palatability, growth season, and the life span, as well as any other information that would be useful in identifying the following invader plants:
 - Barnyardgrass
 - Kochia
 - Canada thistle
 - Leafy spurge
 - Cheatgrass (downy brome)
 - Russian knapweed
 - Common mullein
 - Russian thistle
 - Kentucky bluegrass
 - Smooth brome
2. Have the students review the power point slide show (*available on CAET Moodle site*) on the invader or "RED" labeled plants.

References

- » Colorado 4H Range Management Guide, CSU, Cooperative Extension, 1M 6-75 pp. 17-20
- » Handbook of Colorado Native Grasses, CSU, Bulletin 450-A
- » Pasture and Range Plants, Phillips Petroleum Company
- » Range Plant Handbook, U. S. Forest Service, Washington D. C., PB 168 589

Analysis

Plant Name	Major Type	Origin	Season of Growth	Life Span	Other
Barnyardgrass	grass	introduced	warm	annual	
Canada thistle	forb	introduced	cool	perennial	noxious list B
Cheat grass	grass	introduced	cool	annual	noxious list C
Common mullein	forb	introduced	warm	biennial	noxious list C
Kentucky bluegrass	grass	introduced	cool	perennial	
Kochia	forb	introduced	warm	annual	
Leafy spurge	forb	introduced	warm	perennial	noxious list B
Russian knapweed	forb	introduced	warm	perennial	noxious list B
Russian thistle	forb	introduced	warm	annual	
Smooth brome	grass	introduced	cool	perennial	

Plan of Action

1. Secure the various invader plants from a pasture and have them available for student observation. Discuss some of the various identifying characteristics of each invader plant.
2. Have the students explore the grazing practices being used by the rancher in the pasture where the invader plants were obtained. Discuss how the grazing management may have affected the presence and abundance of the invader plants.

Evaluation

Classification of Plants Exercise

Give an identification test on the invader plants followed by a test using increaser, decreaser, and invader plants. Have the students name and classify each plant's specific characteristics. Use a field trip to help the students identify the different types of range plants found "in the field".

Plant Name	Major Type	Origin	Season of Growth	Life Span	Other

Wavyleaf thistle

Job Eight

BECOMING FAMILIAR WITH RANGE SITES AND ECOLOGICAL SITES

Situation

Describe the particular circumstances related to this job

Objectives

1. Develop an understanding of the differences between range sites and ecological sites.
2. Learn what range sites and ecological sites occur in the students area.
3. Create an understanding of the importance of range and ecological sites to proper management of rangelands.

Motivation

Ask the students if the soil has any effect upon where a range plant can be found. Have them give examples of how different textures of soil will have different types of plants.

Study Guides

1. What is a range site? What is an ecological site?
2. What are the four principal rangeland types found in Colorado?
3. What are the sub-types of rangelands associated with each type? (See Appendix A)
4. What is the principal range site or ecological site found in our area?
5. Describe the soil, topography and type of plant community found on the soil sites in our area.

References

- » Colorado 4H Range Management Guide, CSU, Cooperative Extension, 1M 6-75 pp. 27-33.
- » NRCS (sample range maps and range site or ecological site descriptions (ESD's)
- » USDA-NRCS, Field Office Technical Guide, Section II, Ecological Site Descriptions, <https://efotg.sc.egov.usda.gov/treemenuFS.aspx>

Analysis

1. A range site is an area of rangeland which has similar soil, climate, and topography to produce specific kinds and amount of vegetation. An ecological site is a distinctive kind of land with specific physical and biological characteristics that differs for other kinds of lands it its ability to produce a distinctive kind and amount of vegetation and in its ability to respond to management actions and natural disturbances. An ecological site and be rangeland or forest land.
2. Principal rangeland types found in Colorado are:
 - a. Plains sites [short-grass prairie, sandhills]
 - b. Foothill sites [east slope and west slope foothills]
 - c. Mountain sites [western Colorado plateaus, mountain bunchgrass, mountain parks, alpine]
 - d. Semi-desert sites [salt-desert]
3. Depending upon locality—use NRCS to help secure range site and ecological site descriptions.

Plan of Action:

Visit the local NRCS where you can secure range site and ecological site descriptions and range maps for students to determine the sites in their area.

Evaluation

1. Have a representative from the NRCS or other agency talk to the class to help them understand the differences in soil, range and ecological site description documents.
2. Plan a field trip with the aid of the representative to allow the class to view some of the different sites in their area.



Broomrape, a parasitic plant, is living off the root of fringed sagebrush.

A Source Unit for Colorado Teachers

Job Nine

BECOMING FAMILIAR WITH RANGE UTILIZATION

Situation

Describe the particular circumstances related to this job

Objectives

1. To develop an understanding of the importance of utilizing rangelands properly.
2. To create an understanding of how rangelands may be improved.

Motivation

Encourage discussion by asking the class if they know what an animal unit is and what the proper stocking rate for a range should be.

Study Guides

1. What is meant by an animal unit month (AUM)?
2. What are some guidelines to use for "animal unit equivalents"?
3. How can you determine what the proper stocking rate for a pasture should be?
4. What is meant by range utilization?
5. How is range utilization classified? Of what importance is it?
6. What is a grazing plan and what essential factors should a grazing plan include?
7. List the primary types of grazing systems and describe each.
8. What are some factors that may help to improve ranges and increase forage production?

References

- » Colorado 4H Range Management Guide, CSU, Cooperative Extension, 1M 6-75 pp. 32-452.
- » USDA-NRCS National Range and Pasture Handbook

Analysis

1. An animal unit month (AUM) is the length of time in months that one cow (or animal unit equivalent) can graze. One AUM requires 900 pounds of rangeland forage to meet nutritional requirements based on daily intake of 3 percent of mature body weight. (3% of 1000 pound AU = 30 pounds per day for 30 days in an average month = 900 pounds per AUM).

2. Some various animal unit equivalents are:
 - 1 – 1,000 lb. cow = 1 A.U. (Animal Unit)
 - 1 – Bull = 1.5 A.U.
 - 1 - Yearling = 0.7 A.U.
 - 1 – Horse = 1.25 A.U.
 - 5 – Ewes = 1 A.U.
 - 6 – Goats = 1 A.U.
 - 6-7 – deer/antelope = 1 A.U.

3. To determine the suggested initial stocking rate for a pasture the following steps can be recommended.
 - a. Determine the total annual production (TAP) for a pasture. Various methods can be used from consulting local references such as soil surveys or web soil survey (<http://websoilsurvey.nrcs.usda.gov/app/>), or measuring the forage production by plot sampling. Consult local range management specialists (NRCS, BLM, Forest Service, or University Extension Service) for assistance on sampling procedures.
 - b. If you know the TAP (expressed as pounds per acre air-dry) determine the palatable production. Palatable production is that portion of the total annual production that consists of plants that are high or medium forage value (consider only half of the production from the medium forage value plants).
 - c. The next step involves determining the portion of the palatable production that can be properly consumed by grazing which is the useable production. Useable production is calculated by multiplying the palatable production by the harvest efficiency (HE). HE values are based on the intensity of grazing management and vary from 20-25 percent for continuous grazing and simple deferred rotational grazing strategies, to as high as 30-40 percent for intensive multiple pasture grazing strategies.
 - d. The suggested initial stocking rate is determined by dividing the require amount of forage for an AUM (900 pounds) by the useable production. The result is the suggested initial stocking rate expressed as acres per AUM.
 - e. Example stocking rate calculations:
 - I. TAP is determined to be 1000 pounds per acre (air-dry) on average for a pasture.
 - II. Palatable plants are determined to be 90 percent.
 - III. Palatable production then is 900 pounds per acre (air-dry).
 - IV. Harvest Efficiency (HE) for the applicable grazing management is 30 percent.
 - V. Useable production then is 270 pounds per acre (air-dry).
 - VI. Suggested initial stocking rate is 900 divided by 270 or 3.3 acres per AUM.

4. To determine the carrying capacity (total AUM's) for a pasture first determine the number of usable acres in the pasture by subtracting the rocky, wooded, or forest land, and other unusable acres. The carrying capacity is calculated by dividing the usable acres by the suggested initial stocking rate for the pasture. For example, if the usable pasture acreage is 1000 acres and the suggested initial stocking rate is 3.3 acres per AUM, the carrying capacity for the pasture is 1000 divided by 3.3 or 303 AUM's.

5. The number of animals (expressed as AU's) that can be suggested to be run in a pasture is determined by dividing the carrying capacity for the pasture by the number of months planned to be grazed in the pasture. For example, the grazing plan calls for a grazing period of 45 days in the pasture. Based on the above example, the carrying capacity of 303 AUM's divided by 1.5 months (45 days). The result is that the pasture can properly support about 202 AU's for the 45 day planned grazing period. Alternatively, if the number of livestock is known, then the grazing period can be determined by dividing the carrying capacity by the appropriate number of AUs.

6. Another method of determining the stocking rate is to graze the animals on the pasture and observe the effect upon the vegetation; making animal number adjustments according to the reaction of the vegetation (adaptive management). This method requires more experience and time but is the most accurate. Stocking rates, of course, will vary from pasture to pasture.
7. Range utilization is the amount of forage removed from a range area by grazing animals.
8. Range utilization is classified into (1) heavy use, (2) light use, and (3) moderate use. It is important to know so that the range vegetation can be used efficiently without damaging the productivity or health of the range. An important guideline is to prescribe the grazing use so that the amount of forage that disappears from a pasture by the end of the growing season does not exceed about half of the total annual production. (See illustrations below).
9. A prescribed grazing plan is a prescription for grazing rangelands based upon the range condition and types of vegetation. A prescribed grazing plan should include (1) the time when the range is ready to graze (depending upon plant growth) and (2) the season during which the range can be used for the greatest benefit from the vegetation and offer the greatest protection or improvement of the range.
10. Some common types of prescribed grazing systems include:
 - a. Deferred grazing allows the vegetation to remain ungrazed until after maturity of the desirable forage. This allows the plants to rest/recover in order to build vigor, set seed, and improve its stand.
 - b. Short duration rotation grazing is accomplished by dividing the range into units and grazing rotationally over the pastures in short grazing periods (7-21 days), with adequate recovery periods, until the vegetation is properly utilized.
 - c. Deferred-rotation grazing is a combination of the deferred and rotation systems. This grazing method is used on large range units which are divided and grazed so that all of the units are used. But one or more units are deferred each year until after seed of the desired forage is mature. The grazing prescription for each pasture is designed to provide deferment (plant recovery) based on the dominance of cool or warm season plants in the pastures. The grazing periods are from one month and can be as long as half of the growing season. Adequate recovery periods are a necessary part of the grazing prescription.
 - d. Ultra-high stock density (UHSD) grazing or "mob grazing" involves concentrating very large numbers of livestock on small paddocks for very short grazing periods of one to part of one day. Very long rest/recovery periods of several months to a full year are then used to allow the plants to fully recover.

Note: Continuous grazing is not a commonly accepted method of prescribed grazing because it does not allow plants to recover during the growing season. It has been demonstrated to lead to deteriorated rangeland conditions and impairment of ecological function resulting in loss of ecosystem goods and services.

Continued on page 30

11. In addition to a prescribed grazing plan some rangeland improvement practices that may help to facilitate the grazing plan or accelerate improvement of ranges and grass production include:
- a. Strategic stock watering placement
 - b. Fencing pastures (both barbed wire and electric fences)
 - c. Utilizing salting places for livestock and periodic movement of salt
 - d. Reseeding badly deteriorate rangelands
 - e. Controlling increased amounts of woody plants such as big sagebrush and tamarisk
 - f. Controlling poisonous plant population areas
 - g. Clipping irrigated pastures to improve forage palatability
 - h. Harrowing or dragging to scatter droppings where cattle congregate
 - i. Low-stress livestock handling techniques to maintain good animal performance
 - j. Observing and monitoring rangeland conditions regularly to maintain proper plant balance and health
 - k. Using resource people (NRCS, University Extension Service, Bureau of Land Management, Agricultural Research Service, etc.) for assistance in range improvements.

Plan Of Action

Have a representative from the local NRCS, Extension Service or other agency plan to speak to the class regarding range utilization and improvement.

Evaluation

Have the class members compute the stocking rates currently used on their ranges with the suggested stocking rates and have them compare their results.



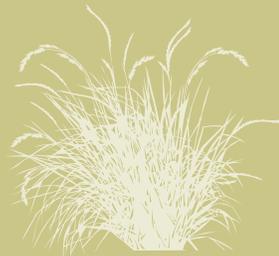
Woolly Indianwheat

Grazing Affects Root Growth

Percent leaf volume removed	Percent root growth stoppage
10%	0%
20%	0%
30%	0%
40%	0%
50%	2-5%
60%	50%
70%	78%
80%	100%
90%	100%

This table illustrates the truth in the old saying: "Take half and leave half". Notice that as you graze off up to half the leaves of your grass that root growth continues unimpaired. But, just look at what happens when you try to sneak in another ten percent "harvest": Half the root growth is stopped. At 80 percent use, root growth stops completely—and at least 30 percent is needed annually to replace roots naturally pruned. Removing 80 percent of the leaves also stops root growth for 12 days. Taking off 90 percent of the leaves stops root growth completely for 18 days.

Adapted from Crider



Grazing management and Utilization target

Plant Vigor —Leaves and Roots—Alberta Riparian Habitat Management Project.



BECOMING FAMILIAR WITH POISONOUS AND INJURIOUS PLANTS

Situation

Describe the particular circumstances related to this job

Objectives

1. To become familiar with the poisonous and injurious plants found on rangelands in the community.
2. To learn to identify these harmful plants.
3. To learn to control undesirable range plants.

Motivation

Secure a sample of wild oats, cheatgrass, or mature needleandthread grass and bring the sample into class. (Be sure the sample has several mature awns). Place the sample on a classroom table and add some water to the sample. Soon the twisted awns on the seeds will begin to rotate the seed. Ask the class what effect this could have on the livestock that could consume these mature plants. Start a discussion on the harmful effects of wild oats as well as other poisonous and injurious plants.

Study Guides

1. What damage to livestock do poisonous and injurious plants cause?
2. What are some of the plants found on ranges that can cause mechanical injury?
3. What are the most common poisonous plants found in this area?
4. How can we control these poisonous and injurious plants? How can they be prevented?

References

- » 16 Plants Poisonous to Livestock in the Western States, Farmers Bulletin No. 2106, USDA.
- » Range and Pasture Plants, Phillips Petroleum Company.
- » An Outline of Common Livestock Diseases, L. Keith Wayt, State Board for Community Colleges and Occupation Education, pp. 44-45.
- » A Guide to Plant Poisoning, Anthony P. Knight, Colorado State University, 2001.
- » Poisonous Plant website: http://southcampus.colostate.edu/poisonous_plants/

Analysis

1. Damage that poisonous and injurious plants cause include:
 - Death
 - Decreased value
 - Reduced gains
 - Mechanical injury
 - Conditions that lead to other sources (diseases, etc.)
2. Some plants that can cause mechanical injury include:
 - Bottlebrush squirreltail
 - Cactus
 - Cheatgrass or downy brome
 - Cocklebur
 - Needleandthread grass
 - Puncture vine
 - Red threawn
 - Sandbur
 - Wild oats
 - Others
3. Some of the common poisonous plants found in this area include: (depends on area) but some common ones are:
 - Arrow grass
 - Chokecherry
 - Gambel oak
 - Greasewood
 - Larkspur (Plains, Tall and Low)
 - Some species of locoweed (woolly, silky)
 - Lupine (Silvery, Silky, etc.)
 - Whorled milkweed
 - Others
4. Some of the common ways to control and prevent these poisonous and injurious plants from causing harm to livestock include:
 - a. Maintain a good cover of native vegetation.
 - b. Avoid overgrazing—reduce the time or number of animals in the pasture, or remove all livestock from short pastures.
 - c. Don't turn animals on the range too early in the spring.
 - d. Reduce the total number of animals in drought periods.
 - e. Avoid turning out hungry animals after shearing, shipping, or feeding poor quality hay.
 - f. Avoid areas where poisonous plants are abundant, such as around salt licks, water holes, and established trails; use different bed grounds each year.
 - g. Some rules to follow to reduce losses from poisonous plants include:
 - I. Become familiar with harmful plants and the conditions when the plants affect livestock.
 - II. Remove all animals from the pasture when poisoning becomes apparent.
 - III. Confine poisoned animal and give a laxative, although treatment is not too effective.
 - IV. Use plenty of salt and mineral on the range.
 - V. If possible, graze the kind of stock not poisoned by the plants present. For instance, larkspur is poisonous to cattle but is not harmful to sheep (in most instances).
 - VI. Use prescribed grazing management to change the season of grazing to fit the plants present on the range. For example, deathcamas causes heavy sheep loss in the spring but it goes dormant around the middle of June and is not dangerous for the rest of the season.

PLAN OF ACTION

1. Have samples of the various poisonous and injurious plants found in the area for the students to observe. Discuss the ways in which they can cause harm and injure livestock.
2. Have the students discuss ways to avoid livestock losses in the areas they have identified above.

Sample Poisonous Plants



Woolly locoweed

Job Eleven

RANGE SITE AND ECOLOGICAL SITE DESCRIPTIONS

Situation

Describe the particular circumstances related to this job

Objectives

1. To become better familiar with some of the range/ecological sites on rangelands in the community.
2. To learn to identify these sites.
3. To learn the key characteristics of some of the range/ecological sites.

Motivation

Correctly identifying range and ecological sites is an important skill in developing range management plans. Due to the variability of climate and soil types in Colorado range sites and ecological sites differ greatly throughout the state. Site descriptions have been developed for most of the range sites and some ecological sites in Colorado. However, the use of pictures and images of the sites (see Appendix B) are useful in helping students to correctly identify the sites. Ask the class to come up with their own name for the site based on the image and then to list some of the key characteristics that are unique to the site. Correctly name the site for the students.

Study Guides

1. What are range and ecological site descriptions?
2. Name the key parts to the site descriptions?
3. How can the site descriptions be useful to ranchers? To students of range management? To rangeland scientists?
4. How are site descriptions developed and who (or what entity) is responsible for their development and updating to current standards?

References

1. USDA-Natural Resources Conservation Service (NRCS), Electronic Field Office Technical Guide (eFOTG), Section II Ecological Site Descriptions. https://efotg.sc.egov.usda.gov/efotg_locator.aspx?map=US
2. Ecological Site Information System (ESIS). <https://esis.sc.egov.usda.gov/>
3. NRCS field offices located in most counties in Colorado.
4. Pictures of some range/ecological sites in Colorado (See Appendix B).

What are Ecological Site Descriptions (ESDs)?

Ecological Sites provide a consistent framework for classifying and describing rangeland and forestland soils and vegetation; thereby delineating land units that share similar capabilities to respond to management activities or disturbance.

Ecological Site Descriptions (ESDs) are reports that provide detailed information about a particular kind of land - a distinctive Ecological Site.

ESDs provide land managers the information needed for evaluating the land as to suitability for various land-uses, capability to respond to different management activities or disturbance processes, and ability to sustain productivity over the long term.

ESD information is presented in four major sections:

- Site Characteristics—physiographic, climate, soil, and water features
- Plant Communities—plant species, vegetation states, and ecological dynamics
- Site Interpretations—management alternatives for the site and its related resources
- Supporting Information—relevant literature, information and data sources

Determining the resilience and resistance of an area begins with knowing the ecology and looking up the ecological site descriptions (ESDs). ESDs are part of a land classification system that provides basic information about soil characteristics, such as temperature, moisture, and soil depth; and vegetation characteristics, such as the composition and abundance of plant species.

For FFA range judging in Colorado the “Legacy” versions (circa 2004) of the ESD’s will be used. These earlier versions show the plant composition based on percent of the total annual production in an average year. This corresponds to the protocol used on the scorecard for FFA range judging in Colorado. The entire set of “Legacy” ESD’s to be used for the FFA Range Judging CDE can be located on Google Drive under the folder for 2018, sub-folder Legacy ESD’s: <https://drive.google.com/drive/folders/0BxF6zTbqAVdrbDJBSWR0VjVhLUU>

For access by Colorado Ag Teachers, the Legacy ESD’s can be found on the Colorado Ag Teachers list-server “Moodle”.

As a side note, the entire set of provisional (i.e. updated) ESD’s for Colorado can be obtained from the Natural Resources Conservation Service (NRCS) electronic Field Office Technical Guide (eFOTG) at:

- http://efotg.sc.egov.usda.gov/efotg_locator.aspx?map=US
- Click on Colorado
- Click on any county in eastern CO Select Section II from the drop-down list Click on Ecological Site Descriptions
- Click on the appropriate Major Land Resource Area, MLRA 67B (NE & E CO) or 69 (SE CO) Select the desired ESD from the list

Analysis

Site Name

Type of Topography*

Soil Surface Texture**

Major Plants

**Examples would be plains, hills, sand dunes, breaks, etc.*

***Sandy, loamy, clayey, rock fragments, rock outcrop, etc.*

Range and Ecological Site Descriptions (ESD) Study Questions

HCPC is the Historic Climax Plant Community and can be considered as the Reference Plant Community (RPC)

Analysis (cont.)

1. What is the name of the Major Land Resource Area that the site occurs within?
2. What is the elevation range for this site?
Minimum _____ Maximum _____
3. What is the mean or average annual precipitation?
Minimum _____ Maximum _____
4. What is the average growing season length in days?
Minimum _____ Maximum _____
5. How deep is the soil surface layer in inches?
6. What is the total annual production of the HCPC or RPC in an average or RV year? (RV = Representative Value)
7. List the % potential vegetation of the HCPC or RPC?
 - a. Grasses and grass-likes
 - b. Forbs
 - c. Woody plants (shrubs)
8. What month and % will the HCPC or RPC see the most expected growth?
9. What is the texture of the soil surface layer?
10. Using the "Plant Communities and Transitional Pathways" diagram in the ESD, what plant community develops as a given transitional pathway is applied?
11. Name two plant communities that can occur on this site as referenced in the ESD.
12. Using the Plant Composition Table, what is the dominant grass that should occur on this site?
13. Using the Plant Composition Table, what is the maximum % composition of the dominant grass that should occur on this site?
14. Under Animal Preferences of the ESD, which quarterly month(s) is/are western wheatgrass?
 - a. Preferred for cattle? Month(s)
 - b. Desirable for cattle? Month(s)

(Refer to the legend under the Animal Preferences table)
(Order of grazing use is: Preferred = highest use, Desirable = moderate use, Undesirable = slight use)

Under the "Supporting Information" section of the ESD, what is the name of a similar ecological site?
15. Under the "Supporting Information" section of the ESD, what is the name of a similar ecological site?

Plan of Action

Have samples of the various range and ecological site descriptions available for the students to read and discuss among their class mates. Show the image of a particular site that corresponds to the site description that was just discussed. Discuss the ways in which the image matches some of the information contained in the description (See Appendix B).



APPENDIX A

General categories of the “types” of rangelands in Colorado, starting from east to west across the state

Source: Ben Berlinger, La Junta, Colorado; 2015

Short Grass Prairie—This type occurs throughout eastern Colorado and has the appearance of flat plains. The dominant plants are blue grama and buffalograss, with some mid-height plants such as western wheatgrass and galleta grass. Some shrubs can be seen such as Fourwing saltbush, yucca and cactus such as prickly pear and cholla. This type of rangeland is very valuable to Colorado’s livestock industry because of the grazing provided year-around. The grasses are very nutritious and plentiful.

Sandhills Prairie—Occurs in the extreme northeast part of Colorado. The land is rolling and is made of hills and dunes of sandy soil. The plants are mostly tall grasses such as sand bluestem, prairie sandreed, yellow Indiangrass, and switchgrass. Sand sagebrush is an important shrub. This type of rangeland is very productive but at the same time needs a lot of care to prevent wind erosion. It is valued for the habitat provided to prairie chickens and other prairie birds.

East Slope Foothill—This type of rangeland occurs along the eastern foothill of the Rocky Mountains. The foothills are the change from the prairie rangelands of eastern Colorado to the mountain type of rangeland. This type occurs from the Wyoming border to New Mexico with the foothills or hogbacks west of Denver being a good example. The main rangeland plants are big bluestem, western wheatgrass, with some blue grama. This type of rangeland is important for the value of providing homes and open space for humans in high population cities such as Denver and Colorado Springs.



Prairie sandreed

Mountain Rangelands—These are the high elevation rangelands of Colorado occurring on both the east and west slopes. They are above the foothills and below the alpine. They consist of mountain bunchgrasses such as mountain muhly, mountain brome, Arizona fescue, Parry's oatgrass and Thurber's fescue. Shrubs are not very common and forest lands usually found nearby. They are valuable for grazing both cattle and sheep because sheep can handle the steep slopes and high elevation. Elk and mule deer find valuable habitat here. The mountain rangelands provide extremely valuable clean water for Colorado's thirsty cities.

Alpine Rangeland—These are the rangelands found above timberline. In Colorado they occur above 11,000 feet in elevation. The plant life is sometime referred to as "cushion plants" because of their extremely low and spreading growth form. This is due to the very harsh growing conditions of constant winds, cold temperatures and short growing season. Most of the plant names of the plants that occur in the alpine have "alpine" in their name, such as alpine bluegrass, alpine sunflower, and alpine forget-me-nots. Sheep are mostly grazed in the alpine due to the very high elevation and sometimes steep slopes. The alpine provides much recreation such as hiking and camping.

High Intermountain Parks—There are 4 high intermountain parks in Colorado. They are from (north to south) North Park in Jackson County, Middle Park in Grand County, South Park in Park County, and the San Luis Valley in Alamosa and Rio Grande Counties. These parks have a cold climate and very short growing season due to the high elevation. They are dry because they are located in the "rain-shadows" of the surrounding high mountain peaks. So the plants are generally short and consist of blue grama and fescue grasses. Cattle graze in these parks but must be fed hay in the winter months due to snow covering the rangeland throughout most of the winter months. Some bison (buffalo) are grazed in these high parks because they can handle the cold temperature and snow during the winter month.

West Slope Foothills—This type occurs throughout the western area of the Rocky Mountains. Typical examples can be found in western Routt, Gunnison and Archuleta Counties. The plant community consists of a mixture of grasses (western wheatgrass and needle-and-thread grass) and shrubs such as big sagebrush and rabbitbrush. Trees such as pinyon pine and Utah juniper are also present. These plants provide very good habitat for livestock and wildlife. Hunting for mule deer and sage grouse is an important value, along with homes and open space for people.

West Colorado Plateaus—This type of rangeland occurs in the far western part of Colorado. Good examples would be Grand Mesa near Grand Junction and the Uncompahgre Plateau near Montrose. The plants found here would be a mixture of grasses, forbs and shrubs. Gambel oakbrush would be very noticeable along with mountain mahogany and serviceberry. Because of the many shrubs that grow here this type of rangeland provides excellent habitat for wildlife and the values of wildlife watching, photography, hunting, along with good forage for cattle, sheep and goats. Recreation is an important value to humans on this type.

Desert Type—The desert type of rangeland is found in extreme western and southwestern Colorado. It is not a "true" desert but is considered "semi-desert" because it isn't quite dry enough. This type occurs west of Grand Junction and in the Four Corners Area of Colorado. Summer temperatures are quite hot and it doesn't rain very much. So the plant life is very scattered and consists of some grasses and many shrubs such as cactus. This rangeland type provides important habitat to Colorado's wild horses and burros. It is valuable grazing for livestock during the winter months because of the lack of snow. Important wildlife would be the desert bighorn sheep.



APPENDIX B

Images of Range and Ecological Sites in Colorado

Southeast Colorado, Major Land Resource Area (MLRA) 69



Alkaline Plains Ecological Site, Southeast Colorado.



Choppy Sands Ecological Site, Southeast Colorado.



Limestone Breaks Ecological Site, Southeast Colorado.



Loamy or Loamy Plains Ecological Site, Southeast Colorado.



Loamy or Loamy Plains Ecological Site, Southeast Colorado.



Salt Meadow Ecological Site, Southeast Colorado.



Saline Overflow Ecological Site, Southeast Colorado.



Salt Flat Ecological Site, Southeast Colorado.



Sands or Deep Sands Ecological Site, Southeast Colorado.



Sandstone Breaks Ecological Site, Southeast Colorado.



Sandstone Breaks Ecological Site, Southeast Colorado.



Sandy Bottomland Ecological Site, Southeast Colorado.



Sandy or Sandy Plains Ecological Site, Southeast Colorado.



Shale Breaks Ecological Site, Southeast Colorado.



Shaly Plains Ecological Site, Southeast Colorado.

Northeast Colorado, Major Land Resource Area (MLRA) 67B



Alkaline Plains Ecological Site, Northeast Colorado



Saline Overflow, Northeast Colorado



Sands or Deep Sands, Northeast Colorado



Sandy Meadow Ecological Site, Northeast Colorado



Sandy Meadow Ecological Site, Northeast Colorado

Northwest Colorado, Routt County Area, Major Land Resource Area (MLRA) 48A



Claypan Ecological Site, Routt County



Claypan Ecological Site, Routt County



Deep Clay Loam Ecological Site (formerly called Mountain Loam), Routt County



Deep Clay Loam Ecological Site (formerly called Mountain Loam), Routt County



Deep Clay Loam Ecological Site (formerly called Mountain Loam), Routt County
West-central Colorado, Major Land Resource Area (MLRA) 34A and B



Clayey Foothill Ecological Site, Pieance Basin



Foothills Swale Ecological Site, Pieance Basin



Stony Salt Desert Ecological Site, South of Grand Junction, Reeder Mesa Area

West-Central Colorado, Major Land Resource Area (MLRA) 36



Salt Desert Overflow Ecological Site, Dry Creek Basin

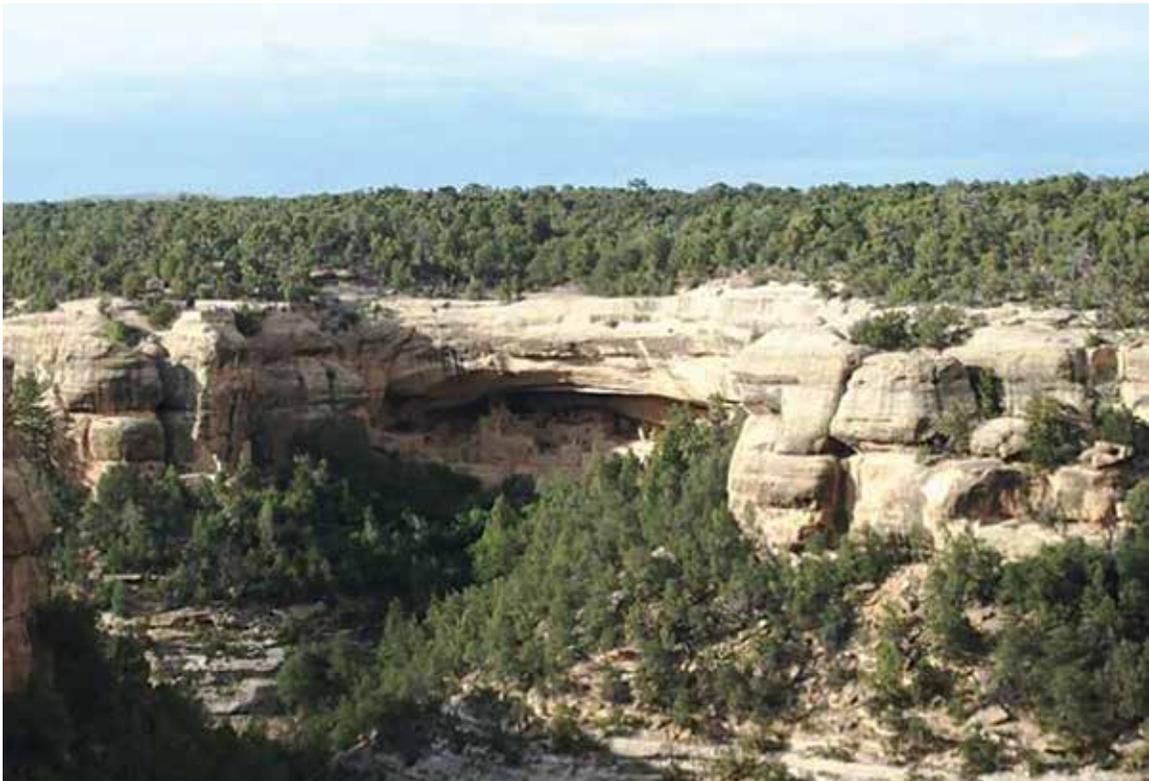


Loamy Foothills Ecological Site, Dove Creek Area

31 Shively, Hovenweep National Monument
EPA: Datas NAD83, Zone 12, Easting 074190,
Northing 4141178
Info by Mike Orman 2009
It is located in Hovenweep National
Monument—Horseshoe Rockberry This site is in
manure photo 1.2



Shallow Clay Loam Ecological Site, Hovenweep National Monument



Shallow Loamy Mesa Top Ecological Site, Mesa Verde National Park

Western and Southwest Colorado, Major Land Resource Area (MLRA) 48A



Clayey Valley Ecological Site, Southwest Colorado



Brushy Loam Ecological Site, Western Colorado



Deep Clay Loam Ecological Site, Cimarron Area



Mountain Swale Ecological Site, Gunnison Basin Area



Pine Grassland Ecological Site, Pagosa Springs Area



Subalpine Loam Ecological Site, Rainbow Lake Road, Gunnison



Loamy Park Ecological Site, Southwest Colorado



Mountain Meadow Ecological Site, Southwest Colorado

APPENDIX C

Eastern Colorado FFA State Plant List 2018

Palatability ratings are for cattle.

Decreasers—plants that are reduced in the composition as a result of heavy continuous use.

Decreasers					
Grasses					
Plant Name	Annual	Biennial	Perennial	Palatability	Growth Season
Alkali sacaton			✓	High	Warm
Arizona fescue			✓	High	Cool
Big or sand bluestem			✓	High	Warm
Canada wildrye			✓	High	Cool
Green needlegrass			✓	High	Cool
Indiangrass			✓	High	Warm
Little bluestem			✓	High	Warm
Nebraska sedge			✓	High	Cool
Prairie cordgrass			✓	High	Warm
Prairie junegrass			✓	High	Cool
Prairie sandreed			✓	High	Warm
Sideoats grama			✓	High	Warm
Switchgrass			✓	High	Warm
Vine mesquite			✓	High	Warm
Western wheatgrass			✓	High	Cool

Decreasers					
Forbs					
Plant Name	Annual	Biennial	Perennial	Palatability	Growth Season
Purple prairie clover			✓	Medium	Cool

Decreasers					
Half Shrubs and Shrubs					
Plant Name	Annual	Biennial	Perennial	Palatability	Growth Season
Fourwing saltbush			✓	High	Warm
Leadplant amorphia			✓	High	Warm
Mountain mahogany			✓	High	Warm
Winterfat			✓	High	Warm

Invaders—plants that are present in small quantity or not present under ideal condition; invaders increase with deteriorating range condition.

Invaders					
Grasses					
Plant Name	Annual	Biennial	Perennial	Palatability	Growth Season
Barnyardgrass	✓			Medium	Warm
Cheatgrass or downy brome	✓			Medium	Cool
Smooth brome			✓	Medium	Cool

Invaders					
Forbs					
Plant Name	Annual	Biennial	Perennial	Palatability	Growth Season
Canada thistle			✓	Low	Cool
Kochia	✓			Medium	Cool
Leafy spurge			✓	Poisonous	Warm
Russian thistle	✓			Medium	Warm

Increases—plants that increase in percentage of composition as a result of heavy grazing and during the first stages of range deterioration. They decrease in percent of composition under continuous heavy grazing.

Increases					
Grasses					
Plant Name	Annual	Biennial	Perennial	Palatability	Growth Season
Baltic rush			✓	Low	Cool
Blowout grass			✓	Low	Warm
Blue grama			✓	High	Warm
Bottlebrush squirreltail			✓	Medium	Cool
Buffalograss			✓	High	Warm
Galleta			✓	Medium	Warm
Hairy grama			✓	High	Warm
Indian ricegrass			✓	High	Cool
Inland saltgrass			✓	Low	Warm
Needleandthread			✓	High	Cool
New Mexico feathergrass			✓	Medium	Cool
Red threeawn			✓	Low	Warm
Ring muhly			✓	Low	Warm
Sand dropseed			✓	Medium	Warm
Sand flatsedge			✓	Medium	Cool
Sand paspalum			✓	Medium	Warm
Sixweeks fescue	✓			Low	Cool
Sun sedge			✓	High	Cool
Threadleaf sedge			✓	Medium	Cool
Tumblegrass			✓	Low	Warm

Increasers					
Forbs					
Plant Name	Annual	Biennial	Perennial	Palatability	Growth Season
Annual buckwheat	✓			Low	Warm
Hairy goldaster			✓	Low	Warm
Louisiana sagewort			✓	Low	Warm
Plains larkspur			✓	Poisonous	Cool
Scarlet globemallow			✓	Medium	Cool
Slimflower scurfpea			✓	Low	Cool
Wavyleaf thistle		✓		Medium	Cool
Western ragweed			✓	Low	Warm
Woolly Indianwheat	✓			Low	Cool
Woolly locoweed			✓	Poisonous	Cool

Increasers					
Half Shrubs and Shrubs					
Plant Name	Annual	Biennial	Perennial	Palatability	Growth Season
Broom snakeweed			✓	Poisonous	Warm
Walking stick cholla			✓	Low	Warm
Fringed sagebrush			✓	Medium	Cool
Plains prickly pear			✓	Low	Warm
Rubber rabbitbrush			✓	Low	Warm
Sand sagebrush			✓	Low	Warm
Small soapweed or yucca			✓	Medium	Cool
Spreading buckwheat			✓	Low	Cool
Wormwood			✓	Low	Warm

Scarlet globemallow

APPENDIX D

Western Colorado FFA State Plant List 2018

Palatability ratings are for cattle.

Decreasers—plants that are reduced in the composition as a result of heavy continuous use,

Decreasers					
Grasses and Grass-likes					
Plant Name	Annual	Biennial	Perennial	Palatability	Growth Season
Alkali Sacaton			✓	High	Warm
Alpine Bluegrass			✓	High	Cool
Basin Wildrye			✓	High	Cool
Bluebunch Wheatgrass			✓	High	Cool
Canada Wildrye			✓	High	Cool
Columbia Needlegrass			✓	High	Cool
Elk Sedge			✓	High	Cool
Green Needlegrass			✓	High	Cool
Idaho or Arizona Fescue			✓	High	Cool
Indian Ricegrass			✓	High	Cool
Mountain Brome			✓	High	Cool
Mountain Muhly			✓	High	Warm
Nebraska Sedge			✓	High	Cool
Nodding Brome			✓	High	Cool
Reed Canarygrass			✓	High	Cool
Tufted Hairgrass			✓	High	Cool
Western Wheatgrass			✓	High	Cool

Decreasers					
Forbs					
Plant Name	Annual	Biennial	Perennial	Palatability	Growth Season
American Vetch			✓	High	Cool

Decreasers					
Half Shrubs and Shrubs					
Plant Name	Annual	Biennial	Perennial	Palatability	Growth Season
Antelope Bitterbrush			✓	High	Warm
Fourwing Saltbush			✓	High	Warm
Mountain Mahogany			✓	High	Warm
Service Berry			✓	High	Warm
Winterfat			✓	High	Warm

Invaders—plants that are present in small quantity or not present under ideal condition; invaders increase with deteriorating range condition.

Invaders					
Grasses					
Plant Name	Annual	Biennial	Perennial	Palatability	Growth Season
Cheatgrass	✓			Medium/ Low	Cool
Kentucky Bluegrass			✓	High	Cool
Smooth brome			✓	High	Cool

Invaders					
Forbs					
Plant Name	Annual	Biennial	Perennial	Palatability	Growth Season
Canada thistle			✓	Low	Cool
Common Mullein		✓		Low	Warm
Kochia	✓			Low	Warm
Leafy Spurge			✓	Poisonous	Warm
Musk Thistle		✓		Low	Warm
Russian Knapweed			✓	Poisonous	Warm

Increases—plants that increase in percentage of composition as a result of heavy grazing and during the first stages of range deterioration. They decrease in percent of composition under continuous heavy grazing.

Increases					
Grasses and Grass-likes					
Plant Name	Annual	Biennial	Perennial	Palatability	Growth Season
Baltic Rush			✓	Low	Cool
Bearded Wheatgrass			✓	Medium	Cool
Blue Grama			✓	High	Warm
Bottlebrush Squirreltail			✓	Medium	Cool
Breadless Wheatgrass			✓	Medium	Cool
Foxtail Barley			✓	Medium/ Low	Cool
Prairie Junegrass			✓	Medium	Cool
Needleandthread			✓	High/ Medium	Cool
Sandberg's Bluegrass			✓	Medium	Cool
Slender Wheatgrass			✓	Medium/ High	Cool
Threadleaf Sedge			✓	Medium	Cool
Thurber's Fescue			✓	Medium	Cool

Increasers					
Forbs					
Plant Name	Annual	Biennial	Perennial	Palatability	Growth Season
Arrowleaf Balsamroot			✓	Medium	Warm
Columbine			✓	Low	Warm
Cow Parship			✓	Medium	Warm
Death Camas			✓	Poisonous	Cool
Goldenrod			✓	Low	Warm
Harebell			✓	Low	Cool
Indian Paintbrush			✓	Low	Cool
Lewis Flax			✓	Low	Cool
Loco			✓	Poisonous	Cool
Lupine			✓	Poisonous	Cool
Mariposia Lily			✓	Medium	Cool
Rocky Mountain Penstemon			✓	Low	Cool
Western Ragweed			✓	Low	Warm
Western Salsify			✓	Low	Warm
Western Yarrow			✓	Low	Cool
Wild Carrot			✓	Medium	Cool
Wild Geranium			✓	Low	Cool
Wild Iris			✓	Low	Cool
Wild Onion			✓	Low	Cool
Wyethia (Mules Ear)			✓	Low	Warm

Increasers					
Half Shrubs and Shrubs					
Plant Name	Annual	Biennial	Perennial	Palatability	Growth Season
Big Sagebrush			✓	Medium/ Low	Warm
Broom Snakeweed			✓	Poisonous	Warm
Fringed Sagebrush			✓	Low	Cool
Gambel Oak			✓	Low	Warm
Greasewood			✓	Poisonous	Warm
Ground or Common Juniper			✓	Low	Warm
Prickly Pear Cactus			✓	Low	Warm
Rabbitbrush			✓	Medium/ Low	Warm
Silver Sagebrush			✓	Low	Warm
Snowberry			✓	Low	Cool
Yucca			✓	Medium/ Low	Cool

APPENDIX E

How to Complete the Colorado State FFA Rangeland Judging Scorecard

By Bill Carwin, Ag Instructor and FFA Advisor, Pritchett, Colorado. 2016

- ❑ Contestant = Students name
- ❑ School = Student's school
- ❑ Site Numer = Top right-hand corner, Student will judge 2 different sites, so they must put which site they are judging site 1 or site 2.
- ❑ Line "A" The ecological site is: _____

Usually in a contest there will be a choice of around 3 or 4 ecological sites that they can pick from. The sites will be given out to teachers in advanced notice; this is so you the teacher can run off the sites for each student as they will need the site sheets for the scorecard. (Each student needs them). To figure out the Ecological site you are on, you can do the following. Observe the pasture first, where is it, how does it lay, there will be FLAGS that mark the area to be judged, look at the flagged area only, a site can change within 10 feet. There will be a hole dug for students to look at and feel the soil, so do it. What type of soil is it? Look at the major plants on the site. Then start looking at the ecological site descriptions, they tell you the slope, soil texture, plants that should be on the site. Bingo if the site description matches what you see than that is the Name to put on line (A).

Warning—Sometimes the Site plants have changed dominant species, so it will not match the site description, which means you must look at other indicators (**slope, topography, soil texture**).

Look for **plants that typically grow on certain sites** (i.e. if you see sand sagebrush guess what? You are on a Deep Sand or Sandy Bottomland site).

- ❑ Now for the Hands-on Part; between letters A and B you will find several lines and columns. Work with the left-hand column that says, "List of Plant Species" There is a box for Grasses and Grass like Plants, a box for Forbs, and a box for Shrubs.

To complete Parts "B", "D" and "E" the students need to do a "dual purpose" step-transect as described below.

The students must fill this out with the plants they find within the flagged area. They must find 100 plants. To do this here is a method: Have student mark a line on the tip of their shoe with a pen.

Find the flags 4 corners, start walking diagonal from one corner to the next corner, take big steps and only count on one shoe, once you have made the step, stop and write down the plant that is closest to the line on the tip of their shoe, take your next step, stop and write down the plant closest to the line on the tip of their shoe. Continue recording plants and making tally marks. Do this for 25 steps (try to get from corner to corner in 25 steps). Now go to the opposite corner and do it again with 25 steps, stopping and writing down plants or putting tally marks.

- ❑ For Part "D", Basal Cover of Perennial Vegetation and Litter Cover on the Soil Surface, the students must also determine the percent of the soil surface covered with the base of perennial plants and litter. Litter is defined as dead plant leaves and stems that are detached from the base of the plant and *laying on the soil surface*.

To do this the students must record if the line-mark on the tip of their shoe is directly on top of the base of a perennial plant or directly on top of a piece of litter. Leaves that are bent over do not count as basal hits. Record each step taken, Basal Hits and Litter Hits in the box at the bottom of the scorecard. As a check, the total of the "Step Count" MUST equal the number of steps taken. Have the students do the math. Example: 10 basal hits divided by 50 Steps = 20% perennial vegetation basal cover on the soil surface.

Yes, this only equals 50 steps or 50 plants. A more accurate way is to do 50 steps each way which gives you 100 plants, however for the time allotted a student usually cannot do this. We will adjust the 50 steps below.

Once the student has the plants, basal hits and litter hits and tallies written down they can sit down with their ecological site descriptions and fill out the rest.

Move under the Plant Community Composition table and look for the column that is ACTUAL % now go back to the grasses and write down how many times you stepped on each plant, this is where we adjust the 50 steps. If your student only took 50 steps then they must count their tally marks and times them by 2 for the actual column (if they had 5 tally marks by blue grama then the actual column would be 10%). Do this for all plants, once this is done they should be able to add up the actual column and as the bottom of the column says, they should have 100%.

- ❑ Line "B" The Plant Composition is _____ %

In order to get this number the student has to fill out the ALLOWABLE% column. Open the Ecological Site Description book, the one of which you named it in line "A", if you use the wrong site book the numbers will be wrong. Open it to the list of plants which says *Plant Community and Group Annual Production*. They can now fill out the column on the work sheet that is Site Description %. Take your first plant and look it up in the ecological site description the number under % Comp write on worksheet under Site Description, (if I had blue grama on my worksheet, then look it up in book and it says 15-25, write 15-25 on the worksheet under site description %). Do this for each plant that is written on their score sheet.

They will work with the last column on the ecological site description that is % COMP. This is what is allowed for plant composition for the plants for the particular site.

Now look at the Actual Column on score sheet, and look at the site description % on the score sheet.

Write the number that is in your actual column in the Allowable % column, UNLESS THE NUMBER FROM YOUR ACTUAL COLUMN IS BIGGER THAN THE NUMBER ALLOWED FROM THE SITE DESCRIPTION, if this is the case you can only write down the most allowed number in the allowable column. (If I had 30 written down for blue grama but the number in my site description % was 15-25 than the most I would write would be 25 in the allowable % column).

When this is done for all plants the ALLOWABLE % column is done. Now ADD up all the numbers in the ALLOWABLE % column and write it down at the bottom of that column. Write this same number down on Line "B" Plant Composition Score.

- ❑ Line "C" Range Condition Score

This line comes from your earlier teaching of range management in Job IV of the Source Unit for Range and Pasture Management:

Poor = 0%-25%, Fair = 26%-50%, Good = 51%-75%, Excellent = 76%-100%.

Take the Number from Line "B" and enter a check-mark where it fits with range condition. (If my line B was 67% than I would mark next to the GOOD in line C).

- ❑ Part "D" Basal Cover of Perennial Vegetation and Litter Cover on the Soil Surface

See above information.

- ❑ Line "E"

Total production per acre _____ lbs. (air-dry per year). (Given)

This Number will be given to them either orally or it will be written on a piece of paper with the range management scenario of that pasture.

Write the number down that is given to them on the total production per acre line.

Palatable Forage per acre _____ lbs. (air-dry per year).

See Appendix F for Palatability to get this line. The total of the "Palatable %" column can be multiplied by the "Total production per acre" amount to determine the palatable forage per acre.

Pounds of useable forage per acre _____ lbs. (air-dry per year).

Look at the bottom of the work sheet and it tells you that 35% of the palatable forage is harvestable forage (which is useable) do the math and put the number on the line.

Line "F"

Acres per animal unit month: _____ Acres.

On the Bottom of the worksheet is tells you that one animal unit month (AUM) is equivalent to about 900 lbs. of harvestable (useable) forage air- dry. Do the Math (division) and put it on the line. (i.e. 900 pounds per AUM divided by 400 pounds per acre of useable forage = 2.25 acres per AUM).

Line "G" Ecological Site Description (ESD) Questions

The students will need to answer the set of five questions about the ESD pertaining to the site being judged. These questions will be taken from the ESD List of Study Questions. The source for this line comes from your earlier teaching of range management and ESD's in Jobs VIII and XI of the Source Unit for Range and Pasture Management.

Back of Sheet

Yes, tell your students to do the BACK!

Part "H" Trend Indicators and Overall Trend Rating

There are 5 trend indicators worth four points each. READ each indicator and look at the site to mark either an "I" for improving trend or a "D" for declining trend. The Overall Trend Rating is determined by analyzing the rating of the five trend indicators and selecting (check-mark) either an Improving or Declining Overall Trend based on the dominance of the indicators. Example: 3 indicators are "I" and 2 indicators are "D", thus the Overall Trend Rating is Improving "I".

Part "I" Range Practices

The students will be given a number, either orally or it will be written down on the paper of the scenario, of how many lines to check for practices.

Read or listen carefully to the management scenario as it will give all the answers of which lines to check under "I".



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Burrowing Owl

APPENDIX F

FFA Rangeland Judging CDE Palatability Rating Method

STEP 1

Determine the percentage of palatable plants on the site:

- High value plants count the entire percent occurring on the site in the Actual % column
- Medium value plants count only half of the percent occurring on the site in the Actual % column
- Low or Poisonous value plants do not count

In the "Palatability Rating" column, record the palatability rating for each plant based on cattle preference of High (H), Medium (M), Low (L), or Poisonous (P).

Record the palatable percent of each plant in the "Palatable %" column using the above guidelines.

STEP 2

Total the percentage from the above calculations.

STEP 3

Multiply this percent times the Total Production given in part E of the scorecard.

The result is the Palatable forage per acre and is entered on the corresponding blank line in part E of the scorecard.



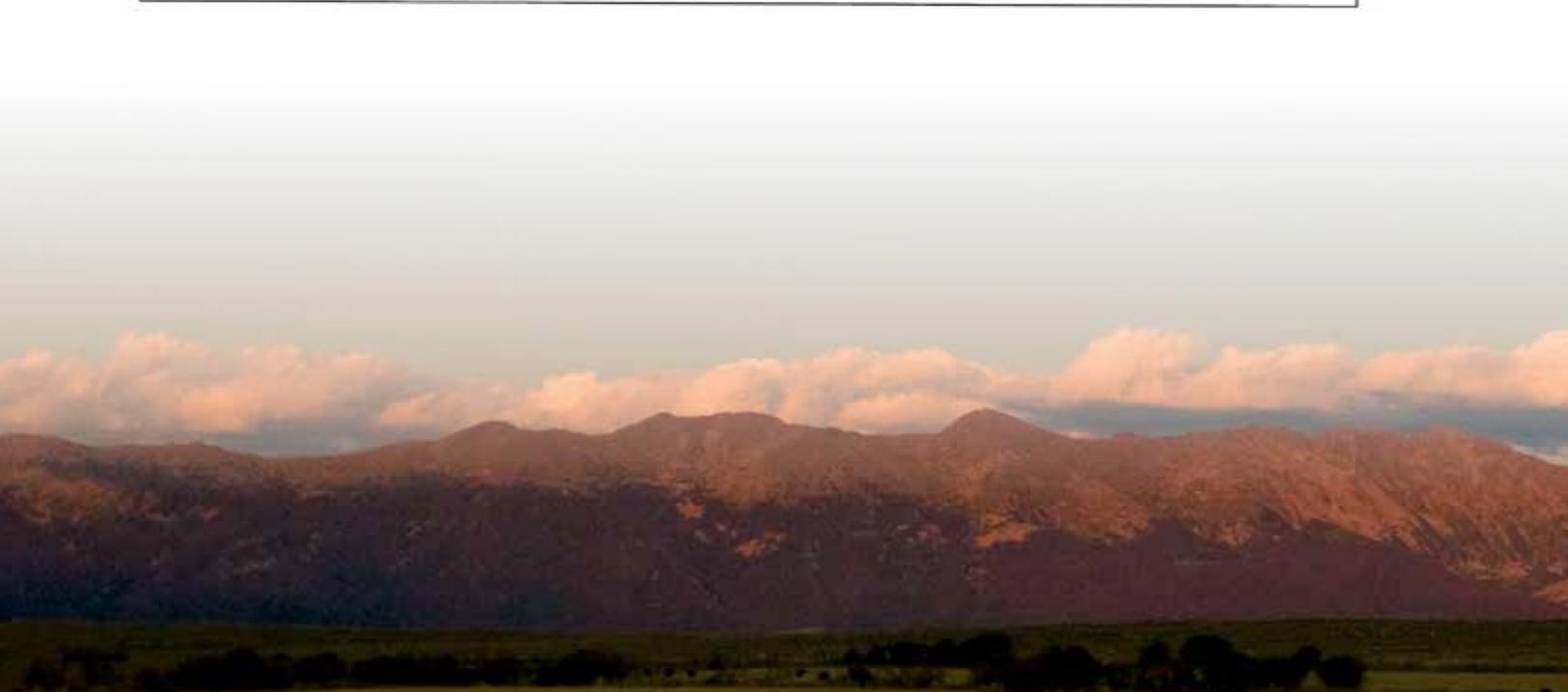
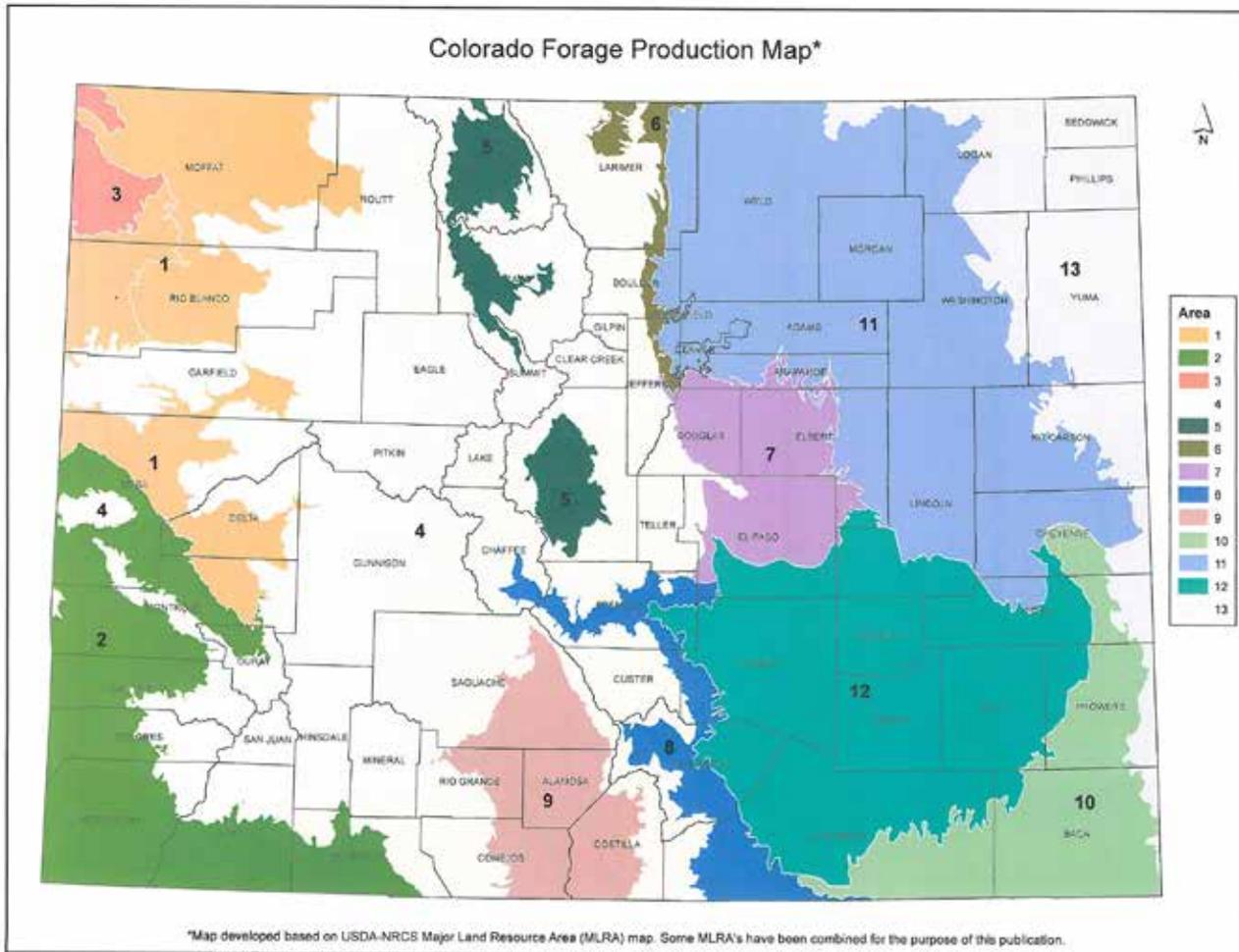
Buffalograss

Curent scorecard is available as a pdf on the CAET Moodle site.

H. Determine the Apparent Range Trend - GUIDE FOR RATING RANGE TREND			
Considering the potential for this site, class of livestock, season of use, recreational use, fire and other influences, rate the following by giving each item a rating of:			
	<u>I (Improving Trend)</u>	<u>D (Declining Trend)</u>	
TREND INDICATORS		RATING	SCORE
REPRODUCTION AND RECRUITMENT OF DESIRABLE PLANTS (4 points)			
» Major species of the potential plant community are producing seedlings, plants are of mixed ages, there is evidence of active tillers, rhizomes, stolons.....	I	_____	
» Major species are not producing seedlings; absence of active tillers, rhizomes, stolons.....	D	_____	_____
PLANT RESIDUE (also called litter) (4 points)			
» Litter produced by major species is apparently abundant for the site, litter is on the soil surface & is providing sufficient cover to the soil.....	I	_____	
» Litter is absent or minimal; OR excessively accumulating due to over-resting the site.....	D	_____	_____
COMPOSITION CHANGES (4 points)			
» Dominant species of the potential plant community are maintaining their place in the stand of vegetation.....	I	_____	
» Dominant species are absent or noticeably decreasing in percentage, while minor species, or plants not native to the community, are increasing.....	D	_____	_____
PLANT VIGOR (4 points)			
» Major species of the potential plant community are strong, healthy, producing seedheads and well rooted.....	I	_____	
» Major species are shallow rooted & showing noticeable die-off; few or no seedheads	D	_____	_____
SOIL SURFACE FACTORS (4 points)			
» Accelerated soil erosion is not evident. Past erosion signs have healed. Water intake for the kind of soil is favorable, runoff is minimal.....	I	_____	
» Accelerated soil erosion is very obvious. Soil stability is poor as seen by failure of erosion signs to heal. Water intake for kind of soil is unfavorable, runoff is excessive.....	D	_____	_____
OVERALL TREND RATING (5 points)			
Rating: Dominance of "I" Indicators.....	Improving Trend	I	_____
Rating: Dominance of "D" Indicators.....	Declining Trend	D	_____
			(Check Appropriate Trend)
			Part H Total Score (25 Pts.)
			<input style="border: 2px solid red; width: 80px; height: 20px;" type="text"/>
I. Check the _____ blank(s) for the most important practice(s) you would recommend for rangeland improvement based on the provided information & map. (10 points per practice)			
1 _____ Continue present grazing management			
2 _____ Practice brush control			
3 _____ Practice noxious weed control			
4 _____ Reseed with adapted plant species and varieties			
5 _____ Implement dual-use livestock grazing (cattle & sheep for example)			Part I Total Score:
6 _____ Implement prescribed (rotational) grazing management (may include additional fencing, and/or specified deferment during the spring or summer growth periods)			<input style="border: 2px solid red; width: 80px; height: 20px;" type="text"/>
7 _____ Water development and/or strategic salt & mineral placement			
8 _____ Decrease stocking rate (higher acres per AUM)			
9 _____ Increase stocking rate (lower acres per AUM)			
			PAGE 2 SCORE:
			<input style="border: 2px solid red; width: 80px; height: 20px;" type="text"/>

APPENDIX H

Colorado Forage Production



Colorado Average Forage Production by Region.

Source: Dan Nosal, NRCS Franktown, Colorado. 2016

Approx. NRCS MLRA**	Area (from CO Forage Production Map)	"Excellent/Good Forage Condition AUM/AC"	Normal Climatic Conditions* AUM/AC	"Fair/Poor Forage Condition AUM/AC"	Excellent/Good Forage Condition AC/AU/YR	Normal Climatic Conditions* AC/AU/YR	Fair/Poor Forage Condition AC/AU/YR
34A and B	1	0.34	0.23	0.12	35	52	100
35 and 36	2	0.30	0.22	0.13	40	55	92
47	3	0.36	0.25	0.14	33	48	86
48A	4	0.50	0.34	0.18	24	35	67
48B	5	0.36	0.27	0.17	33	44	71
49N	6	0.33	0.25	0.16	36	48	75
49C	7	0.50	0.40	0.30	24	30	40
49S	8	0.40	0.29	0.17	30	41	71
51	9	0.37	0.27	0.16	32	44	75
67S	10	0.43	0.33	0.22	28	36	55
67N	11	0.60	0.43	0.25	20	28	48
69	12	0.29	0.21	0.12	41	57	100
72	13	0.60	0.43	0.25	20	28	48

See map on facing page.

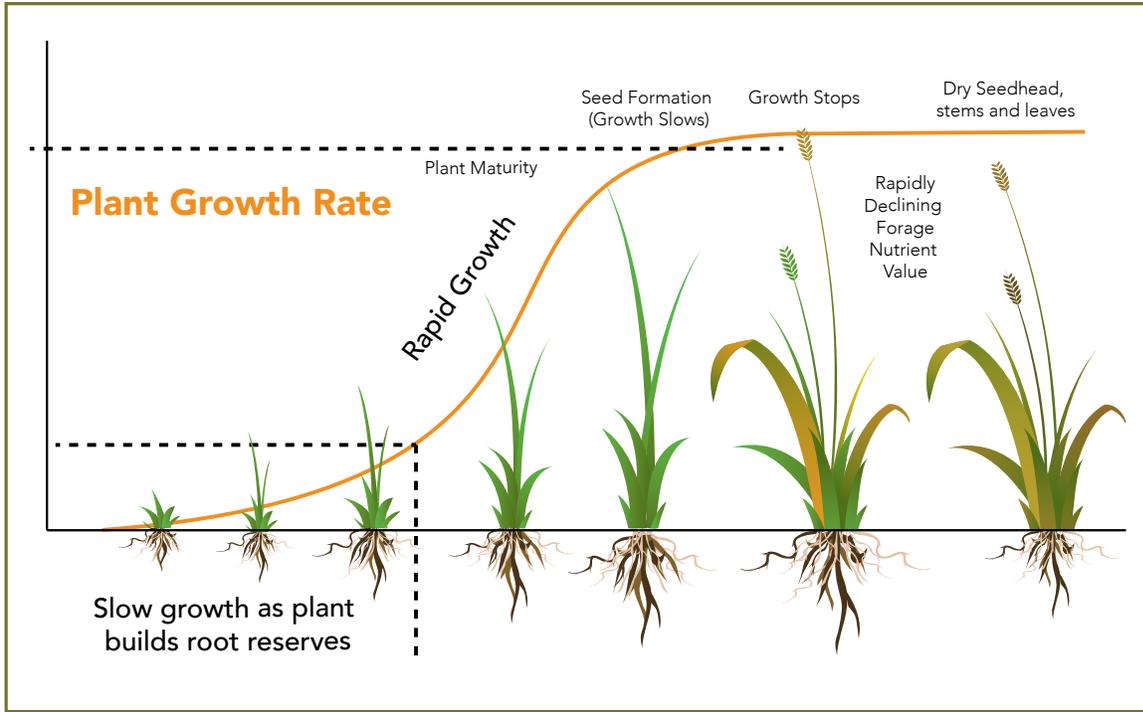
- Note: Grazing capacities are based on the Reference Plant Communities (NRCS Ecological Site Descriptions) and Historic Climax Plant Communities (NRCS Range Site Descriptions).
- *Grazing capacity based on a normal (average) year's forage production using total annual production with average climatic conditions.
- **Complete Major Land Resource Area (MLRA) map is available at Colorado NRCS website https://efotg.sc.gov.usda.gov/references/public/CO/CO_MLRAs.pdf



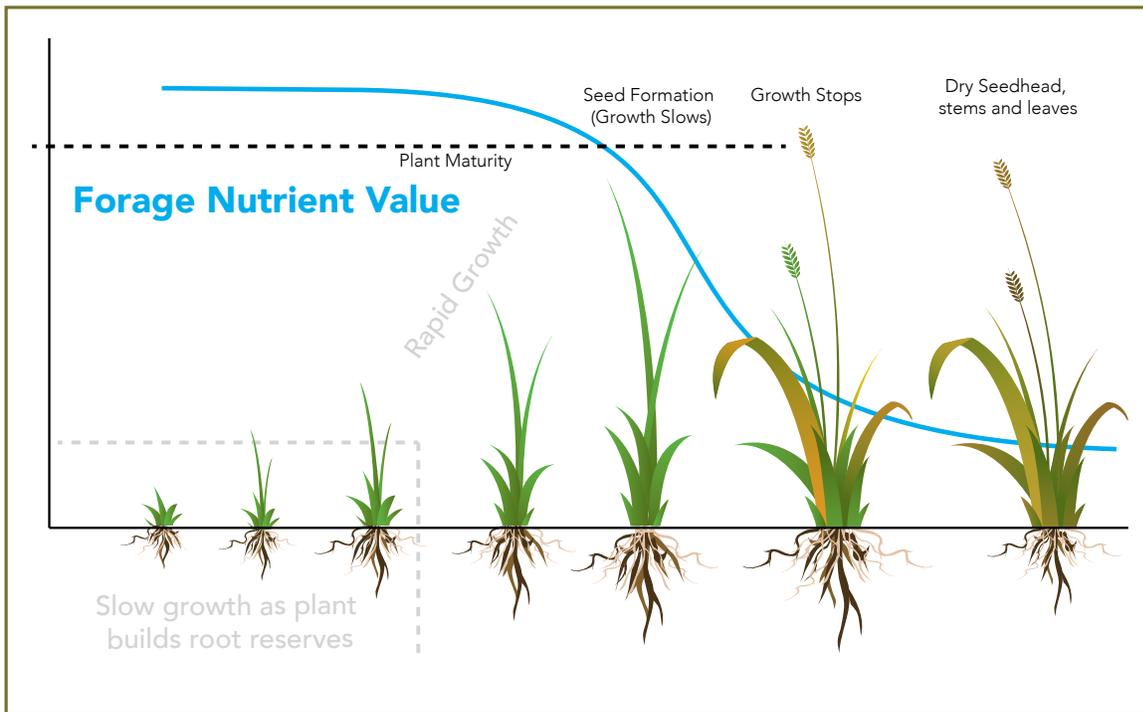
APPENDIX I

Grass Growth Rate and Nutrient Value

Grass growth rate above and below ground correlated with phenology.



Grass nutrient value correlated with phenology.



APPENDIX J

Range Plant Identification Guide

Identification tips by Bill Carwin, Agriculture Instructor, Pritchett High School
 Edited by Ben Berlinger, NRCS Rangeland Management Specialist (ret.), La Junta
 Photographs by Kenneth Lair, former NRCS Range Management Specialist, La Junta

GRASSES

Alkali sacaton

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▼ Decreaser	Perennial	Warm	High	Eastern and Western Colo.

Found in hard land soil (clay); low lying area; deposits of water; found in clumps, there is an extreme amount of litter at the base of the plant; seedhead will resemble Sand dropseed; no pubescence (no hair); will be found around Fourwing saltbush; seedhead will be straw-colored



Arizona (Idaho) fescue

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▼ Decreaser	Perennial	Cool	High	Eastern and Western Colo.



GRASSES

Baltic rush

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass-like	▲ Increaser	Perennial	Cool	Low	Eastern and Western Colo.

Rushes are grass-like, not true grasses; "rushes are round, and have brushes for seedheads"; characteristic roots and seedhead are dark brown; seedhead is near tip of plant on stem; no joints on stem; sometimes called "wiregrass"



Barnyardgrass

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	◆ Invader	Annual	Warm	Medium	Eastern Colo.

Tall growing grass (30 inches); tadpole type seed; usually red; has long tail on seed; grows in wet waste areas; spike inflorescence (purplish in color); leaf and stem are extremely pubescent



GRASSES

Basin wildrye

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▼ Decreaser	Perennial	Cool	High	Western Colo.



Big bluestem

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▼ Decreaser	Perennial	Warm	High	Eastern Colo.

Found on hard land soil; tall plant (4-5 feet); purplish/reddish color to seedhead and stem; turkey foot to inflorescence; nodes (joints) are very purple or reddish



GRASSES

Blowout grass

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▲ Increaser	Perennial	Warm	Low	Eastern Colo.

Found in blowouts (sandy soil); mid-height (18-24 inches); pale-green color; long whip-like leaves; very rhizomatous; big, spreading, open panicle with small spikelets



Blue grama *Colorado State Grass*

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▲ Increaser	Perennial	Warm	High	Eastern and Western Colo.

Shortgrass 10-12 inches tall; leaves are sparsely hairy; seed head will be above main stem (looks like an eyebrow); seed head is equivalent to one kernel of corn; grows in bunch; found in hard land to sandy loam soils



GRASSES

Bluebunch wheatgrass

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▼ Decreaser	Perennial	Cool	High	Western Colo.



Bottlebrush squirreltail

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▲ Increaser	Perennial	Cool	Medium	Eastern and Western Colo.

Bunchgrass; can be confused with Canada wildrye but only 12 inches high; seedhead becomes straw color; found in disturbed areas; seedhead resembles a brush you would use to clean a baby bottle or a squirrel's tail



GRASSES

Buffalograss

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▲ Increaser	Perennial	Warm	High	Eastern Colo.

Very short growing grass; leaves are very, very hairy; hair all over; short, pig-tail leaves (1-2 inches); dioecious (male and female plants); male send up the flag (pollen producing); stolons (above ground stems, every time touch ground will produce a new plant); sod former; loamy to clayey soils



Canada wildrye

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▼ Decreaser	Perennial	Cool	High	Eastern and Western Colo.

Two feet or more high; inflorescence similar to wheat except seed head will curve; like tail of squirrel; seedhead can range from 2-5 inches long; will turn as they mature; will grow on sandy or hard land soil in low-land areas (riparian areas)



GRASSES

Cheatgrass (downy brome)

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	◆ Invader	Annual	Cool	Medium	Eastern and Western Colo.

Thin spikelets that stick to socks, pants; don't confuse with Japanese brome which is broader spikelets; annual bunch grass; purplish or reddish tinge to seedhead at maturity (flag)



Elk sedge

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass-like	▼ Decreaser	Perennial	Cool	High	Western Colo.



GRASSES

Galleta ["Guy-etta"] (Spanish word for biscuit or cookie)

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▲ Increaser	Perennial	Warm	Medium	Eastern Colo.

Mid-height grass (16-20 inches); has a seedhead that resembles little bluestem but very fuzzy with whitish pubescence, rachis is zig-zag or resembles a "crankcase"; hard land soils; tolerable to salty, alkaline soils; find around alkali sacaton or four-wing saltbush



Green needlegrass

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▼ Decreaser	Perennial	Cool	High	Eastern and Western Colo.

Tall plant, 2-3 feet; slender inflorescence; short, straight awns; will grow on hard land soil, clays and clay loams



GRASSES

Hairy Grama

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▲ Increaser	Perennial	Warm	High	Eastern Colo.

Short, bunch grass; resembles blue grama but has much more hair on the leaves; found on shallow, rocky, slopes (breaks); has the "eyebrow" effect except hairy; has extended rachis (seed head stem will extend up and point out at end of rachis)



Indian ricegrass

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▼ Decreaser	Perennial	Cool	High	Eastern and Western Colo.

Found on sandy or hard land soils; mostly on sandy soil or slopes or breaks; will get 20-24 inches tall; has big, open, spreading panicle inflorescence that branches in two's; individual seed is found inside the spikelet; has tuft of hair in the spikelet; when seed falls out glumes look like bird's beak; seed head will be straw colored when it is mature; can act an increaser



GRASSES

Indiangrass

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▼ Decreaser	Perennial	Warm	High	Eastern Colo.

Found in hard and sandy soils; more on hard land soils in low lying areas; 3-5 feet tall; seedhead will look like a flame of a candle, golden-yellow color; each individual seed is very hairy and has an awn (awn will come up straight and then will make a right angle)



Inland saltgrass

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▲ Increaser	Perennial	Warm	Low	Eastern Colo.

Found on hard land soil in areas of lots of alkali, sometimes wet soils; shortgrass about 6-8 inches; produces seedhead that is a spike inflorescence; stem below the leaves is rather jointed; very scaly rhizomes; seedhead looks like a small western wheat head with no awn; leaves are strongly two-ranked



GRASSES

Little bluestem

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▼ Decreaser	Perennial	Warm	High	Eastern Colo.

Bunch grass; hard land soils on slopes; purplish/reddish color; 20 inches high; seedheads are much smaller than big or sand bluestem; inflorescence is a raceme



Mountain brome

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▼ Decreaser	Perennial	Cool	High	Western Colo.



GRASSES

Mountain muhly

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▼ Decreaser	Perennial	Warm	High	Western Colo.

Mid-height (18-24 inches), warm-season, bunch grass; very fine, short awns, seedhead is contracted panicle; look inside base of plant, old leaves resemble wood shavings



Nebraska sedge

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass-like	▼ Decreaser	Perennial	Cool	High	Eastern and Western Colo.

"Sedges have edges"; triangular stem; leaves similar to grass; seedhead is at end of the stem; brownish/red seedhead; roots and lower portion of stem are brownish; wet soils only (meadows and riparian areas)



GRASSES

Needleandthread

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▲ Increaser	Perennial	Cool	High/Medium	Eastern and Western Colo.

Found on loamy slope areas and in sandy, gravelly soils; mid-height cool-season grass (18-24 inches tall); will have characteristic flag-leaf on top; seeds are produced next to plant; tip of the seed is very sharp (needle-like); awn (thread-like) will be curled and 4-6 inches long; ligule is 0.25 inches long, papery and pointed, very prominent



Nodding brome

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▼ Decreaser	Perennial	Cool	High	Western Colo.



GRASSES

Prairie cordgrass

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▼ Decreaser	Perennial	Warm	High	Eastern Colo.

Tall (5-6 feet); found in low areas with lots of water; irrigation ditches and rivers; very coarse textured leaves and stem; produces by underground stems (rhizomes) that are sharp and scaly; spikelets (seeds) are very coarse (serrated); leaves are serrated; hard land soils (seedhead resembles GIANT blue grama)



Prairie junegrass

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	Decreaser/Increaser	Perennial	Cool	High/Medium	Eastern Colo.

Bunch grass; 16 inches high; inflorescence is a tightly contracted panicle, looks "spike-like"; found on hard land soils; will find on some sandy soils; cool season (done in June) will then turn brown



GRASSES

Prairie sandreed

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▼ Decreaser	Perennial	Warm	High	Eastern Colo.

Sandy soils; three feet tall; hairy armpit (tuff of hair where leaf attaches to collar; has long, slender, whip-type leaf; grows by rhizomes; inflorescence is a contracted panicle



Red threeawn

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▲ Increaser	Perennial	Warm	Low	Eastern Colo.

Bunch grass; 12 inches tall; has reddish ting when it is growing; sandy or hard land soil; seeds will form at top of plant in a flag arrangement; when seeds mature all that will remain will be the flag; sharp-pointed seed with three awns



GRASSES

Ring muhly

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▲ Increaser	Perennial	Warm	Low	Eastern Colo.

Typical growth form is in rings, with dead centers that can trap rain to survive; all basal leaves that are short, very narrow, and curved outward; rarely grazed



Sand bluestem

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▼ Decreaser	Perennial	Warm	High	Eastern Colo.

Sandy soils only; light bleached grass; coarse textured; very tall (four feet); turkey foot inflorescence



GRASSES

Sand dropseed

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▲ Increaser	Perennial	Warm	Medium	Eastern Colo.

20-24 inches tall; found in clumps; at junction of leaf and stem a tuft of white hair surrounds the entire stem (cat-whiskers); seedhead will be rolled inside the stem until it matures; will then be small panicle with characteristic flag-leaf; seeds are very small and reddish



Sand flatsedge

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass-like	▲ Increaser	Perennial	Cool	Medium	Eastern Colo.

Type of sedge (triangular stem); seedhead and the roots will have a darkish brown color; seedhead will grow off the side of the stem and then the stem will continue on; seedhead is closer to the ground than to the sun; sandy soil



GRASSES

Sand paspalum

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▲ Increaser	Perennial	Warm	Medium	Eastern Colo.

Sandy soils only, 12-15 inches tall; looks like bead-grass because spikelets are half-round, rachis has a zig-zag appearance; extremely hairy on stem and leaves that are very wide



Sandberg bluegrass

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▲ Increaser	Perennial	Cool	Medium	Western Colo.



GRASSES

Sandhill muhly

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▲ Increaser	Perennial	Warm	Low	Eastern Colo.

Found only in sandy soil; deep and choppy sands; has leaf blades that are about 2 inches long (resemble needles of pine tree); very sharp and pointed; will have a flag at the top; seedhead will have reddish ting; will grow to about 12 inches



Sideoats grama

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▼ Decreaser	Perennial	Warm	High	Eastern Colo.

Bunch grass; hard land soil; will find if you find little bluestem; purplish-red in color; zig-zag rachis with spikelets attached on one side of rachis; about 20 inches in height



GRASSES

Six weeks fescue

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▲ Increaser	Annual	Cool	Low	Eastern Colo.

Very short, cool-season annual grass; 6-8 inches tall; looks like crested wheatgrass but smaller; very short awns on spikelet; shallow root system; all fescues are cool season as are all wheatgrasses



Sun sedge

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass-like	▲ Increaser	Perennial	Cool	High	Eastern Colo.

Plant will be found on hard land soil; triangular stem; brownish root and seedhead; seedhead will grow at the very tip of the stem; seedhead is closer to the sun; will grow to about 4-6 inches tall



GRASSES

Switchgrass

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▼ Decreaser	Perennial	Warm	High	Eastern Colo.

Found in sandy or loamy soil; three to four foot tall; has very large spikelets (seeds); has reddish tinge to seedhead; purple strips along veins; has panicle inflorescence (like fireworks); will resemble switch of a cow; tuft of hair at junction of leaf and collar (white) on upper portion of leaf



Threadleaf sedge

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass-like	▲ Increaser	Perennial	Cool	Medium	Eastern and Western Colo.

Sedge; leaves are short and threadlike (thin and narrow); will grow on hard land soil and typically on shallow break sites; bunch growth habit; will grow to six inches tall; will be found with blue and hairy grama; will have brownish material as a typical sedge characteristic



GRASSES

Thurber's fescue

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▲ Increaser	Perennial	Cool	Medium	Western Colo.



Tufted hairgrass

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▼ Decreaser	Perennial	Cool	High	Western Colo.



GRASSES

Tumblegrass

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▲ Increaser	Perennial	Warm	Low	Eastern Colo.

Low, short growing grass, similar to buffalo; seedhead will be long and will have random spokes and will break off of plant and then tumble; loam and sandy loam soils in areas that are devoid of cover; leaves are hairy and twisted like a licorice stick, have a reddish-purplish tinge



Vine mesquite

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▼ Decreaser	Perennial	Warm	High	Eastern Colo.

Found in hard land soils; roundish type of spikelets; very contracted panicle inflorescence, similar to proso millet; 16 inches in height; long vines (stolons) grow on soil surface



GRASSES

Western wheatgrass

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Grass	▼ Decreaser	Perennial	Cool	High	Eastern and Western Colo.

Coarse textured leaves, stiff and come off of stem at 45 degree angle; bluish-green color (resembles color of sagebrushes); found on hard land soils in low lying areas where there is more moisture; run finger up and down (down is not possible because of jagged edges similar to wheat and barley); leaves can actually cut you; rhizomatous; 16 inches tall



FORBS

Annual buckwheat

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Forb	▲ Increaser	Annual	Warm	Low	Eastern Colo.

Found only on sandy soils; will grow to about 30 inches tall; seedhead will look like an inverted umbrella; stem will be covered with a woolly-fuzz; reddish tinge to the seedhead and flowers



Canada thistle

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Forb	◆ Invader	Perennial	Cool	Low	Eastern and Western Colo.

Purple flowers; smaller and more numerous flowers than other thistles; elongated brown seeds; parachute; spread by creeping roots; usually found in large colonies; spiny silvery leaves; rosette type of immature plant



FORBS

Common mullein

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Forb	◆ Invader	Biennial	Warm	Low	Western Colo.



Hairy goldaster

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Forb	▲ Increaser	Perennial	Warm	Low	Eastern Colo.

Grows in clump and will send out several stems; stems and leaves are very hairy; will get about 8-10 inches high; flower at end of stem will be golden-yellow; leaves are broad and differentiates if from another plant; hard land or sandy soil



FORBS

Kochia

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Forb	♦ Invader	Annual	Warm	Medium	Eastern and Western Colo.

Invasive, weedy annual, noxious forb; fuzzy-hairy leaves make chemical control difficult; livestock will graze before it matures; resembles a "tumble weed" but not as round as Russian thistle (middle image)



Leafy spurge

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Forb	♦ Invader	Perennial	Warm	Poisonous	Eastern and Western Colo.

Tall, 2-3 feet; light green color; milky (sappy); flowers are yellowish-green and include the bract below the flower; robin egg type of seed; poisonous; usually found in low, moist areas; long, linear leaves



FORBS

Louisiana sagewort (*Cudweed sagewort*)

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Forb	◆ Invader	Perennial	Warm	Low	Eastern Colo.

All sages have distinctive odor of sage; forb not a shrub (no wood); sandy or hard land soil; leaves have silvery color; seedhead will have reddish brown seedpods and will be about 20 inches high



Musk thistle

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Forb	◆ Invader	Biennial	Warm	Low	Western Colo.



FORBS

Russian thistle (*tumbleweed*)

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Forb	◆ Invader	Annual	Warm	Medium	Eastern Colo.

Tumbleweeds; annual, reddish; spiny, sticky type of seedhead; hard land or sandy soils; roundish type of plant enables it to tumble



Plains larkspur

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Forb	▲ Increaser	Perennial	Cool	Poisonous	Eastern Colo.

Poisonous; white flowers (compare with the other species); broadleaf resembles the palm of your hand (five pointed, palmate); hard land soils; plants grows low to medium height



FORBS

Purple prairie clover

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Forb	▼ Decreaser	Perennial	Cool	Medium/low	Eastern Colo.

Hard land soil, particularly slopes; leaflets will be very narrow-like; will fall over because of tap root, dark green; flower will be purple (sometimes white), seedhead is long (2-4 inches); leaflets will be small and palmately compound (like alfalfa)



Scarlet globemallow

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Forb	▲ Increaser	Perennial	Cool	Medium	Eastern Colo.

Leaves resemble palm of hand with star-shaped hairs; flower are very showy, usually orange (may find scarlet); low growing and spreading by underground roots; indication of soil disturbance; 6-8 inches tall



FORBS

Silvery lupine

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Forb	▲ Increaser	Perennial	Cool	Poisonous	Western Colo.



Slimflower scurfpea

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Forb	▲ Increaser	Perennial	Cool	Low	Eastern Colo.

Plants are stemmy, will look devoid of numerous leaves; black dots on leaves and seed pod; small seedpod arises from a blue/purple flower; trifoliate like alfalfa (legume); leaflets are narrow, no serrated edges; seeds are born from small pods



FORBS

Wavyleaf thistle

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Forb	▲ Increaser	Biennial	Cool	Medium	Eastern Colo.

Biennial; first year is rosette type of plant (no flowers), second year will flower; purple/blue flower, resembles Canada thistle except there is one big flower instead of clusters; underside of leaves is pubescent; sandy or hard land soil; 24-30 inches; big flower; seedhead has parachute look to it



Western ragweed

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Forb	▲ Increaser	Perennial	Warm	Low	Eastern and Western Colo.

20 inches in height; pubescent all over; yellow flowers that hang down; has stinky odor (sinus infections); leaf is serrated (jagged or saw-toothed); similar to poverty weed; dark-green and hairy looking



FORBS

Woolly Indianwheat

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Forb	▲ In increaser	Annual	Cool	Low	Eastern Colo.

Low growing annual forb; 6-8 inches; seedhead resembles wheat without awns; extremely woolly-pubescent narrow leaves; not very productive for livestock; woolly bracts surround seedhead



Woolly locoweed (*Crazy Weed*)

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Forb	▲ In increaser	Annual	Cool	Poisonous	Eastern and Western Colo.

Poisonous; causes damage to livestock; leaves, stems, seedhead is extremely woolly; leaves are mouse-eared shaped; long tap root; flowers are mostly purple, or bluish; legume (produces a pod); all parts of plant are poisonous; kidney shaped seeds; hairy, leather like seedpod



FORBS

Wyethia (mules ear)

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Forb	▲ Increaser	Perennial	Warm	Low	Western Colo.



After (left) and before high-density, dormant season cell grazing.

SHRUBS

Antelope bitterbrush

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Shrub	▼ Decreaser	Perennial	Warm	High	Western Colo.



Big sagebrush

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Shrub	▲ Increaser	Perennial	Warm	Medium/low	Western Colo.

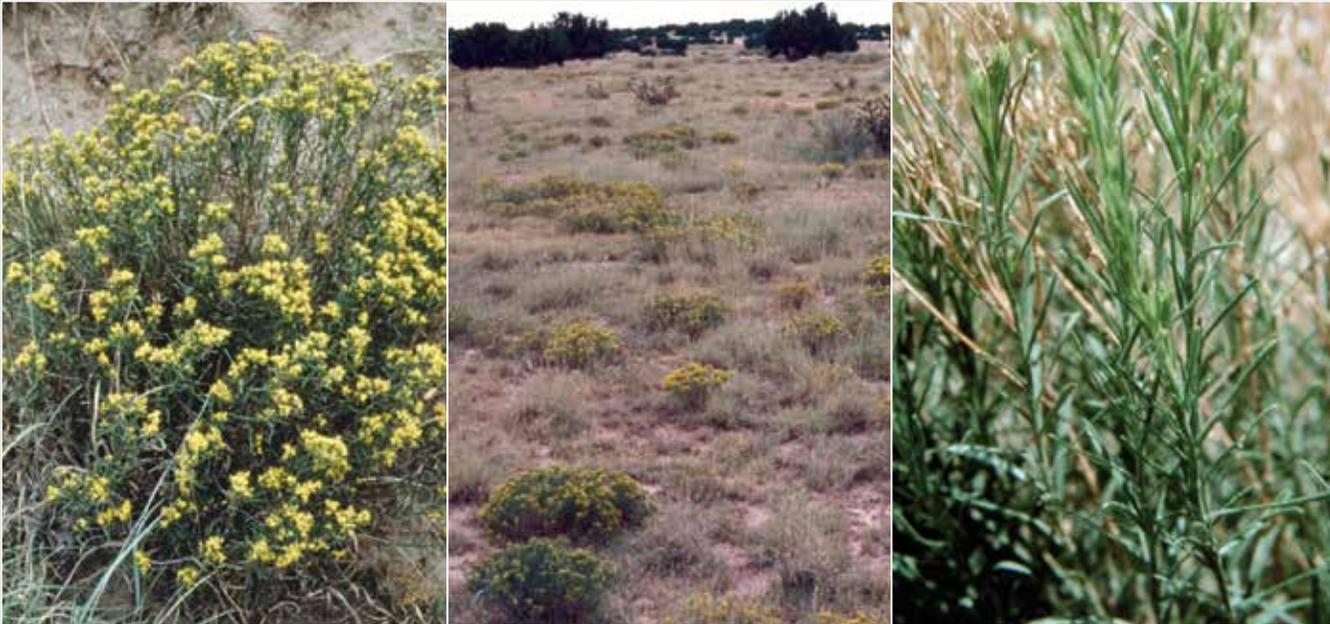


SHRUBS

Broom snakeweed

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Shrub	▲ Increaser	Perennial	Warm	Poisonous	Eastern and Western Colo.

Yellow flowers; has turpentine odor (stinks); half-shrub, grows in small clump; narrow, dark-green leaves and stems; flowers have ray flowers (compare with rubber rabbitbrush which has no ray flowers only yellow disc flowers, and is much taller), strong increaser on bare ground



Fourwing saltbush

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Shrub	▼ Decreasaser	Perennial	Warm	High	Eastern and Western Colo.

Big stemmed shrub; light green ting; low lying areas (wants salt); clay or hard land soil; fruits will have four individual wings with seed inside; will get four foot tall; not all plants will have the fruits because of male and female plants; fruits will turn a straw color



SHRUBS

Fringed sagebrush

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Shrub	▲ Increaser	Perennial	Cool	Low	Eastern and Western Colo.

Hard land soil; half-shrub, sage appearance; resembles plant that is in aquariums; fine leaves that appear fringed; Indians used to call it women sage and was used as deodorant; mature plants will fall over because of fine leaf structure; silvery-blue color; sage smell; seedhead is brownish-orange



Gambel oak

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Shrub	▲ Increaser	Perennial	Warm	Low	Western Colo.



SHRUBS

Greasewood

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Shrub	▲ Increaser	Perennial	Warm	Poisonous	Western Colo.



Leadplant amorpha

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Shrub	▼ Decreasaser	Perennial	Warm	High	Eastern Colo.

Shrub found only in sandy soils; heavy topped will cause it to fall over; large tap root; small leaflets comprise the leaf; hairy all over; end of plant will be white and flowers will be purple; leaves will taste minty; 20 inches tall; seeds resemble the seeds of a pine cone



SHRUBS

Mountain mahogany

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Shrub	▼ Decreaser	Perennial	Warm	High	Eastern and Western Colo.

Found in foothills/mountains; shrub; woody stem; leaves are oval-shaped with serrated edges; flower (usually yellow or white) will have long, slender seed that has a white fuzzy tail (corkscrew shaped tail)



Prickly pear cactus

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Shrub	▲ Increaser	Perennial	Warm	Low	Eastern and Western Colo.

Yellow or red flowers; spiny, succulent shrub; pear shaped leaves; seedpod is reddish, and seeds are edible



SHRUBS

Rubber rabbitbrush

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Shrub	▲ Increaser	Perennial	Warm	Low	Eastern and Western Colo.

3-4 feet tall shrub with many yellow disc flowers; can be confused with snakeweed; smell like green tomatoes; plant will have varied flower height in upper branches; disc flowers only (compare with snakeweed which has yellow ray flowers and no disc flowers, and is much smaller)



Sand sagebrush

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Shrub	▲ Increaser	Perennial	Warm	Low	Eastern Colo.

Typical sage smell; sandy soils only; seedhead is brownish/red; woody stemmed shrub; fine, needle like leaves; much bigger than fringed sagebrush; hard to control; grows to 3 feet



SHRUBS

Snowberry

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Shrub	▲ Increaser	Perennial	Cool	Low	Western Colo.



Spreading buckwheat

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Shrub	▲ Increaser	Perennial	Cool	Low	Eastern Colo.



SHRUBS

Winterfat

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Shrub	▼ Decreaser	Perennial	Warm	High	Eastern and Western Colo.

Found in hard land soils; salty areas; pale-green half-shrub; tap root; woody stem; leaves are about an inch long; plant will produce fuzzy, cotton-like seed pod; plant will get about 20 inches tall; weight of winterfat will cause it to fall over



Wormwood

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Shrub	▲ Increaser	Perennial	Warm	Low	Eastern Colo.

Dark-green color; reddish brown stem; tuff of seed pocket that puffs out; deep rooted; no smell; winterfat type of seedhead; 30 inches tall; hard land or sandy soil;

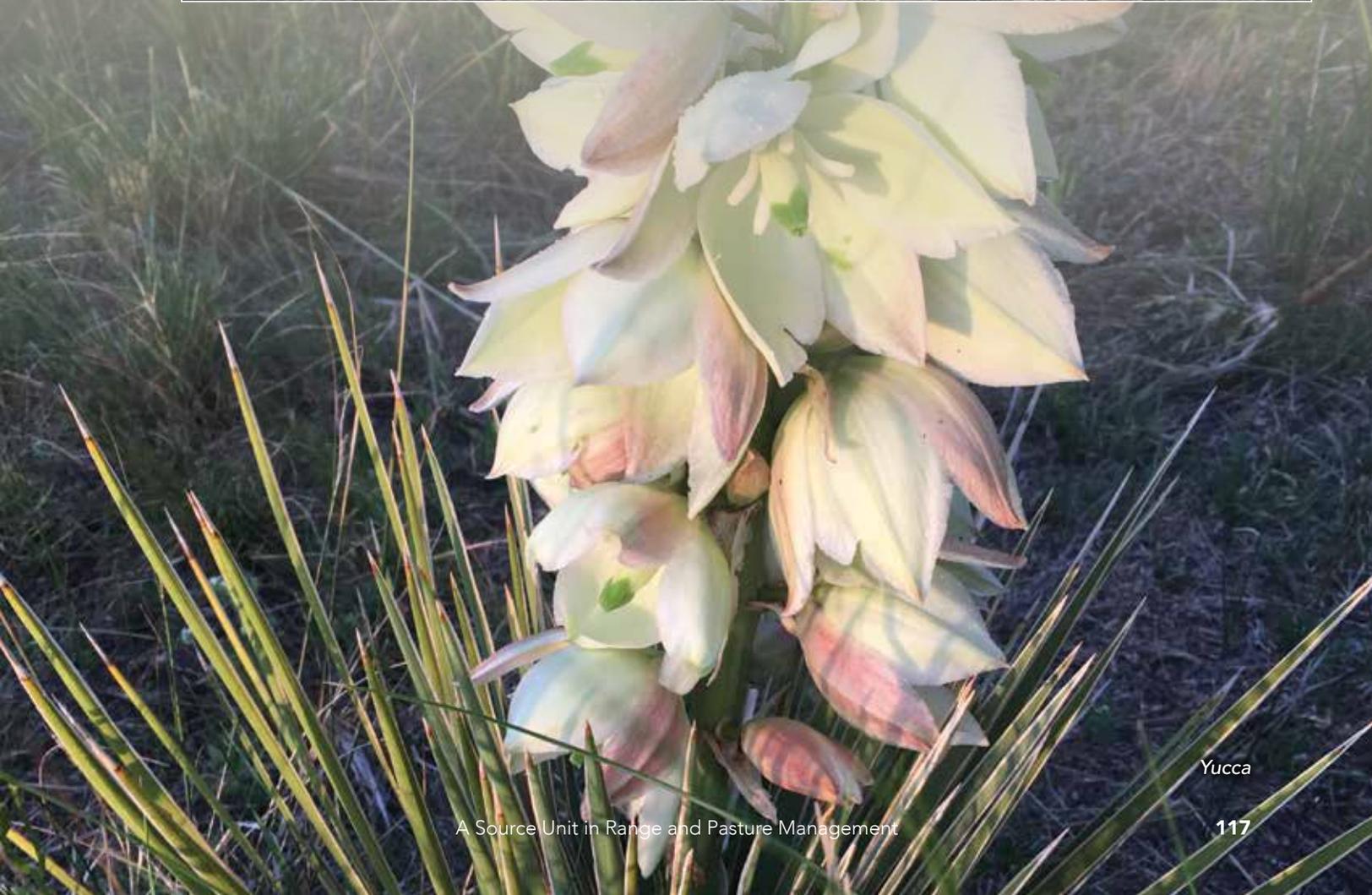


SHRUBS

Yucca (*small soapweed*)

Type	Grazing Response	Life Cycle	Growth Season	Palatability (Cattle)	FFA Plant List
Shrub	▲ Increaser	Perennial	Cool	Low/medium	Eastern and Western Colo.

Will have white flowers with 3 white bracts under flower (inside will be seedpod); black, flat seeds; flowers are highly nutritious to cattle; Indians used to make soap from roots; leaves are leathery, spiny ends produce fuzzy, cotton-like seed pod; plant will get about 20 inches tall; weight of winterfat will cause it to fall over



Yucca

AFTERWORD

Range management today is based on working with nature to bring into balance the needs of the land with the functioning of the natural system. Economically profitable and ecologically sound range management is grounded in this philosophy. These principles are being adopted by successful and profitable ranchers in Colorado and on a global scale. The underlying purpose of this book is to hopefully spark interest in young people to pursue exploring some of these newer concepts of range management.

Holistic Resource Management, as first introduced by Allen Savory, can arguably be said to have revolutionized modern day range management. Savory was the first to espouse the concepts of working with nature and not against it, and treating the real cause of problems not the symptoms. He promoted the novel idea of livestock being the only practical tool (grazing, recovery, animal impact instead of high-input technologically based range improvement practices) to restore healthy landscapes and thriving communities. Currently range managers, rancher and environmentalist are employing this basic philosophy in numerous successful cases.

Today, the Savory Institute and Holistic Management International are two of the dominant organizations promoting holistic range management thinking.

Jim Howell, put it this way in his book, *For the Love of Land* (2008): When practiced holistically, mimicking natural process, an agriculture based on perennial forages and migrating herbivores enhances biodiversity and habitat for all wild species, builds topsoil and soil carbon, and traps, stores, and slowly releases water (reducing drought and flooding).

Range management practiced holistically equates to making management decisions, and testing those decisions, from the viewpoint of the whole, and considers the things wanted in the system instead of being based on components not desired. For example, if brush species are a problem in a pasture, the sustainable approach is to base grazing management decisions on improving the vigor and density of the grass, increasing ground cover and reducing bare ground, thereby giving the competitive advantage to the desired grasses and forbs.

An overview of advancements in range management can include the following.

- ❑ Collaborative management offered that better outcomes are derived from shared goals and visions for the land. The early concept was referred to



Coordinated Resource Management Planning (CRMP). CRMP philosophy was first applied to the mix of land ownership involving private and federally owned land. Today collaborative and adaptive range management can benefit ranchers where multiple stake holders desire an ever increasing say in how rangeland is managed for numerous ecosystem services.

- ❑ Dr. Fred Provenza made known his BEHAVE program with concepts behind understanding why livestock graze and select forages the way they do. An outcome from his work was the program implemented by Kathy Voth based on her observation that “cows do eat weeds”. Turning undesirable weeds into an important forage resource is a prime example of turning a problem into an opportunity!
- ❑ Kit Pharo and Chip Hines introduced profit-based and low-input ranching philosophy. Pharo’s three-tiered approach recognized the importance of a planned grazing system (short grazing periods, long recovery periods, high stock density), calving in sync with nature, and matching cow size to their environment (smaller cows). Today, this approach is being successfully adopted in growing numbers of ranch management operations.
- ❑ Regenerative range management is a key concept being recently used. Regenerating soils and rangeland to be healthy is considered in determining if management goals are being achieved. Regenerative agriculture is being applied to rangeland and cropland management systems. The underlining approach is that long-term abuse of our soil resource can be offset with creative regenerative practices (cover crops, animal agriculture).

The next generation of land stewards have the advantage of these newer concepts of range management available to them. Jim Howell: “The future of grassland agriculture is bursting with possibilities and potential, and we remain in the infant stages of developing and multiplying the opportunity”. These young range managers will be far ahead of those of us who struggled to understand and promote these forward thinking concepts. We need these new faces in range management if we are to have any chance of being successful!

—Ben Berlinger
La Junta, Colorado
July, 2018



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A Source Unit for Colorado Teachers

Long before we were susceptible of any other mode of instruction, Nature took us in hand, and every minute of waking life brought its educational influence, shaping our actions into rough accordance with Nature's laws.

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