

**SOURCE UNIT
IN
RANGE AND PASTURE MANAGEMENT**

Developed by

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and

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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 & updated in 2016 by Bill Carwin, Agriculture Instructor at Pritchett High School, and Ben Berlinger, Rangeland Management Specialist, La Junta, CO.

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2. Handbook of Colorado Native Grasses, Colorado State University Extension Service, Bulletin 450-A, 1963. [out of print]
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4. 16 Plants Poisonous to Livestock in the Western States, Farmers' Bulletin No. 2106, United States Department of Agriculture, U. S. Government Printing Office, Washington 25, D. C., 1964.
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6. Range Plant Handbook, U. S. Forest Service, Washington D. C., PB 168 589.
7. An Outline of Common Livestock Diseases, L. Keith Wayt, State Board for Community Colleges and Occupational Education, 1970.
8. Society for Range Management, www.rangelands.org
9. Wyoming Range & Land Management, WY Association of Conservation Districts, 1987.
10. Grass: The Stockman's Crop, H.E. Dietz, 1988.
11. Understand Grass Growth: The Key to Profitable Livestock Production, Steven S. Waller, Lowell E. Moser, Patrick E. Reece, 1985.

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Attachment

Colorado 4H Range Management Guide, CSU Cooperative Extension, 1M 6-75

ENTERPRISE: Range and Pasture Management

JOB I: Becoming familiar with range and pasture management

SITUATION:

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 CO.
3. To develop an appreciation for range management.

MOTIVATION:

1. Ask the class how many acres of land are in Colorado? (66,000,000)
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:

1. Colorado 4H Range Management Guide, CSU, Cooperative Extension, 1M 6-75 pp. 2-6
2. 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 & services without endangering the range soil and water resources and other important attributes of the range.
2. Range management is important for:
 - a. livestock production
 - b. watershed conservation
 - c. wildlife habitat
 - d. recreation
 - e. 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 & 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 D 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:

- a. To keep our ranges covered with good forage plants
- b. Increase livestock and wildlife products
- c. Maintain a range feed reserve
- d. Increase the holding and “even” the flow of water
- e. Control soil erosion

9. Rangelands are lands on which the native vegetation is predominantly grasses, grass-like plants, forbs or shrubs and is managed as a natural ecosystem using ecological principles.

10. Rangelands provide society with many products and services that support or standard of living and quality of life. These products can be visualized as ecosystem services. They include:

- Food
- Forage
- Purification of air & water
- Flood & 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 & 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.

ENTERPRISE: Range and Pasture Management

JOB II: Becoming familiar with range plants and plant structures

SITUATION:

OBJECTIVE:

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:

1. 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:

1. 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).
2. A range site or ecological site is an area of rangeland that has similar soil, slope, and moisture and produces distinctive kinds & amounts of vegetation.
3. Other than structure, three other ways in which range plants are classified are:
 - A. Life span
 1. Annual – lives for only one season, does not come up a second year.
 2. Biennial – lives for two years, produces seed the second year.
 3. Perennial – lives over from year to year from same crown or roots.
 - B. Origin
 1. native – those plants which have not been introduced from outside North America
 2. introduced – plants which have been brought in from outside North America
 - C. Growth Season
 1. Cool season – plants which make their principal growth during the cool weather (spring and late fall).
 2. 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 leaves & inflorescence, some photosynthesis
 - C. leaves – is the medium for photosynthesis
 - D. 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 is 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, and (c) panicle.

PLAN OF ACTION: (See illustrations below).

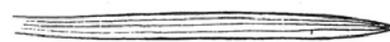
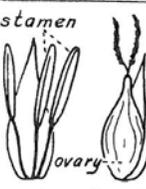
1. Prepare handout material on plant structures and hand out to students.
2. Discuss the differences between the structures of the four types of plants found on ranges.

EVALUATION:

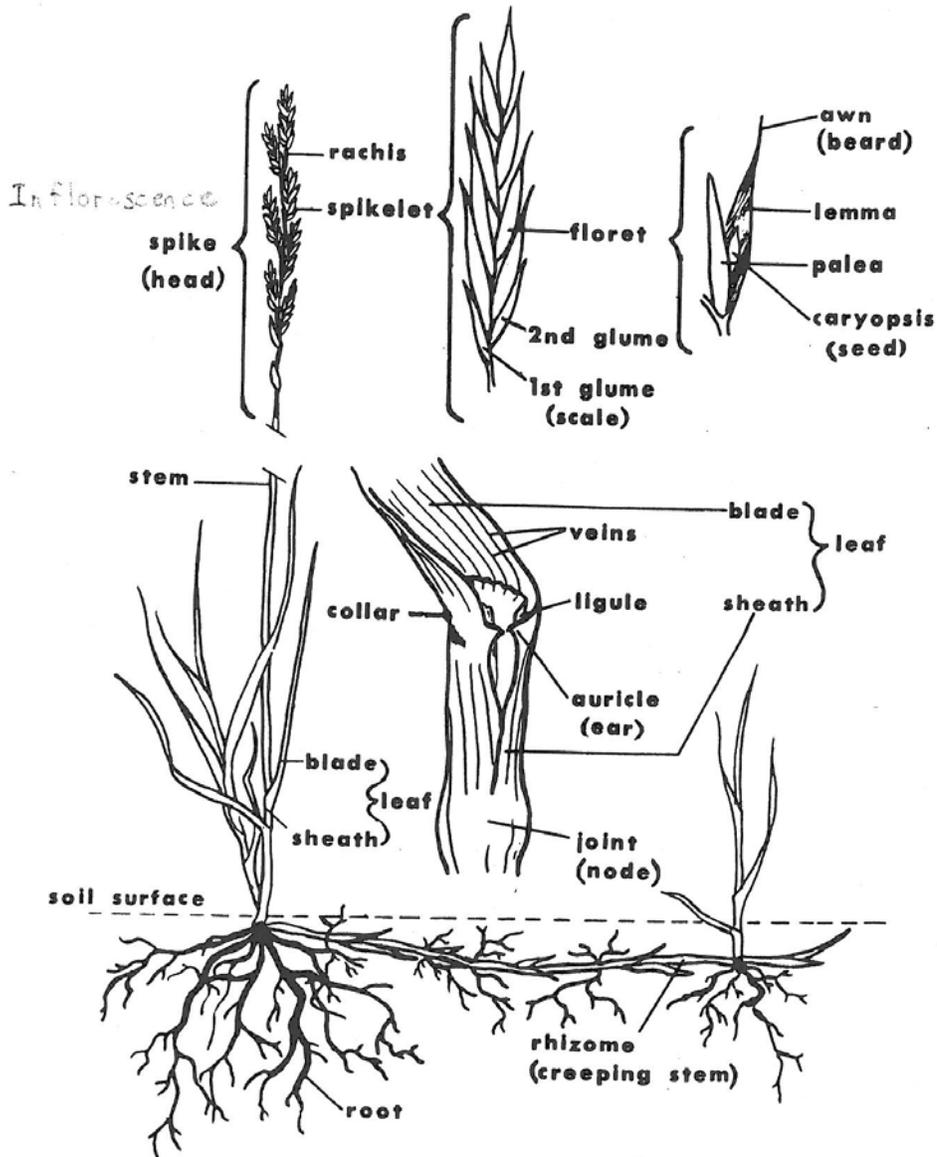
1. Have a sample of each of the types of plants available for the students to tell the difference between the four types of plants as you discuss their structure. Have them bring in a sample of the four types for an assignment.

[See the following illustrations].

IMPORTANT RANGE PLANT GROUPS: Grasses, Grass-likes, Forbs & Shrubs

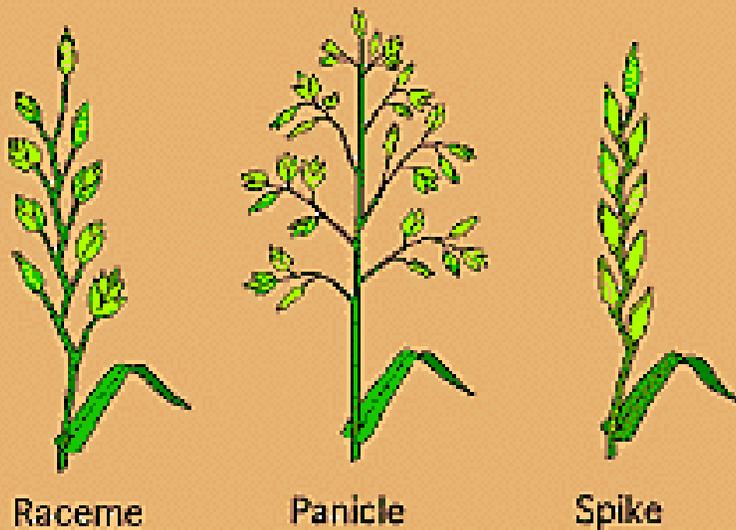
IMPORTANT RANGE PLANT GROUPS					
	GRASSES	GRASSLIKE		FORBS	SHRUBS
		Sedges	Rushes		
STEMS	 <p>Jointed Hollow or Pithy</p>				 <p>growth rings Solid</p>
LEAVES	 <p>Parallel Veins</p>			 <p>"Veins" are netlike</p>	
	 <p>Leaves on 2 sides of stem</p>	 <p>Leaves on 3 sides of stem</p>	 <p>Leaves on 2 sides of stem; rounded</p>		
FLOWERS	 <p>(floret)</p>	 <p>stamen ovary male female (may be combined)</p>		 <p>Usually showy</p>	
EXAMPLE	 <p>Western Wheatgrass</p>	 <p>Threadleaf Sedge</p>	 <p>Wire Rush</p>	 <p>Yarrow</p>	 <p>Big Sagebrush (twig)</p>

GRASS STRUCTURE. Illustrates inflorescence (seedhead), vegetative characteristics, and underground structures (roots & modified grass plant stems or rhizomes).



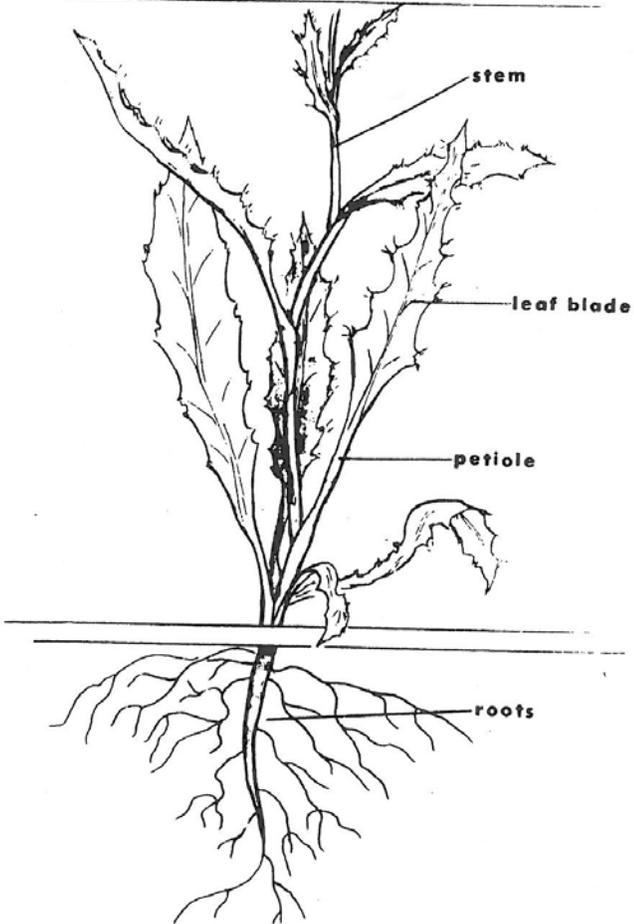
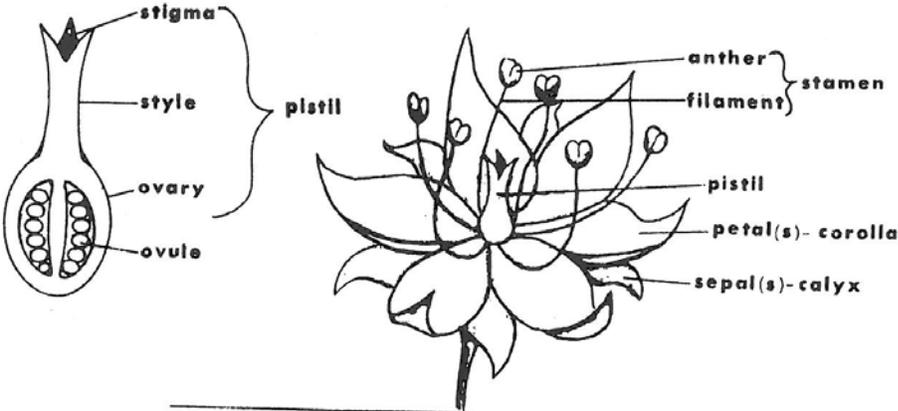
PARTS OF A TYPICAL GRASS PLANT

Grass Inflorescences



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

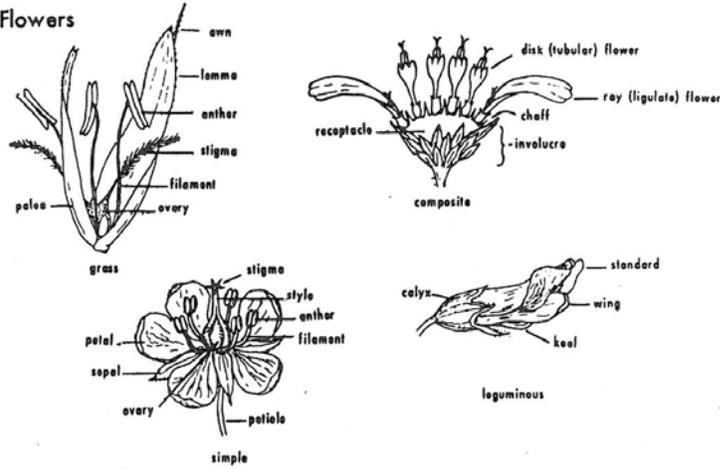
Forb Structure



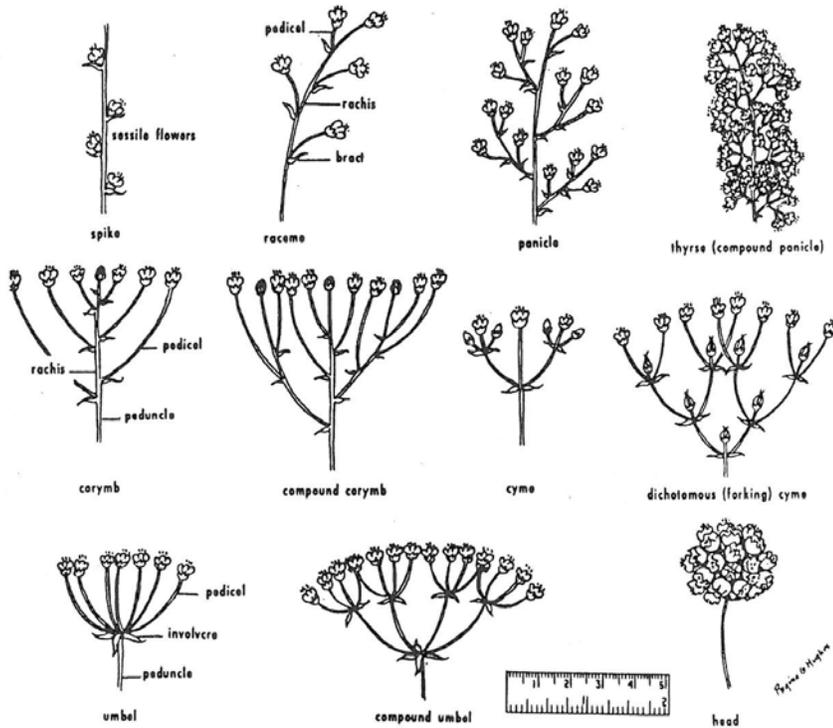
PARTS OF A TYPICAL FORB

“FLOWER PARTS of FORBS AND BASIC INFLORESCENCES”

A - Flowers



B - Inflorescences



ENTERPRISE: Range and Pasture Management

JOB III: Becoming familiar with common range terms

SITUATION:

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:

1. 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:

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

Common terms:

- | | |
|---|---------------------------------|
| a. Ecological site | n. Increases |
| b. Short grass | o. Invaders |
| c. Mid grass | p. Range use |
| d. Tall grass | q. Proper use |
| e. Bunch grass | r. Range management |
| f. Sod grass | s. Palatability |
| g. Litter | t. Rangeland ecology |
| h. Plant vigor | u. Ecosystem |
| i. Density | v. Reference Plant
Community |
| j. Key plants | w. Prescribed grazing |
| k. Range site | |
| l. Range condition or
similarity index | |
| m. Decreasers | |

REFERENCES:

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

ANALYSIS:

1. Range term definitions:
 - a. **Ecological Site**--- a distinctive kind of land with specific physical and biological characteristics that differs for 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.
 - b. **Short grass**-----grasses normally growing less than 18 inches in height, such as buffalo grass or blue grama.
 - c. **Mid grass**-----grasses normally growing from 2-4 feet in height, such as western wheatgrass, sand dropseed or alkali sacaton.
 - d. **Tall grass**-----grasses that normally grow over 4 feet high, such as switchgrass or Indian grass.
 - e. **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.
 - f. **Sod grass**-----grasses that form a mat or turf and reproduce mainly by runners. Examples include prairie sandreed, prairie cordgrass, and western wheat grass.
 - g. **Litter**-----plant material or residue left on the ground to improve soil health and fertility (nutrient cycling).
 - h. **Plant vigor**-----a measure of the health of the plant.
 - i. **Density**-----the percent of the ground covered by growing vegetation.

- j. **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.
- k. **Range site**-----an area of rangeland in which the soil, climate, and topography produce distinct kinds and amount of vegetation.
- l. **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.
- m. **Decreasers**----plants that are reduced in the composition as a result of heavy use.
- n. **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.
- o. **Invader**-----plants that are present in small quantity or not present under ideal condition; invaders increase with deteriorating range condition.
- p. **Range use**-----the degree to which the forage has been used; usually expressed as moderately used, lightly used, or over used.
- q. **Proper use**-----using the plants to a degree that they will maintain or improve their vigor.
- r. **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.
- s. **Palatability**-----the relative degree of an animal's desire to graze or not to graze a certain plant.
- t. **Rangeland ecology**-----the study of the interrelationships of organisms with the rangeland environment.

- u. **Ecosystem**-----organisms together with their abiotic environment, forming an interactive and interdependent system, inhabiting an identifiable space.
- v. **Reference Plant Community**----the plant community that existed at the time of European immigration & 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.

- w. **Prescribed grazing**----an adaptive grazing management strategy that controls the time, number & 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).

ENTERPRISE: Range and Pasture Management

JOB IV: Becoming familiar with how plants grow and indicate grazing response

SITUATION:

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 and 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:

1. 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:

1. Colorado 4H Range Management Guide, CSU, Cooperative Extension, 1M 6-75 pp. 23-27, 55.
2. USDA-NRCS, Field Office Technical Guide, Prescribed Grazing conservation practice, 2007.
3. 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 closely 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. From the air the leaves get carbon and 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.

Appendices E & F illustrate 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 side-oats 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, buffalo grass, 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, tumble grass.

6. Four range condition classes can be recognized. Similarity indices can be likewise interpreted:

- a. Excellent --- 100-75%
- b. Good --- 75-50%
- c. Fair --- 50-25%
- d. Poor --- 25-0%

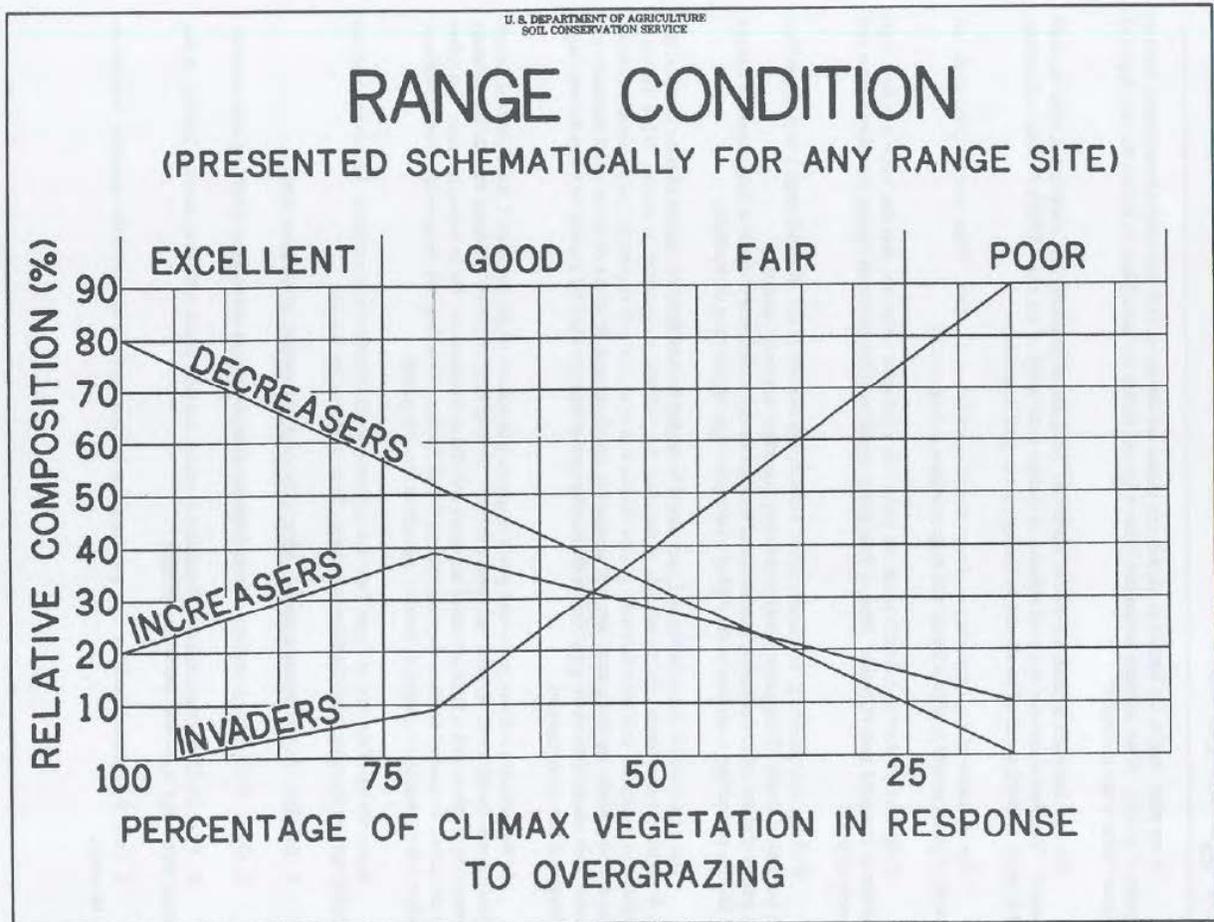
7. A high successional plant (formerly called climax plant) is usually a native plant that composes a high percentage of the plant cover of a range in top condition. High successional plants are the most permanent kinds of plants under ideal conditions and decrease under continuous use.

8. On a range in top condition the decreaser plants will be the first to decline due to the animal's palatability (high forage preference) for these plants. During this time the increaser plants will increase in composition. Under continued 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 "Legacy" Concept of Range Condition].

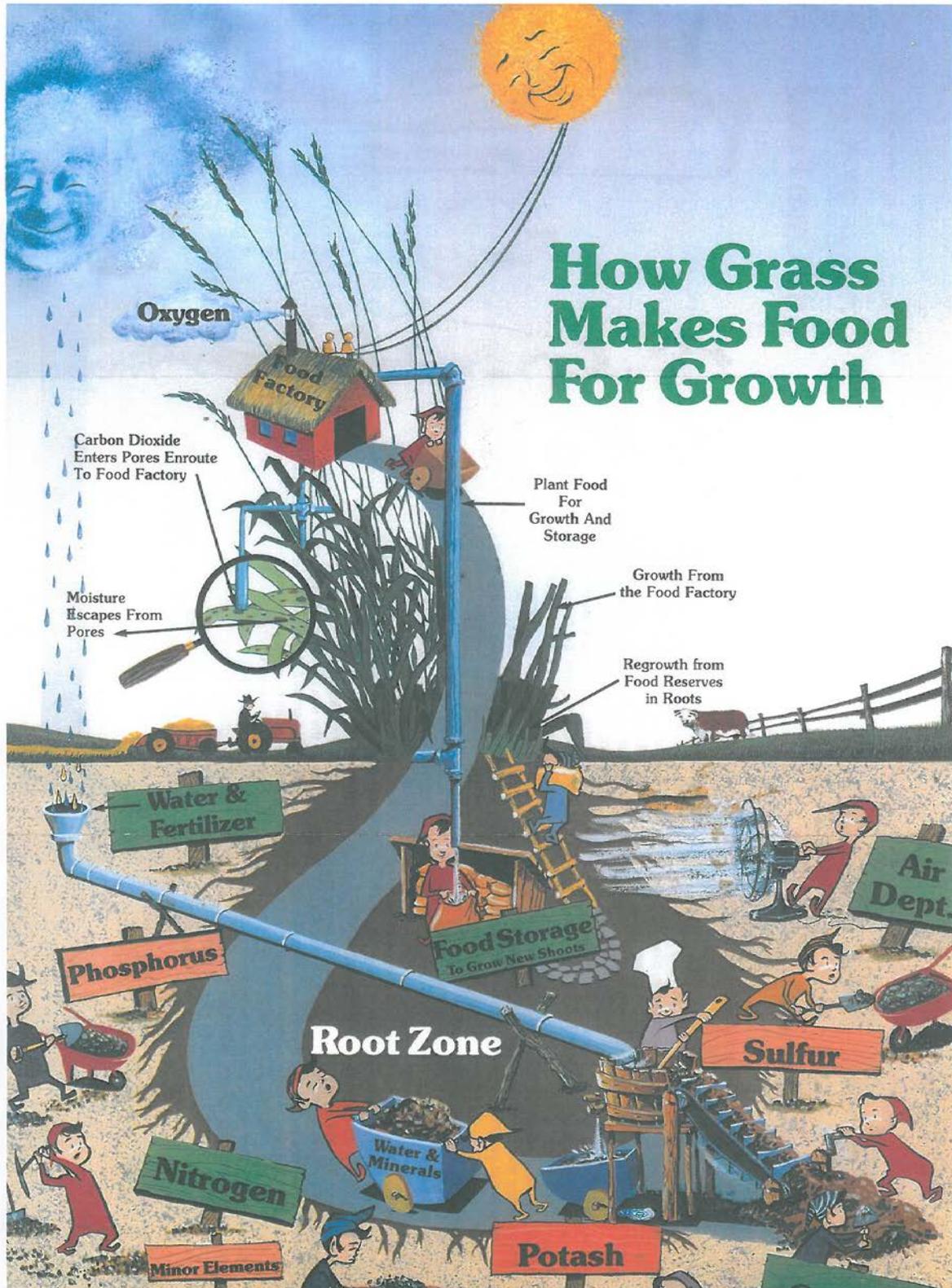
PLAN OF ACTION:

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

"Legacy" Concept of Range Condition



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



ENTERPRISE: Range and Pasture Management

JOB V: Becoming familiar with decreaser plants

SITUATION:

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:

1. 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:

- | | |
|-----------------------|--------------------------|
| 1. Alkali sacaton | 9. Bluebunch wheatgrass |
| 2. Big/sand bluestem | 10. Green needlegrass |
| 3. Four-wing saltbush | 11. Arizona/Idaho fescue |
| 4. Indiangrass | 12. Prairie cordgrass |
| 5. Indian ricegrass | 13. Mountain brome |
| 6. Prairie junegrass | 14. Sideoats grama |
| 7. Leadplant Amorpha | 15. Mountain mahogany |
| 8. Little bluestem | 16. Western wheatgrass |

2. Have the students review the power point slide show 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. CO State Contest, 2016-2020
6. FFA Range Judging Master Plant List, Western CO, draft 2015

ANALYSIS:

PLANT NAME	MAJOR TYPE	PALATABILITY (cattle)	SEASON OF GROWTH	LIFE SPAN	OTHER
Alkali sacaton	grass	H	warm	perennial	
Big/Sand bluestem	grass	H	warm	perennial	
Fourwing saltbush	shrub	H	warm	perennial	
Indiangrass	grass	H	warm	perennial	
Indian ricegrass	grass	H	cool	perennial	See Note below
Prairie junegrass	grass	H	cool	perennial	See Note below
Leadplant amorpha	shrub	H	warm	perennial	
Little bluestem	grass	H	warm	perennial	
Bluebunch wheatgrass	grass	H	cool	perennial	
Green needlegrass	grass	H	cool	perennial	
Arizona/Idaho fescue	grass	H	cool	perennial	
Prairie cordgrass	grass	H	warm	perennial	
Mountain brome	grass	H	cool	perennial	
Sideoats grama	grass	H	warm	perennial	
Mountain mahogany	shrub	H	warm	perennial	
Western wheatgrass	grass	H	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 your areas 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.

EVALUATION:

1. Use a quiz composed of different plant specimens to help the students learn to identify the decreaser plants.

Classification of Plants Exercise

PLANT NAME	MAJOR TYPE	PALATABILITY (cattle)	SEASON OF GROWTH	LIFE SPAN	OTHER

ENTERPRISE: Range and Pasture Management

JOB VI: Becoming familiar with increaser plants

SITUATION:

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:

1. 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:

- | | |
|------------------------|-----------------------------------|
| 1. Annual buckwheat | 17. Red threeawn |
| 2. Blue grama | 18. Death camas |
| 3. Hairy grama | 19. Rabbitbrush |
| 4. Sand dropseed | 20. Broom snakeweed |
| 5. Buffalo grass | 21. Scarlet globe mallow |
| 6. Blowout grass | 22. Squirrel tail |
| 7. Baltic rush | 23. Hair goldaster |
| 8. Inland saltgrass | 24. Yucca |
| 9. Foxtail barley | 25. Cactus (prickly pear, cholla) |
| 10. Slender wheatgrass | 26. Needleandthread |
| 11. Galleta | 27. Big sagebrush |
| 12. Sun sedge | 28. Locoweed |
| 13. Threadleaf sedge | 29. Western yarrow |
| 14. Sand sagebrush | 30. Western ragweed |
| 15. Louisiana sagewort | 31. Wyethia (Mules ear) |
| 16. Fringed sagebrush | 32. Woolly Indianwheat |

2. Have the students review the power point slide show on the increaser or "YELLOW" 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

ANALYSIS:

PLANT NAME	MAJOR TYPE	PALATABILITY (cattle)	SEASON OF GROWTH	LIFE SPAN	OTHER
Annual buckwheat	forb	L	warm	annual	
Blue grama	grass	H	warm	perennial	
Hairy grama	grass	H	warm	perennial	
Sand dropseed	grass	M	warm	perennial	
Buffalo grass	grass	H	warm	perennial	
Blowout grass	grass	L	warm	perennial	
Baltic rush	grass-like	L	cool	perennial	
Inland saltgrass	grass	L	warm	perennial	
Foxtail barley	grass	M/L	cool	perennial	
Slender wheatgrass	grass	M/H	cool	perennial	
Galleta	grass	M	warm	perennial	
Sun sedge	grass-like	H	cool	perennial	
Threadleaf sedge	grass-like	M	cool	perennial	
Sand sagebrush	shrub	L	warm	perennial	
Louisiana sagewort	forb	L	warm	perennial	
Fringed sagebrush	shrub	L	cool	perennial	
Red threeawn	grass	L	warm	perennial	
Death camas	forb	P	cool	perennial	
Rabbitbrush	shrub	M/L	warm	perennial	See Note below
Broom snakeweed	shrub	L/P	warm	perennial	
Scarlet globemallow	forb	M	cool	perennial	
Bottlebrush squirreltail	grass	M	cool	perennial	See Note below
Hairy goldaster	forb	L	warm	perennial	
Yucca	shrub	L/M	cool	perennial	
Cactus (prickly pear, cholla)	shrub	L	warm	perennial	

Needleandthread	grass	H/M	cool	perennial	See Note below
Big sagebrush	shrub	M/L	warm	perennial	See Note below
Locoweed	forb	P	cool	perennial	
Western yarrow	forb	L	cool	perennial	
Western ragweed	forb	L	warm	perennial	
Wyethia (Mules ear)	forb	L	warm	perennial	
Wooly Indianwheat	forb	L	cool	annual	

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.

PLAN OF ACTION:

1. Secure plants of each of the increaser plants. Obtain a sample of the soil that the plant came from (if possible) to help the students understand the type of soil that the plant grow in. Discuss in class each plant and give the identifying characteristics of each plant and have the students list any other information that might be helpful to them in identifying the plant in the column marked OTHER.

EVALUATION:

1. Use a quiz to help the students to learn to identify the plants after you have given them time to review the plant samples. Have each student bring in at least 5 different increaser plants for class tomorrow. (This helps them in that it adds variety in the plant samples and gives you another set of plants.)

ENTERPRISE: Range and Pasture Management

JOB VII: Becoming familiar with Invader Plants

SITUATION:

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:

1. 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:
 1. Barnyard grass
 2. Cheat grass (downy brome)
 3. Kentucky bluegrass
 4. Russian thistle
 5. Smooth brome
 6. Leafy spurge
 7. Barnyard grass
 8. Common mullein
 9. Canada thistle
 10. Kochia
2. Have the students review the power point slide show on the invader or "RED" 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
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ANALYSIS:

PLANT NAME	MAJOR TYPE	ORIGIN	SEASON OF GROWTH	LIFE SPAN	OTHER
Barnyard grass	grass	introduced	warm	annual	
Cheat grass	grass	introduced	cool	annual	noxious list C
Kentucky bluegrass	grass	introduced	cool	perennial	
Russian thistle	forb	introduced	warm	annual	
Smooth brome	grass	introduced	cool	perennial	
Leafy spurge	forb	introduced	warm	perennial	noxious list B
Russian knapweed	forb	introduced	warm	perennial	noxious list B
Common mullein	forb	introduced	warm	biennial	noxious list C
Canada thistle	forb	introduced	cool	perennial	noxious list B
Kochia	forb	introduced	warm	annual	

PLAN OF ACTION:

1. Secure the various invader plants and have them available for student observation. Discuss some of the various identifying characteristics of each invader plant.

EVALUATION

1. 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".

ENTERPRISE: Range and Pasture Management

JOB VIII: Becoming Familiar with range sites & ecological sites

SITUATION:

MOTIVATION:

1. 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 plant.

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?
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:

1. Colorado 4H Range Management Guide, CSU, Cooperative Extension, 1M 6-75 pp. 27-33.
2. NRCS (sample range maps and range site or ecological site descriptions (ESD's)
3. 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 & west slope foothills*]
 - c. Mountain sites [*western CO plateaus, mountain bunchgrass, mountain parks, alpine*]
 - d. Semi-desert sites [*salt-desert*]

3. Depends upon locality – use NRCS to help secure range site and ecological site descriptions.

PLAN OF ACTION:

1. Visit the local NRCS where you can secure range site & 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 & 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.

ENTERPRISE: Range and Pasture Management

JOB IX: Becoming familiar with range utilization

SITUATION:

OBJECTIVES:

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

MOTIVATION:

1. 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:

1. Colorado 4H Range Management Guide, CSU, Cooperative Extension, 1M 6-75 pp. 32-45
2. 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 912 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 30.4 days in an average month = 912 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	= 1.5 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) 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 safely 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

& 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 (912 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 on average for a pasture.
 - ii. Palatable plants are determined to be 90 percent.
 - iii. Palatable production then is 900 pounds per acre.
 - iv. Harvest Efficiency (HE) for the applicable grazing management is 30 percent.
 - v. Useable production then is 270 pounds per acre.
 - vi. Suggested initial stocking rate is 912 divided by 270 or 3.4 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 3.4 acres per AUM, the carrying capacity for the pasture is 1000 divided by 3.4 or 294 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 294 AUM's divided by 1.5 months (45 days). The result is that the pasture can property support about 200 AU's for the 45 day planned grazing period.
 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. 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 forage 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 periods (7-21 days) until the vegetation is utilized.
 - c. **Deferred-rotation grazing** is a combination of the deferred and rotation systems. This procedure 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 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.
 - 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 & services.

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 standard and electric fences)
- c. Utilizing salting places for livestock & periodic movement of salt
- d. Reseeding badly deteriorated rangelands
- e. Controlling undesirable woody plants such as big sagebrush & 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 & monitoring rangeland conditions regularly to maintain proper plant balance & 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:

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

EVALUATION:

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

Grazing Affects Root Growth

Percent leaf volume removed	Percent root growth stoppage
10%	.0%
20%	.0%
30%	.0%
40%	.0%
50%	.2-4%
60%	.50%
70%	.78%
80%	.100%
90%	.100%

How grazing affects root growth

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 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.

ENTERPRISE: Range and Pasture Management

JOB X: Becoming familiar with Poisonous and Injurious plants

SITUATION:

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:

1. 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:

1. 16 Plants Poisonous to Livestock in the Western States, Farmers Bulletin No. 2106, USDA.
2. Range and Pasture Plants, Phillips Petroleum Company.
3. An Outline of Common Livestock Diseases, L. Keith Wayt, State Board for Community Colleges and Occupation Education, pp. 44-45.
4. A Guide to Plant Poisoning, Anthony P. Knight, Colorado State University, 2001.

5. Poisonous Plant website:

http://southcampus.colostate.edu/poisonous_plants/

ANALYSIS:

1. Damage that poisonous and injurious plants cause include:

- a. Death
- b. Decreased value
- c. Reduced gains
- d. Mechanical injury
- e. Conditions that lead to other sources (diseases, etc.)

2. Some plants that can cause mechanical injury include:

- a. Bottlebrush squirrel tail
- b. Red three-awn
- c. Wild oats
- d. Puncture vine
- e. Cheatgrass or downy brome
- f. Sandbur
- g. Needleandthread grass
- h. Cocklebur
- i. Cactus
- j. Others

3. Some of the common poisonous plants found in this area includes:

(depends on area) but some common ones are:

- a. Chokecherry
- b. Larkspur (Plains, Tall & Low etc.)
- c. Greasewood (wooly, silky)
- d. Whorled milkweed
- e. Gambel oak
- f. Arrow grass
- g. Lupine (Silvery, Silky, etc.)
- h. Some species of locoweed
- i. 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:
1. Become familiar with harmful plants and the conditions when the plants affect livestock.
 2. Remove all animals from the pasture when poisoning becomes apparent.
 3. Confine poisoned animal and give a laxative, although treatment is not too effective.
 4. Use plenty of salt and mineral on the range.
 5. 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).
 6. 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.

ENTERPRISE: Range and Pasture Management

JOB XI: Range Site and Ecological Site Descriptions.

SITUATION:

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 & 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 following pages) 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 (attached last pages).

ANALYSIS:

<u>Site Name</u>	<u>Type of Topography*</u>	<u>Soil Surface Texture**</u>	<u>Major Plants</u>
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*Examples would be plains, hills, sand dunes, breaks, etc.

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

Range & Ecological Site Descriptions (ESD) Study Questions

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

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?
Grasses and grass-likes
Forbs
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? B) Desirable for cattle?
A) Month(s) B) 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)
15. Under the "Supporting Information" section of the ESD, what is the name of a similar ecological site?

PLAN OF ACTION:

1. Have samples of the various range & 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 some images attached next pages)

Images of Some Range Sites & Ecological Sites in Colorado
Southeast Colorado, Major Land Resource Area (MLRA) 69



Alkaline Plains Ecological Site, SE Colorado.



Choppy Sands Ecological Site, SE Colorado.



Limestone Breaks Ecological Site, SE Colorado.



Loamy or Loamy Plains Ecological Site, SE Colorado.



Loamy or Loamy Plains Ecological Site, SE Colorado.



Salt Meadow Ecological Site, SE Colorado.



Saline Overflow Ecological Site, SE Colorado.



Salt Flat Ecological Site, SE Colorado.



Sands or Deep Sands Ecological Site, SE Colorado.



Sandstone Breaks Ecological Site, SE Colorado.



Sandstone Breaks Ecological Site, SE Colorado.



Sandy Bottomland Ecological Site, SE Colorado.



Sandy or Sandy Plains Ecological Site, SE Colorado.



Shale Breaks Ecological Site, SE Colorado.



Shaly Plains Ecological Site, SE Colorado.

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



Alkaline Plains Ecological Site, NE Colorado.



Saline Overflow, NE Colorado.



Sands or Deep Sands, NE Colorado.



Sandy Meadow Ecological Site, NE Colorado.



Sandy Meadow Ecological Site, NE 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 & 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

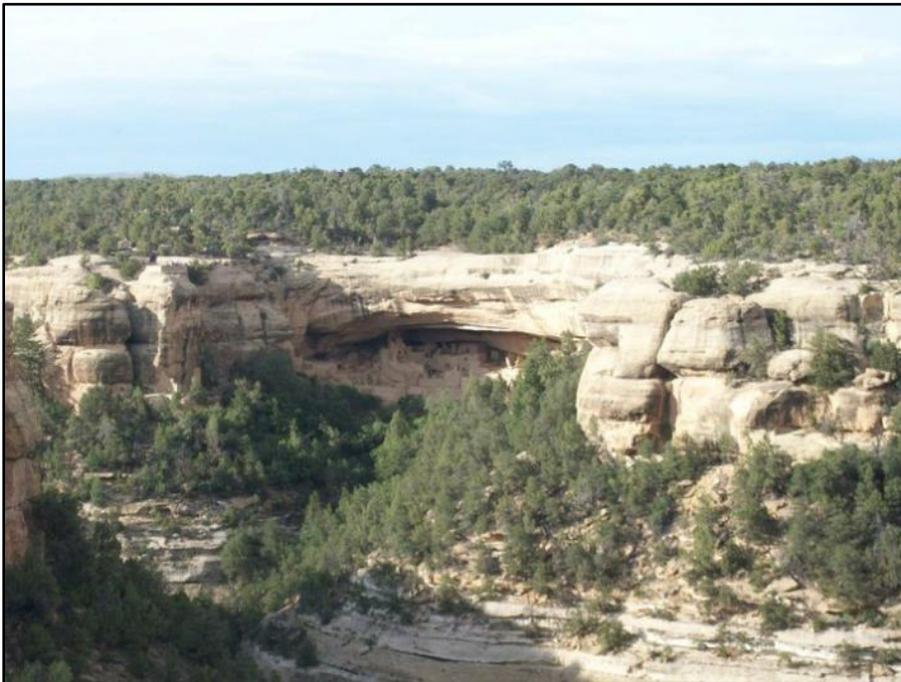


Loamy Foothills Ecological Site, Dove Creek Area

R000531103 Shallow Clay Loam
Dominant Plants: Utah Juniper, Blackchopchick,
Perennial Grasses
Soil Survey: Hovenweep National Monument
U.T.M.: Datum: NAD83, Zone 12, Easting: 674196,
Northing: 4142338
Photo by Julie Ottens (2009)
Site located in Hovenweep National
Monument—Horseshoe Rockberry. This site is in
community phase 1.2.



Shallow Clay Loam Ecological Site, Hovenweep National Monument



Shallow Loamy Mesa Top Ecological Site, Mesa Verde National Park

Western & 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

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Appendix A. Eastern CO FFA State Plant List

EASTERN COLORADO STATE RANGE PLANT LIST 2015-2019											
PLANT NAME	LIFE CYCLE			PALATABILITY		PLANT NAME	LIFE CYCLE			PALATABILITY	
	annual	biennial	perennial	PA	GS		annual	biennial	perennial	PA	GS
DECREASEASERS						INCREASEASERS					
Grasses:						Grasses:					
alkali sacaton			X	H	W	baltic rush			X	L	C
big or sand bluestem			X	H	W	blowout grass			X	L	W
Canada wildrye			X	H	C	blue grama			X	H	W
green needlegrass			X	H	C	bottlebrush squirreltail			X	M	C
Arizona fescue			X	H	C	buffalograss			X	H	W
little bluestem			X	H	W	galleta			X	M	W
Nebraska sedge			X	H	C	hairy grama			X	H	W
prairie cordgrass			X	H	W	indian ricegrass			X	H	C
prairie junegrass			X	H	C	inland saltgrass			X	L	W
prairie sandreed			X	H	W	needleandthread			X	H	C
sideoats grama			X	H	W	New Mexico feathergrass			X	M	C
switchgrass			X	H	W	red threeawn			X	L	W
vine mesquite			X	H	W	ring muhly			X	L	W
western wheatgrass			X	H	C	sand dropseed			X	M	W
yellow indiagrass			X	H	W	sand flatsedge			X	M	C
Forbs:						Forbs:					
purple prairie clover			X	M	C	annual buckwheat	X			L	W
Half Shrubs & Shrubs:						Half Shrubs & Shrubs:					
fourwing saltbush			X	H	W	hairy goldaster			X	L	W
leadplant amorpha			X	H	W	Louisiana sagewort			X	L	W
mountain mahogany			X	H	W	plains larkspur			X	P	C
winterfat			X	H	W	scarlet globemallow			X	M	C
INVADERS						INVADERS					
Grasses:						Grasses:					
barnyardgrass	X			M	W	slimflower scurfpea			X	L	C
cheatgrass or downy brome	X			M	C	wavyleaf thistle	X			M	C
false buffalograss	X			L	W	western ragweed			X	L	W
Forbs:						Forbs:					
Canada thistle			X	L	C	woolly indianwheat	X			L	C
leafy spurge			X	P	W	woolly locoweed			X	P	C
Russian thistle	X			L	W	Half Shrubs & Shrubs:					
PA = Palatability (cattle)						GS = Growth Season					
L=Low palatability						C = Cool season					
M=Medium palatability						W = Warm season					
H=High palatability											
P= Poisonous (cattle)											
broom snakeweed			X	L	W	walking stick cholla			X	L	W
walking stick cholla			X	L	W	fringed sagebrush			X	M	C
rubber rabbitbrush			X	L	W	plains prickly pear			X	L	W
sand sagebrush			X	L	W	rubber rabbitbrush			X	L	W
small soapweed or yucca			X	M	C	sand sagebrush			X	L	W
spreading buckwheat			X	L	W	small soapweed or yucca			X	M	C
wormwood			X	L	W	spreading buckwheat			X	L	W

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Appendix B. Western CO FFA State Plant List

WESTERN COLORADO STATE RANGE PLANT LIST DRAFT 11/2015					
PLANT NAME	annual	biennial	perennial	PA	GS
DECREASESERS					
Grasses & Grass-likes:					
Alkali Sacaton			X	H	W
Alpine Bluegrass			X	H	C
Basin Wildrye			X	H	C
Bluebunch Wheatgrass			X	H	C
Canada Wildrye			X	H	C
Columbia Needlegrass			X	H	C
Elk Sedge			X	H	C
Green Needlegrass			X	H	C
Idaho or Arizona Fescue			X	H	C
Indian Ricegrass			X	H	C
Mountain Brome			X	H	C
Mountain Muhly			X	H	W
Nebraska Sedge			X	H	C
Nodding Brome			X	H	C
Reed Canarygrass			X	H	C
Tufted Hairgrass			X	H	C
Western Wheatgrass			X	H	C
Forbs:					
American Vetch			X	H	C
Half Shrubs & Shrubs:					
Antelope Bitterbrush			X	H	W
Fourwing Saltbush			X	H	W
Mountain Mahogany			X	H	W
Service Berry			X	H	W
Winterfat			X	H	W
INVADERS					
Grasses:					
Cheat Grass	X			ML	C
Kentucky Bluegrass			X	H	C
Smooth brome			X	H	C
Forbs:					
Canada thistle			X	L	C
Common Mullein		X		L	W
Kochia	X			L	W
Leafy Spurge			X	P	W
Musk Thistle		X		L	W
Russian Knapweed			X	P	W
PA = Palatability (cattle) GS = Growth Season L=Low palatability C = Cool season M=Medium palatability W = Warm season H=High palatability P= Poisonous (cattle)					
INCREASESERS					
Grasses & Grass-likes:					
Baltic Rush			X	L	C
Bearded Wheatgrass			X	M	C
Blue Grama			X	H	W
Bottlebrush Squirreltail			X	M	C
Breadless Wheatgrass			X	M	C
Foxtail Barley			X	M/L	C
Prairie Junegrass			X	M	C
Needleandthread			X	H/M	C
Sandberg's Bluegrass			X	M	C
Slender Wheatgrass			X	M/H	C
Threadleaf Sedge			X	M	C
Thurber's Fescue			X	M	C
Forbs:					
Arrowleaf Balsamroot			X	M	W
Columbine			X	L	W
Cow Parsnip			X	M	W
Death Camas			X	P	C
Goldenrod			X	L	W
Harebell			X	L	C
Indian Paintbrush			X	L	C
Lewis Flax			X	L	C
Loco			X	P	C
Lupine			X	P	C
Mariposa Lily			X	M	C
Rocky Mountain Penstemon			X	L	C
Western Ragweed			X	L	W
Western Salsify			X	L	W
Western Yarrow			X	L	C
Wild Carrot			X	M	C
Wild Geranium			X	L	C
Wild Iris			X	L	C
Wild Onion			X	L	C
Wyethia (Mules Ear)			X	L	W
Half Shrubs & Shrubs:					
Big Sagebrush			X	ML	W
Broom Snakeweed			X	P	W
Fringed Sagebrush			X	L	C
Gambel Oak			X	L	W
Greasewood			X	P	W
Ground or Common Juniper			X	L	W
Prickly Pear Cactus			X	L	W
Rabbitbrush			X	ML	W
Silver Sagebrush			X	L	W
Snowberry			X	L	C
Yucca			X	M/L	C

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Appendix C-2. Eastern CO State FFA Site Judging Score Card, page 2.

G. 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 (5 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) (5 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 (5 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 (5 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 (5 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	_____	_____

Part G Total Score (25 Pts.)

H. 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)
- 6 _____ Implement prescribed (rotational) grazing management (may include additional fencing, and/or specified deferment during the spring or summer growth periods)
- 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)

Part H Total Score:

PAGE 2 SCORE:

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Appendix D. How to Complete the Eastern CO State Rangeland Judging Score Card

How to fill out the State FFA Rangeland Judging Score Card.

By Bill Carwin, Ag Instructor & FFA Advisor, Pritchett, CO. 2016

Contestant = Students name

School = what school is student from

Site No = This is in the 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: This line is worth 25 points. Usually in a contest there will be a choice of around 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 score card. (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) to gain 25 points.

****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, soil texture)

Look for plants that typically grown on certain sites (if you see sand sagebrush guess what? You are on a sands site).

Now for the Hands-On Part, between letters A and B you will find a bunch of lines and columns. Work with the left hand column that says

“List of Plant Species” There is a box for Grasses & Grass like Plants, a box for Forbs and a box for Shrubs.

The students must fill this out with the plants they find within the flagged area. They have to find 100 plants. In order 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 leg, 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 closet to the line on the tip of their shoe, if it is the same plant make 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.

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 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 than 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 percent.

Line “B” The Plant Composition is ____%

In order to get this number the student has to fill out the ALLOWABLE% column. Open the 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 site

description the number under % Comp write on worksheet under Site Description, (if I had blue grama on my worksheet, than 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 the worksheet.

They will work with the last column 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 worksheet, and look at the site description % on the worksheet.

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. Worth 20 points.

Line "C" Range Condition Score

This line comes from your earlier teaching of range management in Job IV

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

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

Line "D"

Total production per acre _____ lbs.

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.

Line "D"

Palatable Forage per acre

See attached worksheet for Palatability in order to get this line

Line "D" Pounds of useable forage per acre_____

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 "E" Acres per animal unit month: _____Acres.

On the Bottom of the worksheet is tells you that One animal unit month is equivalent to about 900 lbs. of harvestable (useable) forage air dry. Do the Math (division) and put it on the line.

Back of Sheet

Yes tell your students to do the BACK

Trend Indicators = there are 5 trend indicators worth 5 points each read each indicator and look at the site to mark either a "I" for improving trend or a "D" for declining trend.

Line "H" Range Practices

They 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 "H".

Appendix E. General categories of the “types” of rangelands in Colorado, starting from east to west across the state. [Source: Ben Berlinger, La Junta, CO; 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.

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 & 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 & 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 & 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 surrounded by 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 & Archuleta Counties. The plant community consists of a mixture of grasses (western wheatgrass & needle-and-thread grass) and shrubs such as big sagebrush & 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 & sage grouse is an important value, along with homes and open space for people.

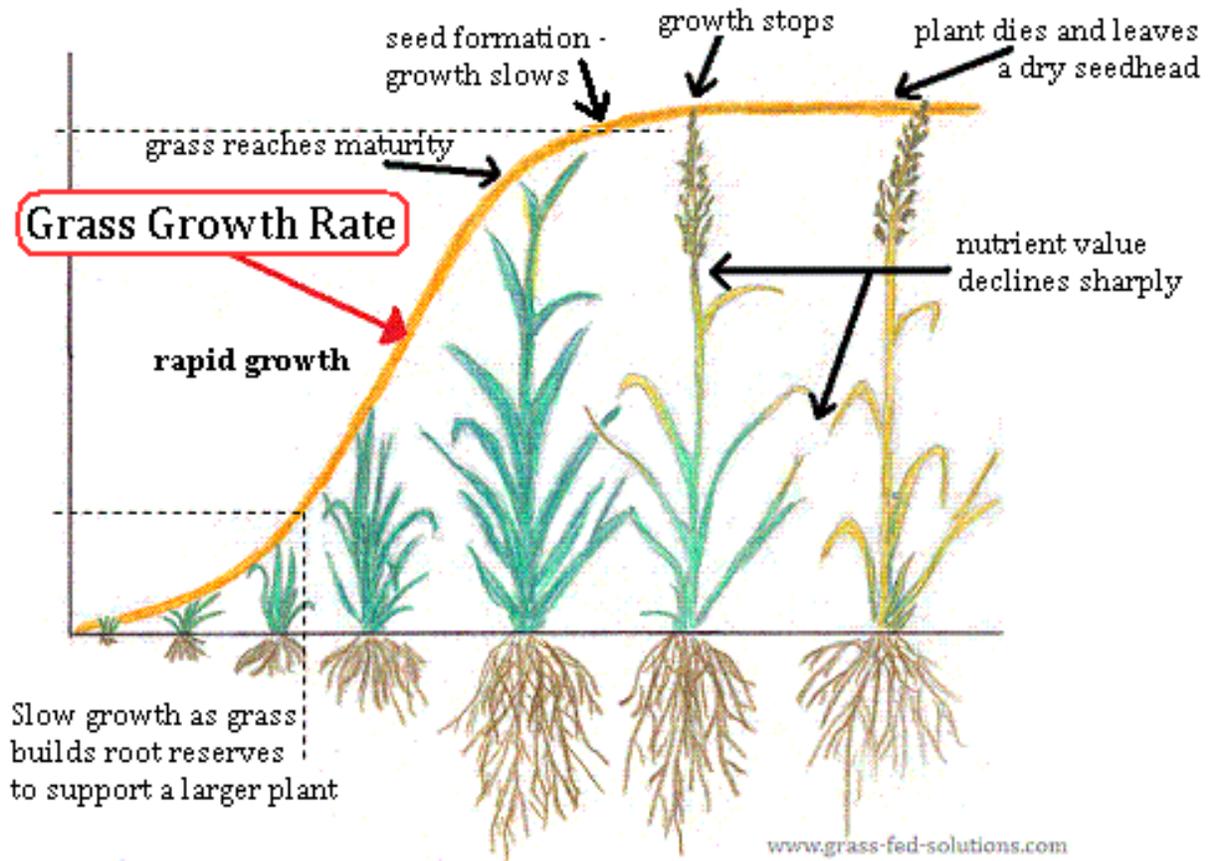
West Colorado Plateaus- This type of rangeland occurs in the far western part of Colorado. Good examples would be Grand Mesa near Grand Junction and the Uncompahgre Plateau near Montrose. The plants found here would be a mixture of grasses, forbs & shrubs. Gambel oakbrush would be very noticeable along 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 & 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 & 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.

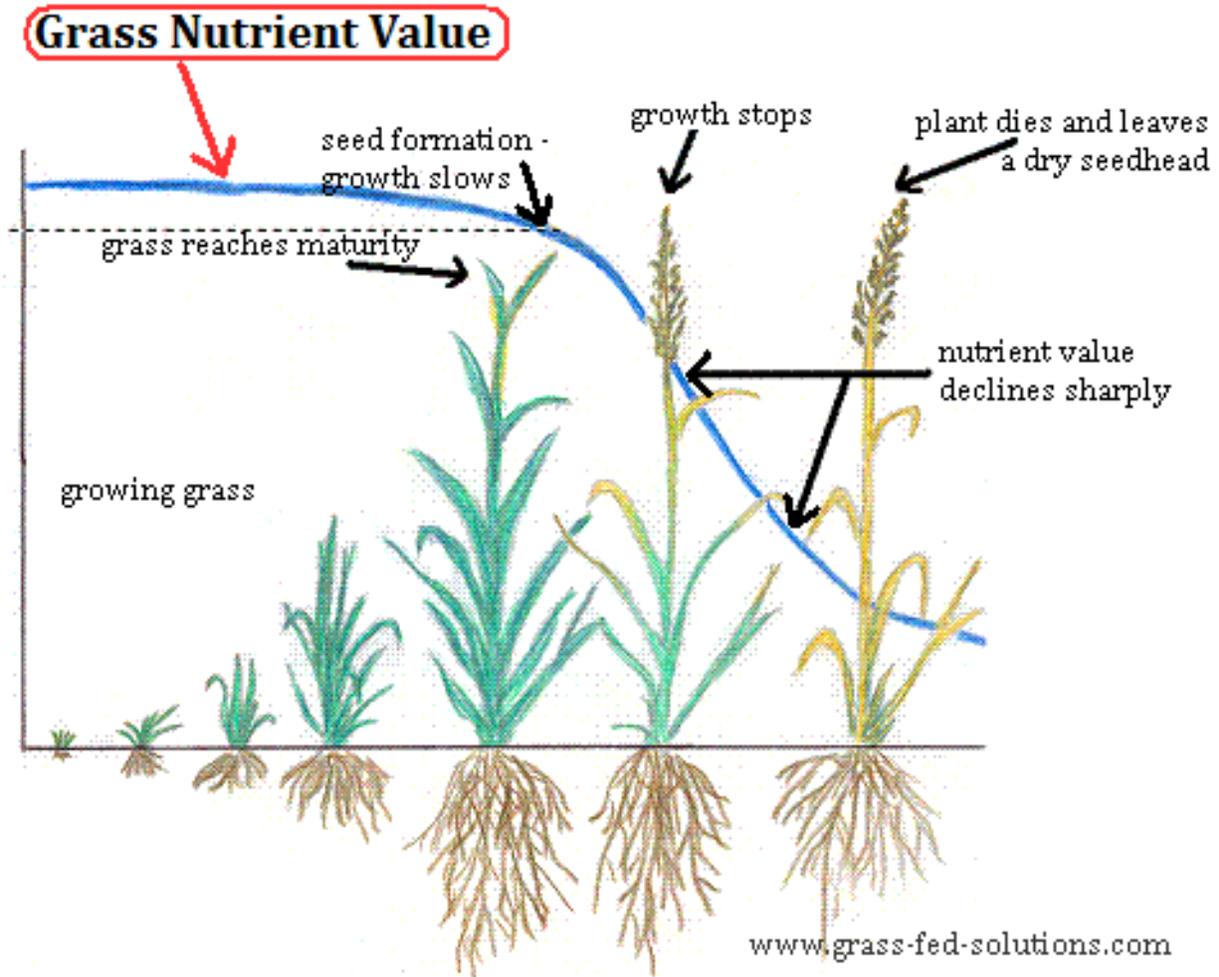
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Appendix F. Illustration showing grass growth rate above & below ground correlated with phenology. [Source: www.grass-fed-solutions.com]



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Appendix G. Illustration showing grass nutrient value correlated with phenology. [Source: www.grass-fed-solutions.com]



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Appendix H. Colorado Average Forage Production by Region. (DRAFT)
 [Source: Dan Nosal, NRCS Franktown, CO. 2016]

Approximate 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 & B	1	0.34	0.23	0.12	35	52	100
35 & 36	2	0.3	0.22	0.13	40	55	92
47	3	0.36	0.25	0.14	33	48	86
48A	4	0.5	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	0.5	0.4	0.3	24	30	40
49S	8	0.4	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	0.6	0.43	0.25	20	28	48
69	12	0.29	0.21	0.12	41	57	100
72	13	0.6	0.43	0.25	20	28	48

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.egov.usda.gov/references/public/CO/CO_MLRAs.pdf

[See map on next page.]

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Appendix I. Range Plant Identification Tips. Adapted from Eastern Colorado State FFA Range Plant List (2015-2019).

Source: Bill Carwin, Agriculture Teacher, Pritchett High School. 2016.

Plant Name	Other Names	Characteristics
Decreaser Grasses		
Alkali Sacaton		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
Big Bluestem		Found on hard land soil; tall plant (4-5 feet); blue – purplish color to seedhead and stem; turkey foot to inflorescence; nodes (joints) are very purple or reddish
Sand Bluestem		Sandy soil; light bleached grass; coarse textured; very tall (four feet)
Canada Wildrye		Two feet or more high; spikelet 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
Green Needlegrass		Tall plant – 2-3 feet; slender inflorescence; straight awns; will grow on sandy or hard land soil
Griffith’s Wheatgrass		Mountain grass; similar to Canada Wildrye except awns are shorter and more curly; not much on plains;
Little Bluestem		Bunch grass; hard land soils on slopes; purplish/reddish color; 20 inches high; seeds are much smaller than big or sand bluestem
Nebraska Sedge		“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 is brownish; end of stem resembles foxtail – except brown
Prairie Cordgrass		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; seeds are very coarse; seed is serrated; hard land soils
Prairie Junegrass		Bunch grass; 16 inches high; resembles Woolly Indianwheat without any awns; found on hard land soils; will find on some sandy soils; cool season (done in June) will then turn brown

Prairie Sandreed		Sandy soils; three feet tall; hairy armpit (tuff of hair where leaf attaches to collar; has broad, coarse type leaf; grows by rhizomes; resembles seedhead of prairie cord grass
Sideoats Grama		Bunch grass; hard land soil; will find if you find little bluestem; purplish red in color; zig zag stem at each joint; about 20 inches in height
Switchgrass		Found in sandy or loamy soil; three to four foot tall; has very large seeds; have reddish tinge to head; purple strips along veins; has panicle inflorescence (like fireworks); will resemble switch of a cow; tuff of hair at junction of leaf and collar (white) on upper portion of leaf
Vine Mesquite		Found in hard land or sandy soils; roundish type of seedhead; panicle inflorescence – grass; similar to proso millet; 16 inches in height;
Western Wheatgrass		16 inches tall; coarse textured; silvery-green color (resembles color of sages); found on hard land soils in low lying areas where there is more moisture; run finger up and then down (down is not possible because of jagged edges similar to wheat and barley); leaves can actually cut you
Yellow Indiangrass		Found in hard and sandy soils; more on hard land soils in low lying areas; 3-5 feet tall; seed head will look like a flame of a candle; each individual seed is very hairy and has an awn (awn will come up straight and then will make a right angle)
Decreaser Forbs		
Purple Prairieclover		Hard land soil; particularly slopes; leaves will be fine and grass-like; will fall over because of tap root; dark green; thin grass-like leaves; flower will be white or purple (2-4 inches); leaves will be small

Decreaser Half Shrubs & Shrubs		
Fourwing Saltbush		Big stemmed; light green ting; low lying areas (wants salt); clay or hard land soil; seeds will have four individual wings with seed inside; will get four foot tall; not all plants will have the seeds because of male and female plants; seeds will turn a straw color
Leadplant Amorpha		Found only in sandy soils; heavy topped will cause it to fall over; large tap root; short leaves; hairy all over; end of plant will be white and flower will be purple; leaves will taste minty; 20 inches tall; seeds resemble the seeds of a pine cone
Mountain Mahogany		Found in foothills/mountains; shrub; woody stem; leaves have a palmate type of arrangement; flower (usually yellow or white) will have long, slender seed that has a white fuzzy tail (usually corkscrew seedhead)
Sand Cherry		Shrub – usually produce white colored flower – with cherry type of seed (yellowish/brown); some make jam out of it; 4-5 feet tall; leaves are smooth (palmate); no pubescence
Winterfat		Found in hard land soils; salty areas; pale-green plant; tap root; shrub; 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
Increaser Grasses		
Baltic Rush		Rushes (grass-like) “rushes are round”; similar to grass; characteristic roots and seedhead are dark brown; seedhead is at tip of plant on stem; no joints on plant; resembles yellow foxtail (but brown);
Blowout Grass		Found in blowouts (sandy soil); salty areas; pale-green plant; tap root; shrub; 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

Blue Grama	Colorado State Grass	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
Bottlebrush Squirreltail		Bunch grass; can be confused with Canada Wildrye; 12 inches high;; seedhead because straw color; found around gopher hole; end of stem looks like brush you would use to clean a baby bottle
Buffalograss		Short growing grass; leaves are very, very hairy; hair all over; short leaves (1-2 inches); dioecious (male and female plant); male send up the flag (pollen producing area); stolons (above ground stems – every time touch ground will produce a new plant; sod former; loamy soils
Galleta (“Guy-etta”)	Spanish name for biscuit or cookie	Grass – has a seedhead that resembles little bluestem but fuzzy; whitish pubescence; hard land soils; 16 inches in height; tolerable to low lying moisture areas; salt tolerant; find around alkali or four wing saltbush;
Hairy Grama		Bunch grass; resembles blue grama; has hair on the leaves much more; found on sandy or loamy slopes; have the eyebrow effect except hairy has extended rachis (stem will extend up and go at right angle); at end of rachis
Indian Ricegrass		Found on sandy or hard land soils; mostly on sandy soil or slopes or breaks; will get 20-24 inches tall; had definite panicle inflorescence; individual seed is found inside the gloom; has spot of tuff of hair in the seed; when seed falls out gloom looks like bird’s beak; seed head will be straw colored when it is mature
Inland Saltgrass		Found on hard land soil in areas of lots of alkali; short grass about 6-8 inches; produces seed head that is a spikelet inflorescence; stem below the leaves is rather jointed and scaly; seedhead looks like a small western wheat head with no awns
Needleandthread		Found on loamy slope areas and in sandy soil; 20 inches tall; will have characteristic flag on top; will look similar to small cheat grass; seeds are produced next to plant; seed is very sharp; awn will be curled and long

Red Threeawn		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
Ring Muhly		Usually plant that grows in rings; circle of grass contains moisture to survive; pine needle type leaves; not too tolerable of grazing; found near salt tolerant plans;
Sand Dropseed		20-24 inches tall; found in clumps; at junction of leaf and stem a tuff of white hair surrounds the entire stem; seedhead will be rolled inside the stem until it matures; will then resemble a tree shape; seeds are very small and reddish
Sand Flatsedge		Is a 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 then to the sun; sandy soil
Sand Paspalum		Looks like bead grass; seeds are half round; stem will be a zig zag appearing; plant will be found only in sandy soil; extremely hairy on stem and leaves; thick, wide leaf plant; will grow to about 15 inches
Sandhill Muhly		Found only in sandy soil; deep and choppy sands; has leaf blades that are about 2 inches (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
Sixweeks Fescue		Very short; cool season plant; 6-8 inches tall; looks like crested wheat – but smaller; no awns on seedhead; short root system; all fescues are cool season; wheatgrass; short life span

Sun Sedge		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 10-15 inches
Threadleaf Sedge		Sedge; leaves are very small and threadlike; thin and narrow; will grow on hard land soil; bunch grass; will grow to six inches tall; will mingle with buffalo and glue gramma; will have brownish material as a sedge characteristic
Tumblegrass		Low-short growing grass similar to buffalo; seedhead will be long and will have random spike and will break off of plant and will then roll; sandy soils and areas that are devoid of cover; is hairy and has a reddish-purplish tinge
Increaser Forbs		
Annual Buckwheat		Found only on sandy soil; plant will grow to about 30 inches tall; seedhead will look like an inverted umbrella; stem will be covered with a then fuzz; reddish tinge to the seedhead and flowers
Hairy Goldaster		Grows in clump and will send out several stems; stems are hairy; will get about 8-10 inches high; flower at end of stem will be golden; leaves are broad and differentiates if from another plant; hard land or sandy soil
Louisiana Sagewort	Cud Weed or Sage	All sages have distinctive odor of sage; sandy or hard land soil; will have silvery color; seed head will have reddish brown seedpod and will be about 20 inches high
Plains Larkspur		Poisonous; white flowers (compare with the other species); leaf – resembles that of a spur (five pointed, palmate); hard land soils; broadleaf shape leaf; plants grows low to medium
Scarlet Globemallow		Leaves resemble palm of hand; flower are usually orange (may find scarlet); low growing; indication of range over grazing; 6-8 inches tall

Slimflower Scurfpea	Wild alfalfa	Plant will be devoid of numerous leaves; black dots on leaves and seed pod; seed pod arises from a blue/purple flower; trifoliolate (legume); warm season; leaf is round shaped; no serrated ends; seeds are born from pods; skeleton like plant;
Wavyleaf thistle		Biennial; first year is rosette type of plant (no flowers) – next will flower; purple/blue flower – resembles Canada thistle except there is one big flower instead of clusters; underside of leaves in pubescent; sandy or hard land soil; 24-30 inches; big flower; seedhead has parachute effect;
Western Ragweed		20 inches in height; pubescent all over; yellow seed pod; has stinky odor (sinus infections); leaf is jagged or saw-toothed; similar to poverty weed; is dark green and hairy
Woolly Indianwheat	Woolly Plantain	Low growing; 6-8 inches; seedhead resembles wheat without awns; extremely pubescent; not very productive for livestock; woolly bracts surround seedhead
Woolly Locoweed	Crazyweed	Poisonous; causes damage to livestock; leaves, stems, seedhead – extremely hairy; leaves are mouse eared shaped; large tap root; flowers are white, purple, or bluish; legume (produces a pod); all parts of plant are poisonous; kidney shaped seeds; hairy, leather like pod
Increaser Half Shrubs & Shrubs		
Broom Snakeweed		Yellowish flowers; has turpentine odor (stinks); plants if formed in clump; seedhead, flowers are yellow; about equal; dark green leaves and stems;
Cholla		Cactus type plant; succulent; hard or sandy soils; plants has elongated prickly pear characteristic; flowers are red, thorny; thorns have barbs on end; 3-4 feet tall and bushy
Fringed Sagebrush		Hard land soil; sage appearance; resembles plant that is in aquariums; fine leaves; Indians used to call is women sage and was used as deodorant; as grows up – will fall over because of fine leaf structure; silvery blue color; sage small; seedhead is brownish orange

Plains Prickly Pear		Yellow or red flowers; thorny; half-shrub; pear shaped leaves; seedpod is reddish; succulent (full of water);
Rubber Rabbitbrush		2-4 feet; confused with snakeweed, smell like green tomatoes; plant will have varied head height along top;
Sand Sagebrush		Sage small; seedhead is brownish/red; stinks; woody stemmed; fine needle like leaves; big than fringed sage; hard to control; grows to 3 feet;
Small Soapweed	Yucca	Will have flowers (white) 3 or 4 different types of bracts (inside will be seedpod); seeds look like black, flat seeds; highly nutritious to cattle; Indians used to make soap from roots; leathery, spiny ends;
Spreading Eriogonum	Bush Buckwheat	Leaves, stems have fine hair on them; seedhead umbrella type of seedhead; reddish brown in color; found on hard land soils (sometimes sandy); devoid of many leaves; silvery pubescence; looks like annual buckwheat but more of a shrub (16 inches);
Wormwood		Darkgreen 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;
Invader Grasses		
Barnyardgrass		Tall growing grass (30 inches); tad pole type seed; usually red; has long tail on seed; grows in waste areas; spike inflorescence (purplish in color); leaf and stem are extremely pubescent;
Cheatgrass	Downy Brome	Thin seed; seed sticks to socks, pants; don't confuse with Japanese brome which is broader leaf; bunch grass; purplish or reddish tinge to seedhead at maturity (flag);
False Buffalograss		Resembles buffalo grass; extends from one root system; have runners instead of stolons; plants has sharp ½ inch leaves that are sharp; not true stolons;

Invader Forbs		
Canada Thistle		Purple flowers; smaller seedheads; more numerous seedheads; elongated brown seeds; parachute; spread by rhizomes; usually found in clump; thorny, spiny; silvery leaves; rosette type of immature plant;
Leafy Spurge		Tall; 2-3 feet; light green color; milky (sappy); plant flowers are blended in (yellowish color); robin egg type of seed; poisonous; usually found in low, moist areas; elongated leaves
Tumbling Russian Thistle		Tumbleweeds; annual, reddish; spiny, sticky type of seedhead; hard land or sandy soils; roundish type of plant;