TRI RIVER AREA
Counties of:
• Delta • Mesa
• Montrose • Ouray

Colorado State University Cooperative Extension

PASTURE ESTABLISHMENT

AND

RENOVATION

How To Keep It Competitive

Pasture Establishment and Renovation

How to Keep It Competitive

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Introduction

A. Wayne Cooley

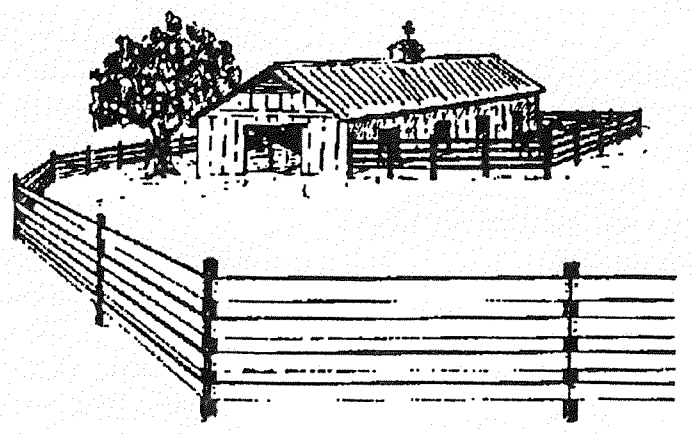
There are different needs for each operation as it relates to pasture and/or hay production. Therefore the first step in pasture and/or hay management, is to establish goals for a particular operation.

There are several points that need to be considered when establishing those goals. Consideration needs to be given to the required management practices for that particular goal, financial resources available on a yearly or long term basis, and the forage needs with regards to amounts and time of year they will be needed. In addition, consideration needs to be given to the operation's production limitations due to elevation, soil types, available water, plant species, acres available, etc.

One big question is, renovate or start completely over for a particular pasture, hay field or meadow? This question needs to be answered on a case by case basis. If at all possible, renovation is the best solution. Starting over means losing at least one season of grazing or minimal hay production the first season, considerable weed pressure in the initial stages, potential for soil erosion on sloping ground, and more frequent irrigations until plants are fully established.

Alfalfa hay fields will decline with time due to repeated harvesting and disease development. Starting over is the only solution after 4 to 6 years of production, if maximizing yields is the goal.

However, if a goal is to have a grass/alfalfa mix, then an alfalfa field that is declining can be interseeded with grasses with minimal disturbance and loss of production during the first year.



Plant Species Selection

A. Wayne Cooley

Species selection is probably one of the first concerns to have when renovating or establishing a pasture or hay field. Grass mixtures are generally preferred over single species and the number of species to use in a mix will vary. Generally, plant no more than three grass species per mix with the addition of a legume if a legume is desired in a particular pasture or hay field. Mixtures generally result in a better overall stand. Soil types, topography, moisture, and soil depth will vary over a given field. Single species may result in thin stands or basically no stand of a particular single species in parts of the pasture. In other words, native rangeland or pastures/meadows do not exist as a monoculture, but rather have a mix of plant species in any given area.

However, there are situations that may warrant establishing single species for both hay production and intense rotational grazing programs. These situations may require somewhat different management practices than mixed species pastures or hay production fields.

Other factors to consider when selecting species is their performance at different elevations, precipitation amounts, soil textures, irrigated vs. dryland, wet areas, and whether the grass will be used for hay production or grazing or both.

Before selecting a particular species, there is a need to review and understand the type of grasses growing in our area and how a grass plant grows and survives.

On the western slope of Colorado, there are primarily cool season grasses. A cool season grass grows primarily during the spring and fall when moisture is available. Cool season plants are usually dormant during the warm summer months. Examples of cool season grasses are: smooth brome, orchardgrass, ryegrasses, wheatgrasses, tall fescue, reed canarygrass, and Kentucky bluegrass.

In eastern Colorado, there are primarily warm season grasses. A warm season grass grows primarily during the warm summer months. Examples of warm season grasses are: big bluestem, buffalograss, little bluestem, sideoats grama, sand dropseed, and switchgrass. Probably one of the main reasons warm season grasses do not do well on the western slope, is when growth would be initiated in June we are generally very dry.

However some warm season grasses have produced good tonnage in test plots under irrigation on the western slope.

How does a grass plant grow? Buds break dormancy and initiate grass tillers. A grass tiller is composed of a growing point, stem, leaves, roots, and dormant buds.

Where are the buds located? The basal buds are located on the nodes at the base of the shoot. The axillary buds are located on the stem. If the plant has stolons or rhizomes, then buds will be located at the nodes on the stolon or rhizome.

Once the dormant or inactive buds break dormancy, they produce a new tiller (shoot) with a new growing point. If that growing point is removed, then another dormant bud must produce a new tiller. Remember, dormant buds must survive the winter as that is the basis for perennial plants to live from year to year.

The time required for a grass plant's dormant bud to break dormancy after the growing point is removed depends on the grass species. There are grasses that are classified as either cyclical tillers or continuous tillers with regards to their growth habit.

Cyclical models have buds that remain very dormant until heading occurs on the initial tiller. Examples are smooth bromegrass and intermediate wheatgrass.

Those grasses that are classified as continuous models have less dormant buds and new tillers are initiated periodically throughout the growing season. Examples are orchardgrass, meadow bromegrass, tall fescue, and Kentucky bluegrass.

The grass species that have performed well over the past several years on the Western slope at various elevations, precipitation amounts, irrigated vs dryland, high salt soils, etc., are listed in Attachment I.

The general rule of thumb for seeding rates is 20 pure live seed (PLS) per square foot for rangeland and non-irrigated and 40 PLS per square foot for irrigated pasture and hayland. The pounds of seed per acre recommended in Attachment I are based on pure live seed that is planted with a drill. If you broadcast your seed then the seeding rate must be doubled.

Pure live seed means all seed planted should germinate. Since no seed has 100 percent purity and 100 percent germination, we need to calculate how much bulk seed will need to be planted to obtain the PLS rate listed in Attachment I.

For example, smooth brome under irrigated pasture and hayland for well-drained soils (Attachment I) has a recommendation of 13 lbs per acre of PLS if planted with a drill as a single species. If the seed you purchase has a purity of 95% and a germination of 90% we need to determine the bulk seed rate per acre utilizing the following formula.

$$\text{lbs/A Bulk Seed} = \frac{\text{lbs of PLS/A (rate/A in Attachment I)}}{\%\ \text{purity X}\ \%\ \text{Germination (from seed tag)}}$$

$$\text{lbs/A Bulk Seed} = \frac{13\ \text{lbs PLS}}{.95\ \text{X}\ .90}$$

lbs/A Bulk Seed = 15.2 lbs of the smooth brome per acre would be needed if planting alone and using a planting drill. If we were broadcasting we would need 30.4 lbs/A of this particular bulk seed.

If we wanted a 3 way mix of smooth brome, orchardgrass and meadow brome, then we would need to determine what percent of each species we wanted in the mixture and multiply times the single species rate listed in Attachment I.

For example, if we wanted equal number of seed per square foot for each of the 3 species, we would multiply by 1/3 for each rate listed in Attachment I. This would result in 4.3, 1.0, and 7.3 lbs/A PLS for smooth brome, orchardgrass, and meadow brome, respectively, in an irrigated pasture or hayland. We would then need to calculate bulk seed rates for each of the species using the above formula.

Remember, we generally suggest no more than 3 grass species per mix but there are always exceptions. By now, it should be evident that each of us need to determine our needs and try to select the mix of grasses that will best meet those needs based on the strengths and weaknesses of each grass species. In Attachment II you will find some general characteristics of the recommended species listed in Attachment I.

CSU Cooperative Extension, Tri River Area, Mountain Meadow Research Center and NRCS personnel are working together with various producers on seeding recommendations for interseeding in existing meadows as well as newly seeded areas. We are also involved in initiating controlled test plots as well as monitoring the successes of large scale interseedings. This is an ongoing program and results and suggestions on seeding mixtures are available by calling your local Cooperative Extension office. Dr. Calvin Pearson, Fruita Research Center, has initiated a long term test with various grass and legume mixes on Rogers Mesa. This was initiated in the fall of 1996 and results will be made available after each years harvest.

Plant Establishment

A. Wayne Cooley

Land Preparation: Land preparation is very important whether it is a rangeland/non-irrigated or irrigated pasture or hayland. When undesirable perennial plants are present, it is generally important to initiate suppression or control methods before seeding. Obviously control measures that involve tillage would need to be done prior to planting, however many chemical (herbicides) control measures for perennial plants (weeds and brush) are important to initiate prior to new seedings. This is especially true for seedings that involve legumes (alfalfa, clover, birdsfoot trefoil, etc.). Herbicides that are active on perennial weeds or brush would also damage the legumes.

Seedbed preparation for rangeland/non-irrigated should not involve plowing or deep tillage if at all possible. Since precipitation in our area is minimal, we should not do anything to dry out the soil. Some type of harrow or light disking should suffice for seedbed preparation if anything is required.

Irrigated pastures or haylands that require starting completely over will require a fine, weed-free seedbed, conducive to good irrigation. Obtaining a well prepared seedbed will usually require plowing and two or more disking operations. In addition, an operation with a roller or cultipacker will be necessary to obtain a firm seedbed.

A firm seedbed is recommended for all planting situations. Firm seedbeds allows for good seed-to-soil contact, helps retain moisture in the top 1 to 3 inches, and prevents excessive seeding depths. A good definition of a firm seedbed would be when a person walks on a prepared seedbed they should not make a footprint deeper than one half inch.

How To Seed: Seeding depth for most grasses and small seeded legumes is 0.2 to 0.6 inches deep. This will depend on soil type and seed size. Larger seeded species or species planted in sandy soils would be planted around the 0.5 inch depth. Smaller seeded species or species planted in clay soils would be planted around the 0.25 inch depth.

The planting drill or interseeder is the best method to plant grasses or legumes. The planting drill provides more uniform depth of seed placement and better seed-to-soil contact.

Interseeding with a planting drill can be used on rangeland/non-irrigated and irrigated pastures or hayland situations provided the area is not too rocky. There are some interseeders that will handle some rocks if the rocks aren't boulders.

Interseeding into existing irrigated pastures or hayland with a planting drill would provide the best results. I am aware of four different types of interseeders that have been used in the Tri River Area. Those include the John Deere Power Drill, Haybuster no-till drill, the Rocky Mountain Tar-King Plant-O-Vator, and Aitchison SeedMatic. There are always advantages and disadvantages with any

equipment. However at this point the four interseeders listed above seem to do an adequate job except for very rocky ground.

When interseeding into existing pastures or haylands, have the grass grazed or mowed as close to the soil surface as possible. This will allow the newly seeded grasses and/or legumes the best chance for establishment and survival by minimizing early competition from the established grasses.

Broadcast seeding of grasses and legumes is a common practice in the area and can be very successful. However, when broadcasting seed, the seeding rate per acre is twice that of planting with a drill. In addition, the area generally will require a harrow operation prior to seeding in untilled areas and some method of incorporating the seed after broadcasting in both tilled and untilled seedbeds.

Declining grass pastures or alfalfa fields could be broadcast seeded with grasses and/or legumes (grass pastures only) if a spiked tooth harrow operation was used prior to broadcasting the seed and again after the seeding was completed. Again, the end results would probably not be as good as using an interseeder but could certainly improve the existing declining grass pasture or alfalfa field over its current condition.

Remember, established alfalfa fields can be interseeded with grasses. Grass pastures can be interseeded with legumes. However, interseeding alfalfa into established alfalfa will generally not work because of the autotoxicity unless the established alfalfa is 2 years old or less or there are 2 or less alfalfa plants per square yard.

Seeding Time: Planting dates will vary throughout the area depending on elevation, rainfall, irrigated versus dryland, etc. In Table I there are seeding dates by elevation for rangeland/non-irrigated and seeding dates for irrigated pastures and haylands.

In Table I there is reference to dormant seeding. Dormant seeding refers to planting the grass and or legumes after the soil temperature is below 40 to 42 degrees F. Seed will not germinate below these temperatures, therefore lying dormant until late winter or early spring when the soil temperature increases to above the 40 to 42 degrees F.

Dormant seeding is very important in non-irrigated areas below 6000 feet elevation since precipitation in these areas is minimal and not dependable for spring plantings to become established before the hot summer. This is especially true when broadcasting the seed on the surface.

There has been some work in the area that suggests when using an interseeder to plant the grass seed in non-irrigated areas, a March seeding date is more successful than a November or December dormant seeding date. When the seed is planted in the late fall with an interseeder, the freezing and thawing "fluffs" the soil and the shallow planted grass seed dries out and does not survive. When seeded in March, the interseeder places the seed in a firm seedbed and the seedbed remains firm since the major freezing and thawing season has past. This refers to areas that are 6000 feet elevation or less.

TABLE I

Rangeland/non-irrigated Seeding Time

Less than 6000 feet elevation
- Dormant season - November 1-30

6000 to 7500 feet elevation
- Dormant season - October 15 - November 15
- Spring seeding - April 1-30 (marginal success)
- Late summer seeding - August 15 - September 1

7500 to 9500 feet elevation
- Dormant season - September 15 to October 15
- Spring seeding - not recommended
- Late summer seeding - August 1-31

Alpine Zone (10,000 feet elevation & above
- Dormant season - September 1-30
- Spring seeding - not recommended
- Summer seeding - July 15 to August 15

Wetland Areas ** (under 6500 Feet Elevation)
- Dormant season - November through March
- Spring planting (live plant material) - April 1 to June 1

** Wetland areas are defined as areas that have either hydric soils, free standing water, or water loving plants or a combination of any of the three

Irrigated Pasture & Hayland

Spring seeded - April 1-30

Late summer seeding (If irrigation water is available - need 6 weeks grass growth prior to first killing freeze)

Dormant season
- Less than 6000 feet elevation (November 1-30)
- 6000 to 75000 feet elevation (October 15 to November 15)
- 7500 to 9500 feet elevation (September 15 to October 15)

Important - Newly established pastures require one full season of growth and development before they should be grazed.

Fertility Requirements

A. Wayne Cooley

Soil testing is a good first step in determining your fertility requirements for a particular pasture, hay meadow, etc. We know grasses respond to nitrogen but the amount of nitrogen can vary considerably depending on yield goal, number of cuttings for hay, amount of grazing, location, water availability, etc.

Nitrogen: Nitrogen is the most important element for forage grasses. Nitrogen should be applied in the spring to maximize production during that growing season.

There are three possible negative impacts from fall applied nitrogen.

The first loss could come from runoff and/or leaching during the winter or early spring snowmelt since nitrogen is water soluble.

Secondly, nitrogen applied in the fall followed by fall moisture could allow for cool season grasses to take up and use a portion of the nitrogen in the fall that was intended for grass production during the next spring and summer.

The third possible way to lose benefits from fall applied nitrogen for the following years hay crop would be in situations where grazing is done and then a hay cutting taken in mid summer. In other words, the grass plants utilize a portion of the fall applied nitrogen for early spring growth. Animals graze for a short period in the spring and this leaves us short of nitrogen to maximize regrowth for a hay cutting in mid- summer.

Nitrogen fertilizers used in this area for pastures and haylands are urea (46-0-0), ammonium nitrate (34-0-0), and sometimes anhydrous ammonia (82-0-0). The anhydrous ammonia is metered in with the irrigation water.

Phosphorus: Grasses also need a certain amount of phosphorus and a soil test will allow us to determine those needs. Phosphorus enhances root development.

On established pastures and haylands, phosphorus is recommended to be applied in the fall for maximum benefit the following growing season. Phosphorus is not very water soluble so the freezing and thawing in the winter can assist in moving the phosphorus into the soil. This would allow the plant's feeder roots to start utilizing the phosphorus the next spring.

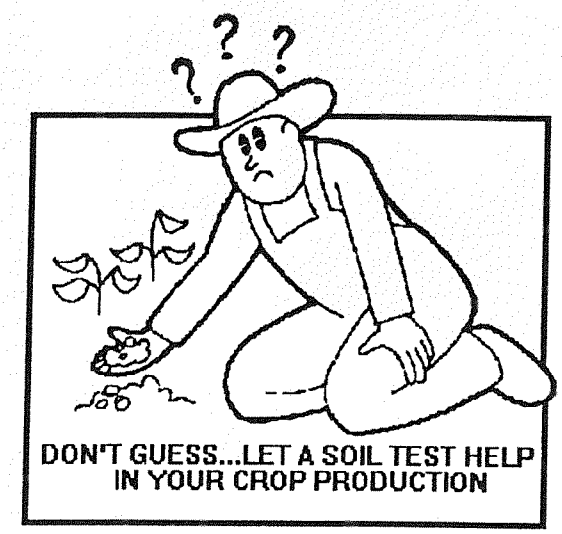
Applying phosphorus in the spring can be done, however the full benefit from the phosphorus may not be realized that growing season. Since phosphorus does not readily leach out of the soil, a portion of the spring applied phosphorus should still be available the following season.

Phosphorus becomes less available as soil pH exceeds 7.5. Since most of the area soils have a pH ranging from 7.8 to 8.3 or higher, we may be required to apply more phosphorus than areas with lower pH's. This is another reason to soil test.

Commonly used phosphorus fertilizers for

our area are monoammonium phosphate (11-52-0) and diammonium phosphate (18-46-0).

Potassium and Micronutrients: Colorado soils are generally adequate for potassium and micronutrients, however a soil test should be done to know for sure.



Soil Testing: Fertilizer recommendations without a soil test is at best a "shot in the dark". Careful soil sampling is essential for an accurate fertilizer recommendation. A composite soil sample should represent a uniform field area. Exclude small areas within a field that are obviously different. These can be sampled separately if they are large enough to warrant special treatment. The field area represented by a single composite sample should represent no more than 40 irrigated acres or 100 dryland acres.

Use a systematic sampling scheme, and a minimum of 15 subsamples, throughout the field regardless of acreage. The subsamples should be thoroughly mixed in a clean plastic bucket. Take 1 pint of soil for the composite soil sample.

Sampling depth for pastures or hay crops should be 8 to 12 inches. A soil sampling probe is best to use but a shovel can be used if it is free of rust. Sample most fields every year for nitrate analyses or until enough history is obtained to sample every other year. Thoroughly air dry all soil samples within 12 hours after sampling.

Research and demonstration plots over the past several years on the Western Slope have provided insight for general fertilizer recommendations for the areas where the tests were conducted.

In irrigated mountain meadows in Ouray County where one cutting of hay per season is taken, 70 to 80 units of nitrogen per acre was the most economical following two years of demonstration plots. However, this particular ranch location had been applying nitrogen fertilizer on an annual basis.

In irrigated haylands, where more than one cutting per season can be obtained, nitrogen needs can be as high as 180 units/A per season. All 180 units/A of nitrogen would not be applied at one time but in split applications starting in the spring and after each cutting with no more than a 100 units/A per application.

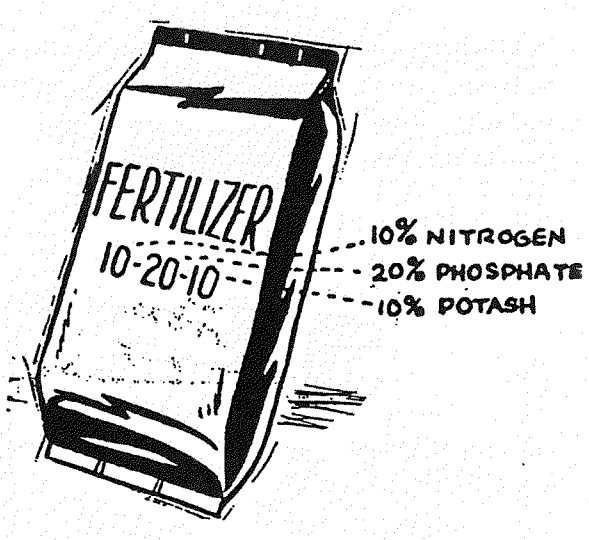
Nitrogen fertilizer should not be applied to rangeland/non-irrigated pastures in our area without first doing a soil test and considering the average annual precipitation.

Phosphorus fertilizer needs for irrigated pastures or haylands could go as high as 80 units/A with most requirements falling in the 30 to 40 units/A range. Again a

soil test is the only way it can be determined if a particular pasture or hayland has a phosphorus deficiency.

Normally phosphorus fertilizers are not recommended for rangeland or non-irrigated pastures for our area. However there have been a few soil test results for the area that required up to 20 units/A of phosphorus.

Fertilizer recommendations are generally made in units/A. Units/A refers to the actual nitrogen, phosphorus, or other nutrients needed per acre. There are several different fertilizers on the market with different percentages of nitrogen, phosphorus, etc. Therefore if 80 units/A of nitrogen is needed and urea (46-0-0) is the product being used, urea would be applied at 174 lbs/A to obtain the 80 units of nitrogen per acre. However if ammonium nitrate (34-0-0) was being used it would require 235 lbs/A to obtain the 80 units/A.



Irrigation Management

A. Wayne Cooley

Grass and alfalfa requires about the same amount of water for good growth and development. The amount of water required for these two crops are more than any other crop grown in Colorado. Grass requires about 500 pounds of water to produce 1 pound of grass.

Grass roots that are well established and in good condition can extract water up to 4 feet. However the bulk of the water taken up by grass roots is in the upper foot of soil.

How much and when to water are probably the two most often asked questions. There is no pat answer as it depends on soil type, location, amount of water and when water is available. Fertility, weed pressure, and specie selection can also affect the amount of water needed.

There are several factors that can be evaluated to help in making the decision of when to water and how much to apply.

Plants can tell us by their color. In the heat of the day, plants that have a blue-green color are in need of water.

We can take a soil sample at various depths to see if it will make a nice ribbon when pushed between our thumb and fingers. If the soil does not make a ribbon and crumbles, then it needs water.

There is also a "moisture rod" that can be pushed into the soil to determine the depth of moisture. When the soil has 50 percent or less moisture the rod will not penetrate the soil. At this point (50 percent) or slightly above, an irrigation is needed. Also if the rod will not penetrate to a depth of 12 inches or more, then an irrigation is probably needed.

Determining how much water is needed at different times of the year can be obtained by utilizing evapotranspiration (ET) data (generally published in local newspapers) or consumptive use data.

ET is probably the most accurate since it reflects the water use of each particular crop and location over the past week utilizing current weather conditions. Consumptive use graphs (Table II) are generally a long term average of use for a particular location. Since weather conditions from year to year can differ considerably, this type of data may not be as useful as current ET data.

If estimated consumptive water use graphs are used for irrigation scheduling, then the amount of water applied at each irrigation (plus rainfall amounts) must be known. For example, in the Delta, CO area, (Table II) an average pastures will utilize nearly 7 inches of water in the month of July, this means nearly 2 inches a week is needed from irrigation and/or rainfall.

Location is very important to the amount of water needed during the grass production season. In the Gunnison area it is estimated that 17 inches of water is needed per season where the Delta area requires slightly over 30 inches of water.

When irrigating it is useful to understand water equivalents so that the amount of water needed can be determined. Figure I lists some useful water equivalents.

FIGURE I

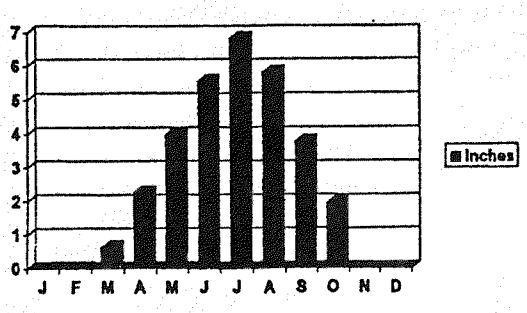
Water Equivalents

1 cubic foot = 7.48 gallons = 62.4 Lbs
1 acre-foot = 43,560 cubic feet = 325,000 gal
1 cubic foot/second(csf) = 450 gal/minute
1 cfs = 646,360 gallons per day (24 Hrs)
1 million gallons = 3.07 acre-feet

An acre-foot of water supplies a family of 5 for 1 year

TABLE II

ESTIMATED CONSUMPTIVE WATER USE - PASTURES - DELTA, CO



Weed Prevention and Control

A. Wayne Cooley

Good management and desirable vegetation greatly reduces the potential for weed invasion. When weeds are present, the reason the weeds are present needs to be determined. Are the weeds there because they are invaders or is it because of the way the pasture has been managed?

Annual Weeds: Annual weeds can be a short term problem during the first season when establishing a new pasture or hay field. Most herbicides should not be used on new seeded grass until it has established several tillers. Minimizing the impact of annual weeds the first season during grass establishment can best be accomplished by mowing the weeds to a height just above the new seeded grass. This probably would require mowing only once, twice at the most.

Annual weed problems in established pastures indicate the established pasture is in bad shape. This could be from overgrazing, lack of fertility, specie mix, or irrigation practices. Applying herbicides under these conditions would only be a short term fix if the reason the weeds where present was not corrected.

Noxious, Perennial, and/or Poisonous Weeds: These weeds should be a concern at any time or population level. Noxious weeds are those that have been introduced from other countries, therefore having no natural enemies. Without natural enemies, weeds can spread and become the dominate species in a given location. Each county has a list of those weeds that have been classified as noxious weeds.

There are annual, biennial and perennial weeds listed on the noxious weed lists, so it is important to identify the weeds so we can choose the best control method.

Poisonous weeds can be a threat to livestock and in some cases humans. Therefore monitoring, managing, and/or controlling poisonous weeds should be a priority where livestock or humans are at risk.

Weeds that have toxic properties to either livestock or humans that are present on the Western Slope include: Western whorled milkweed, showy milkweed, Russian knapweed, poison hemlock, water hemlock, low larkspur, tall larkspur, arrowgrass, deathcamas, halogeton, houndstongue, lupine, locoweed, monkshood, and orange sneezeweed.

Biennials are plants that require two seasons to complete their growth cycle. The seeds generally germinate in the spring and the emerged plants spends the first season storing up food, usually in short, fleshy root systems. The foliage of the plant is limited to clumps of leaves or rosettes. The following season, the plant draws heavily upon the stored food and grows vigorously, maturing seeds in the summer and fall before dying. Biennials spread and reproduce only by seed.

Biennial weeds found in the area include: spotted knapweed, musk thistle, bull thistle, scotch thistle, plumeless thistle, burdock, poison hemlock, houndstongue, and curly cup gumweed.

There are two classes of perennial weeds: simple perennials and creeping perennials.

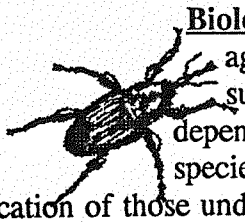
Simple perennials have a root crown which produces new plants year after year. The root crown is supported by a fleshy taproot or by a mass of fibrous roots. These perennials depend upon the production of seed for their spread, except in instances where pieces of the crown may be broken off and transplanted elsewhere.

Common simple perennials found in the area include: chicory, buckhorn plantain, curly dock, and foxtail barley.

Creeping perennials propagate by seeds, creeping aboveground stems, and creeping underground parts. Creeping above ground stems are called runners or stolons. Creeping underground stems are called rhizomes. Creeping or horizontal roots are true roots but give rise to adventitious aerial shoots and to lateral roots at any place along their length. The horizontal roots may turn downward at any point and develop as vertical roots. Aerial shoots usually arise at this point and lateral roots continue their horizontal growth.

Creeping perennials found in the area include: saltgrass, quackgrass, Russian knapweed, field bindweed (morningglory), Canada thistle, leafy spurge, whitetop, western whorled milkweed, showy milkweed, yellow toadflax, dalmatian toadflax, poverty weed, purple loosestrife, and arrowgrass.

Weed control methods: These include preventative, cultural, mechanical, biological, and chemical. It is important to use two or more of these methods for a successful program. Weed control methods in pastures or haylands are generally restricted to cultural (desirable species and good management), preventative, herbicides, and some cases mechanical (e.g. mowing).



Biological weed control agents can certainly be successfully used depending on the weed species present and the location of those undesirable plants. Location may eliminate mechanical or chemical control for various reasons. However biological control agents are limited or non existent for some plants and those that are available require 5 or more years to be successful. Biological control agents alone can never completely eliminate an undesirable plant in a given area. This is due to the fact that as their food source declines, they will either die out or move on to other areas.

Preventative weed control measures actually translates into good sanitation practices. This would include not feeding weed infested hay, planting noxious weed free certified seed, and cleaning hay and other equipment before entering a field.

Cultural weed control measures involve establishing desirable plant species and managing all aspects of the pasture or hayland as discussed throughout this publication.

Mechanical weed control methods are limited in permanent crops such as pasture or haylands. Mowing or burning may be used successfully in certain cases. Mowing can be beneficial for annual weed control as previously mentioned. Mowing

for perennial weeds in pasture or haylands is not generally conducive to maximizing hay production. In other words, frequent mowings would be required to obtain a certain level of perennial weed control and consequently would eliminate most of the forage production.

Chemical weed control involves the use of herbicides. There is no single herbicide that can address all weeds in all situations. In other words, just because a particular herbicide is said to be active on broadleaf plants (e.g. 2,4-D), it will not be effective on all broadleaf plants. In addition, an herbicide that does control a specific weed may also control or severely damage the crop being grown. This requires identifying the weeds present and in many cases prioritizing the weeds that need to be addressed first in a given location. Or in many cases changing the crop being grown so the weed can be addressed chemically.

Chemical control of perennial weeds (or any weed for that matter) requires three very important steps for a successful program. Product choice, rate of application, and timing of the herbicide application at the correct growth stages of the perennial weeds is a must to obtain maximum perennial weed control for the least time and money spent. Without following these 3 steps, failure to achieve acceptable perennial weed control is guaranteed.

The application of herbicides in a safe and effective manner requires the user to READ THE LABEL before applying the product and not after something goes wrong. The label was developed for a reason and the information contained on that label is important to know before applying the product on a given location.

Grass/alfalfa pastures or haylands: There are no herbicides that can be used in a grass/alfalfa mix to control perennial weeds without either damaging or destroying the grass or the alfalfa or both. Perennial weed control should be addressed prior to establishing a grass/alfalfa pasture or hayland. In cases where the grass/alfalfa mix is already established, the alfalfa will have to be sacrificed to chemically control the broadleaf perennial weeds. Alfalfa can then be interseeded after the weed problem is solved.

HERBICIDES COMMONLY USED FOR WEED CONTROL IN GRASS PASTURES AND HAYLANDS

A. Wayne Cooley

READ THE LABEL PRIOR TO USING ANY HERBICIDE

The following information was compiled using results from Tri River Area demonstration test plots, research literature, experience as a commercial applicator, consultant and researcher.

The importance of reading the label cannot be stressed enough. Herbicide rates can vary considerably for different weed species as well as timing of application. An attempt was made to list the weed species under each of the herbicides that result in good to excellent control when applied at the recommended rate and timing.

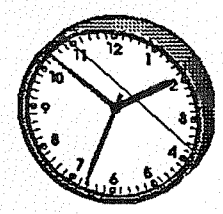
HERBICIDE ACTIVITY

How rapidly a plant "dies" or "dries up" following an herbicide application is not necessarily an indication of the herbicide's effectiveness. This is especially true in perennial weeds but also can be true for annuals as well.

Effective perennial weed control is a result of obtaining good root kill. The longer it takes a perennial plant to "dry up" following an herbicide application, the better chance that the plant is still functional and is translocating the herbicide into and throughout the root system.

Curtail on Russian knapweed generally requires several weeks following application at the bud to flower stage for the plant to completely "dry up". Roundup is another product that is very slow in it's activity and if the temperature is cool, it can take up to 6 to 8 weeks for the plants to completely brown out.

Many of the newer products on the market are slow to show visual symptoms but provides excellent long term control of many plant species.



Timing of herbicide applications must be stressed again since it is very important for effective weed control. Timing can vary depending on the herbicide as well as the species being controlled. However the general "rule of thumb" is to treat annual weeds when small and actively growing, biennial weeds when in the rosette stage of development, simple perennials in the rosette stage or in the fall and creeping perennial weeds at bud to early flower stage or in the fall prior to the first "hard freeze". In a biological system "rule of thumb" applications do not work in every situation as show below for Canada thistle control with Curtail.

Curtail:
Russian knapweed @ 3 qts/A (or 1 1/2 to 2 ounces per gallon of water and wet the plants) at the bud to early flower stage or fall (prior to first hard freeze). The best control has been obtained following fall applications.

Canada thistle @ 2 qts/A (or 1 1/4 to 1 1/2 ounces per gallon of water and wet the plants) in the fall (prior to first hard freeze) or in the spring to early summer when plants are actively growing just prior to flower bud formation.

There are over 50 weeds listed on the curtail label. Weeds listed on the Curtail label that could be important to pastures and haylands include: common burdock, curly dock, diffuse and spotted knapweed, plantain, musk thistle, Canada thistle, and Russian knapweed.

Banvel:
There are 80 annual, 18 biennial, 66 perennial and 55 woody species listed on the Banvel label as control or growth suppression. Rates and timing vary for different weeds so it is necessary to refer to the label for each specific weed.

Banvel or Banvel + 2,4-D should effectively control the following weeds on the Western Slope of Colorado when applied at the recommended rate and timing: common burdock, plantain, bull thistle, musk thistle, plumeless thistle, field bindweed, chicory, curly dock, spotted and diffuse knapweed, waterhemlock, poison hemlock, dalmatian toadflax, houndstongue, poverty weed, curly cup gumweed, tall larkspur, rabbit brush, arrowgrass, deathcamas, lupine, and locoweed.

2,4-D:
There are several trade names of 2,4-D and the list of broadleaf weeds (annual, biennial, and perennial) vary according to manufactures label. The number of weeds listed as control or growth suppression exceed 50 species.

2,4-D should provide acceptable control of the following weeds when applied at the recommended rate and timing: common burdock, diffuse knapweed, musk thistle, bull thistle, plumeless thistle, chicory, poison hemlock, and waterhemlock. Whitetop and field bindweed control with 2,4-D is acceptable at 3 qts/A, applied 3 consecutive years, at the bloom stage or in the fall.

Tordon:
Tordon is active and very effective on many broadleaf plants. Tordon is a Restricted Use Pesticide which requires a license to buy and use. It is a violation of label to use Tordon on flood or sub-irrigated pastures or haylands.

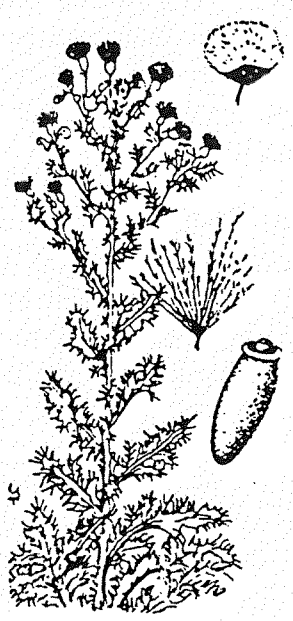
Tordon has good activity on leafy spurge but requires several years of treatment for complete control.

Roundup or Roundup + 2,4-D:
Roundup or Roundup + 2,4-D is often used for general weed control prior to planting a pasture or hayland. Roundup is non-selective and provides control or at least activity on any plants that are green. Roundup has no activity in the soil. Since Roundup is non-selective, spot spraying in established pastures or haylands would be the only option for weed species that Roundup is the only choice (e.g. foxtail barley).

Roundup can be used with a "weed wiper" application when there is a height difference between the target species and the desirable species. Obviously the target species being significantly taller than the desirable species.

Roundup + 2,4-D is fairly effective on leafy spurge but does require several years of repeated applications.

Crossbow:
Crossbow is an effective product for the control or suppression of 60 annual, biennial or perennial broadleaf weeds. The major strength of Crossbow is it is effective on over 30 brush or woody species including Russian olive, salt cedar, and multiflora rose. The product can be applied as a foliar application, dormant stem application, basal bark and cut stump application or thinline basal application.



Canada Thistle

Grazing Management Strategies

Robbie Baird-LeValley

Good grazing management strategies are designed with animal and plant productivity and economic viability in mind.

A. The Structure of Grass Plants

Growth of plants occurs from meristems (location where cell division takes place). Two basic types of meristems occur in plants. Apical meristems occur at the tips of roots, shoots, and leaves. Intercalary meristems are growing points that lie between regions of permanent tissue (i.e. at the base of internodes, leaf blades, and sheaths). The collective term for the growth unit of plants is called a phytomer. Phytomers consist of a leaf blade and sheath, internode, node, and axillary bud. Numerous phytomers collectively make up a tiller. Growth of phytomers occurs first from growing points (apical meristems) at the end of the leaf, and secondly from intercalary meristems located at the point where the leaf meets the sheath. Defoliation or death of the apical meristem causes the development of intercalary meristems to cease. However, limited growth continues from previously divided cells of intercalary meristems of the defoliated phytomer. The majority of regrowth after defoliation occurs from dormant basal buds where new tillers are formed. These buds cannot begin growth until apical dominance is released by removal of the apical meristem.

Growth of tillers occurs from the bottom up and from the inside out. Tillers are made up of terminal growing points (apical meristems), stem, leaves, roots, nodes, dormant buds, and the potential to produce a seedhead. A collective group of tillers makes up a plant.

B. The Grass Growth Cycle

Growth of grass plants can be grouped into four major phases: 1) early growth period, 2) rapid growth period, 3) reproductive period, and 4) dormancy period.

1. Early growth period. Grasses begin growth when temperature and moisture conditions allow. The process begins with the exertion of the first leaf. This is a slow process due to cooler temperatures and less than optimal growing conditions. During this period the plant relies solely on energy stored in the roots and crowns of the plant for growth. Excessive or frequent defoliation during this period can be damaging to the plant if they are grazed too much as to deplete food storage reserves.

2. Rapid growth period. When plants develop 4-5 leaves they begin to produce enough energy to support growth and metabolism of the plant. About 75-80 percent of the current years growth occurs during this period. Growth is relatively fast because temperature and moisture conditions are optimal for growth. Defoliation during this period has minimal effect on the plant because a) growth is oriented to producing new leaves and b) temperature and moisture conditions are usually favorable and enough time remains to sustain additional growth. However,

sufficient leaf area must remain to produce energy through photosynthesis and maintain energy flow to support plant functions. If too much leaf area is removed the plant must again rely on stored energy for subsequent growth.

3. Reproductive period. Near the end of the rapid growth period the plant receives a signal that conditions are changing (i.e. temperature, moisture and day length) which are not advantageous to vegetative growth. This signals the cessation of vegetative growth and the onset of the reproductive phase. At this point energy produced is allocated almost exclusively to producing seed and storing energy. This energy storage is needed for regrowth the next spring and for dormant season metabolism (respiration). It is also during the end of this period that new growing points (basal buds) are formed for next seasons growth. In warm season grasses these buds remain dormant during the winter until conditions are conducive for growth the next year. In cool season grasses these buds will begin growth in late fall (commonly referred to as fall regrowth), remain green throughout the winter, and begin growth again in the spring. Excessive defoliation during this period can be damaging due to reduced seed production and energy storage. Detrimental effects from excessive defoliation during this period will not be realized until subsequent growing seasons.

4. Dormancy period. After the reproductive period plants become dormant. These plants, however, are not "dead" but carry on life through respiration. Energy for respiration relies almost entirely on stored reserves. Excessive grazing during this period is less detrimental to the plant unless grazing removes basal buds. Leaving enough leaf material to the soil surface is crucial for maintaining soil stability, insulations and water holding capacity.

C. The FIO Principle

Plant responses to grazing can be defined in terms of three basic factors: 1) Frequency of defoliation, 2) Intensity of defoliation, and 3) Opportunity for regrowth. This is referred to as the FIO principle. Each of these factors are closely related and should not be considered as a singularly unique principle. Grazing management strategies should be designed with this principle in mind.

1. Frequency of defoliation is simply the number of times a plant is defoliated or grazed during a period of time. Research shows that plant health is directly related to the number of times in which material is removed. These responses are also related to time of removal, intensity of removal, and opportunity for regrowth.

Grazing management strategies should be designed to reduce the potential number of times a plant is grazed in one season.

2. Intensity of defoliation is the proportional removal of plant material. The effect of defoliation increases as intensity of defoliation increases. Moderate removal of leaf tissue during rapid growth will stimulate additional leaf growth. Severe removal of leaf tissue (total leaf removal) may cause cessation of growth and requires the plant to draw on stored energy reserves for regrowth. Severe removal can potentially reduce the current years production as well as seasonal growth through reduced plant vigor. A plant response to intensity of defoliation is directly related to frequency and season of defoliation and opportunity for regrowth. Grazing management strategies should be designed to increase the opportunity for regrowth as grazing intensity increases.

3. Opportunity for regrowth is probably the most important factor that determines plant health and productivity. The amount of time needed for regrowth is determined by environmental influences (i.e. temperature and moisture), season of removal, previous defoliation events, frequency of defoliation, and intensity of defoliation. Opportunity for regrowth is also influenced by plant genetics. For example, created wheatgrass has a high genetic potential for regrowth and bluebunch wheatgrass has a low genetic potential for regrowth.

D. Quality and Quantity of Forage

Animal responses to grazing are determined primarily by the quantity and quality of forage available to them. These are interacting factors but for simplicity of consideration we will look at them first as separate factors.

1. Quality is the concentration of nutrients in the herbage to be consumed. There are many measures of quality, such as crude protein percentage, total digestible nutrients, digestible organic matter, cell content percentage, etc. Leaves are the highest quality part of the plant. They have the highest digestibility , the highest protein content, and the highest concentration of most other nutrients. The youngest leaves are the highest quality leaves. That means the uppermost grass leaves are the most nutritious and that regrowth leaves are of greater quality than original leaves at the same point in time.

Anti-quality compounds are found in some plants some of which have profound effects on either selection of the plant or on its use by the animal once it is chosen. Examples of these are lignin which accumulates in plants as they mature and reduces palatability and forage digestibility or alkaloids which reduce plant palatability and/or are toxic.

Mixes of plants provide higher quality over longer seasons due to inherent differences in nutrient composition among kinds of plants and because plants grow at different rates and in different seasons (i.e., cool vs. warm season plants). One of the beneficial attributes of natural rangelands is the broad mix of plants growing there.

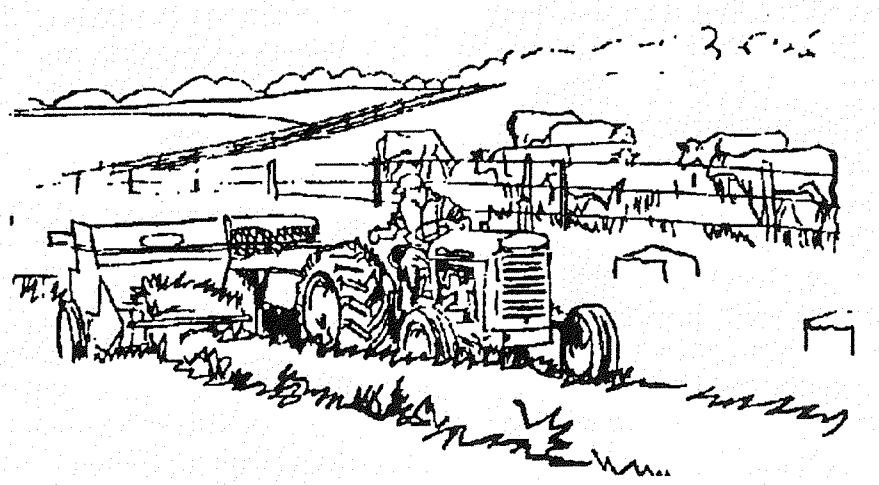
2. Quantity is the amount of forage available to the grazing animal. Quantity is sometimes expressed in different time

frames. For example, it may be useful to express forage availability in terms of amount in a pasture per animal for the season or at a point in time. A word of caution, animal choices of forage are always in terms of what is available when the choice is made. The choice has nothing to do with how many pounds per acre the land produces or how many pounds per animal are available for the season. It should be specifically noted here that animals graze forage not acres. Therefore, acres/animal may not be a very interesting value unless there is additional information. All quantity is relative. Even though there may be a lot of grasses in pounds on the ground that does not necessarily mean the grazing animal has a lot to eat. Availability of forage is modified by plant palatability, plant height, livestock distribution and many other factors.

E. Matching Plant Quality to Animal Needs

Quality vs. Quantity interactions are the key to livestock management in a rangeland situation. A grazing animal has the capability to consume about 3 percent of its body weight per day on a dry matter basis. However, in a grazing situation either forage availability or digestibility will reduce that intake. An animal will not extend its grazing time beyond a certain point. The digestibility of the consumed forage limits passage rate, therefore the additional forage cannot be consumed.

Animals grazing in the best of conditions (high availability and high digestibility) will consume about 2.5 percent of their body weight per day. This rate of consumption will produce good livestock performance.



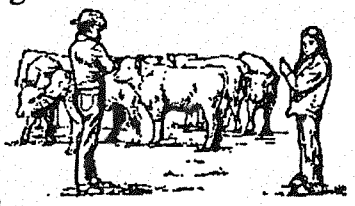
The Grazing Process

Robbie Baird-LeValley

Understanding the grazing process is important since the predictability of the defoliation process is an integral part of any grazing management program. Livestock are very selective in their choice of plants and will consume the most palatable plants first. Selective defoliation can be a very important factor affecting the stability of multiples species pasture through its effect on individual plants. A seeded mixture should contain plants with similar palatability and growth form. If a less palatable grass is included in a mixture with palatable species, the less palatable grass will soon dominate the pasture as a result of selective grazing.

The net effect of grazing can be either detrimental or beneficial dependent on the severity of grazing as characterized by frequency, intensity and opportunity to regrow. Proper grazing of a perennial grass is very beneficial. Proper grazing should be viewed in the same manner as proper irrigation and fertilization. When properly implemented, its effect can be as dramatic as irrigation or fertilization.

Proper grazing can increase total production of a pasture. If grazing is done with the consideration of the plant, the forage is maintained in an active growth and tillering phase longer. As long as the plant is vigorous, an active growing point remains intact and proper environmental conditions exist, forage production can continue.



The degree of grazing during the growing season should be designed to allow enough leaf area to remain to provide carbohydrates for regrowth rather than using stored energy from buds. One tool used to help design a proper grazing program is stubble height. Stubble height is used to monitor the pasture currently being grazed for how much forage is left, as opposed to how much has been consumed (see chart for minimum stubble heights).

Not every plant in the pasture will be grazed to the minimum stubble height. Rotate pastures when the majority of the desired plants have been grazed to the accepted stubble height. This will prevent the less desirable species from becoming dominant as the desirable species are unable to maintain their vigor. Overgrazed pastures look as if it had been mowed. Properly grazed pastures will have some areas that do not get proper utilization. Under utilized pastures will have large areas that do not receive grazing and can become unpalatable or dominant.

Pastures should be rotated through fast during the peak growing season and slower as the plant growth slows down. Do not graze a pasture too severely during the later part of the grazing season as this will reduce the energy for next springs growth. This will result in lower production of the grass during next spring. Once the plant

goes completely dormant, heavier grazing can occur. However, avoid grazing that exposes the crown and damages the plant.

Plants are not capable of supporting rapid growth in their shoots and roots simultaneously for an extended period of time. If pastures are grazed severely, root growth stops and roots may die back. If overgrazing continues, the grass has little leaf area to carry on photosynthesis so the plant is low in energy and cannot adequately replenish root reserves. Roots then die back and the plant has only enough energy to maintain a shallow root system. The result is a pasture that is much more susceptible to environmental factors. Some plants may die out allowing weeds to invade. Even if plants stay alive, there may be enough open ground for weeds to establish. The pasture begins to decline as weeds and undesirable species become dominant. Therefore, it is critical to maintain or work toward a proper grazing program to keep a pasture healthy and vigorous.

To understand grazing management, certain terms must be defined and understood.

Stocking rate: is the number of animals on a given land area for a unit of time. This is frequently expressed in standard units such a AUM/acre (animal unit months per acre). In its truest form, stocking rate is an expression of forage demand. An example of a stocking rate is .5 AUM/acre. This means that one acre will have enough forage to take care of one-half of one animal for a month before it needs to be moved to another acre in order to avoid overgrazing. One AU (Animal Unit) weighs 1000 pounds. One AU equals one cow weighing 1,000 pounds or five sheep or 0.7 horses.

Determining Stocking rate:

1. Determine total grazeable pasture acreage (PA) for the season.

2. Estimate average pasture yield (PY) per acre. Use actual yield figures. An estimate is 400 lbs of production per acre per inch of grass.

3. Estimate the length of your grazing season (GS) in days.

4. Estimate the average weight (AW) of one of your animals.

5. Calculation: Number of animals $= \frac{PA \times PY}{(.04) \times (AW) \times (GS)}$

6. Example: The total grazeable acreage is 10 acres with a 4000 lb yield and a grazing season of 150 days. The pasture will be grazed by 1200 pounds cows.

No. of animals $= \frac{(PA)\ 10 \times (PY)\ 4000}{(.04) \times (AW)\ 1200 \times (GS)\ 150}$

$= \frac{40{,}000}{7200}$

= 5.55 cows on 10 acres per year

These calculations should be used only as guides to help you get started. Actual numbers will vary from site to site and year to year because of variations in the weather, soil type, and pasture condition.

Stocking density: is the number of animals per unit of land at an instant in time. This

may be expressed as animal units/acre.

Perennial forages are a renewable resource. With the basic understanding of how grasses grow, grazing management can increase the productivity of a pasture. It is critical to utilize appropriate grazing management to attain a high productive pasture.

1. Know the pasture's stocking rate and stocking density and manage grazing accordingly. If you have more animals than the pasture can sustain, plan on feeding supplemental forage in a corral and locking animals out of the pasture. For example, most pastures in the Tri River Area cannot sustain horses on them for extended periods of time. You may have to limit them to a few hours per day of pasture grazing to maintain a productive pasture.

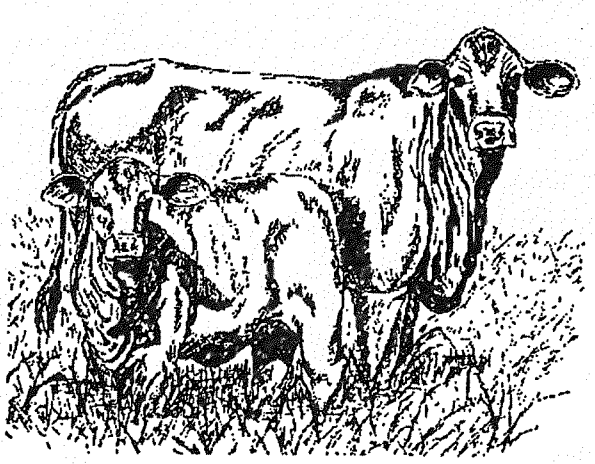
2. Rotate animals within a pasture. Even smaller pastures are more productive when they are allowed the opportunity to regrow. Properly graze the pasture by monitoring stubble height.

3. Do not graze the same pasture at the same time of year continuously. Alternate when the animals graze the pasture with the plant growth. Allow the plant to go to seed once in three years of grazing.

4. Buds for energy are formed during the season prior to winter dormancy. Carbohydrates are stored late in the growing season. Consequently, fall management is a very critical period and adequate time should be provided after grazing and before dormancy for carbohydrate accumulation and bud development.

5. Allow sufficient leaf area going into the fall to insure continued root growth.

This information is just a synopsis of grazing management. For specific information on your pasture, contact the Colorado State University Cooperative Extension Office at 874-2195.



SPECIFICATIONS

1. Minimum Grazing or Cutting Heights
   A. Pastureland

Species	Minimum Height Prior to Beginning Grazing (inches)		Minimum Height During Growing Season (inches)	
	Maintenance 1/	Optimum 2/	Maintenance 1/	Optimum 2/
Alkali Sacation	5	8	3	5
Brome, smooth	5	8	3	4
Fescue, Meadow	5	8	3	5
Fescue, tall	5	8	3	3
Fescue, hard	4	5	2	4
Foxtail, creeping meadow	5	10	3	5
Kentucky bluegrass	3	5	2	4
Indian grass	12	18	6	10
Orchard grass	5	8	3	5
Redtop	4	6	3	4
Reed canarygrass	12	18	4	6
Russian wildrye	4	6	3	5
Sideoats grama	4	5	2	4
Switchgrass	12	18	8	10
Timothy	4	6	2	4
Sedge, Nebraska	3	5	2	4
Wheatgrass Siberian, Pubescent Western, Intermediate Slendar	5	8	3	5
Wheatgrass, crested	4	6	2	4
Wheatgrass, tall	8	12	5	8
Cicer Milkvetch	6	10	3	4
Alfalfa	6	10	3	4

1/ These heights will allow maintenance of the stand.
2/ These heights will provide maximum yields when other plant requirements are met.

ATTACHMENT I

I. RANGELAND/NON-IRRIGATED

The seeding rates are for individual grasses or legumes in pure stands and drilled. If a mixture is preferred, we recommend no more than three grass species and a legume.

A. Altitude - Less than 6000 ft. Moisture Range - Less than 12" total precipitation

	Seeding Rates
1. Siberian wheatgrass (P-27)	4 #/ac.
2. Indian ricegrass (Nezpar)	6
3. Western Wheatgrass (Barton, Arriba, Rosanna)	7
4. Thickspike wheatgrass (Critana)	7
5. Pubescent wheatgrass (Luna)	9
6. Crested wheatgrass	
a. Bunchgrass (Nordan)	4
b. Sod-former (Fairway)	4
c. Hybrid, bunchtype (Hycrest)	4
7. Orchardgrass (Paiute)	3
8. Tall Wheatgrass (Jose')	11
9. Galleta grass	6
10. Sand dropseed	0.2

B. Altitude - 6000 - 7500 ft. Moisture Range - 12 - 16" total precipitation

	Seeding Rates
1. Siberian wheatgrass (P-27)	4 #/ac.
2. Indian ricegrass (Nezpar)	3
3. Western wheatgrass (Barton, Arriba, Rosanna)	7
4. Russian wildrye (Vinall, Swift, Bazoisky)	5
5. Crested wheatgrass	
a. Bunchgrass (Nordan)	4
b. Hybrid (Hycrest)	4
6. Pubescent wheatgrass (Luna)	6
7. Intermediate wheatgrass (Oahe, Amur)	9
8. Smooth brome (Manchar)	7
9. Basin wildrye (Magnar)	6
10. Sweetclover (white or yellow blossom)	3
11. Ladak Alfalfa	3

C. Altitude - above 7500 ft. Moisture Range - 16" precipitation and above

	Seeding Rates
1. Smooth brome (Manchar, Lincoln)	7 #/ac.
2. Meadow brome (Regar)	11
3. Intermediate wheatgrass (Amur, Oahe)	5

4. Orchardgrass (Latar, Potomac)	3
5. Slender wheatgrass (Primar)	6
6. Alfalfa (cold tolerant, nematode and disease resistant varieties)	5
7. Tall fescue (Endophyte-free) (Fawn)	5
8. Cicer milkvetch (Monarch, Lutana)	8

II. IRRIGATED PASTURE AND HAYLAND

The seeding rates are for individual grasses or legumes in pure stands and drilled. If a mixture is prepared, we recommend no more than three grass species and a legume.

A. Well-drained	Seeding Rates
1. Smooth brome (Manchar, Lincoln)	13 #/ac.
2. Orchardgrass (Latar, Potomac)	3
3. Intermediate wheatgrass (Amur, Oahe)	20
4. Tall fescue (Endophyte-free) (Fawn)	8
5. Timothy (Climax, Itasca)	3
6. Meadow brome (Regar)	22
7. Alfalfa (Nematode-disease resistant varieties)	10
8. Red clover (Kenland, Redland, "medium red")	6
9. Cicer milkvetch (Monarch, Lutana)	10
10. Sainfoin (Eski) - Potentially valuable, non-bloating	15
11. Birdsfoot Trefoil - Potentially valuable, non-bloating	5

B. Poorly-drained/Wetlands/Sub-irrigated	Seeding Rates
1. Red top	1 #/ac.
2. Reed canary (low alkaloid varieties)	5
3. Creeping meadow foxtail (Garrison)	5
4. Scotch timothy ("common meadow foxtail")	5
5. Tall fescue (Fawn)	8
6. White clover (Ladino)	3
7. Alsike clover	3
8. Strawberry clover	3
9. Red clover	3

C. High Salt Conditions	Seeding Rates
1. Tall wheatgrass (Jose')	12 #/ac.
2. Tall fescue (Fawn)	8
3. Basin wildrye (Magnar)	11
4. Birdsfoot trefoil	5
5. Strawberry clover	3

ATTACHMENT II

CHARACTERISTICS OF GRASSES AND LEGUMES

SPECIES	GROWTH HABIT	SEASON OF USE	SALT TOLERANCE	SEEDLING VIGOR	LONGEVITY	RECOVERY RATE	FLOOD OR WETNESS TOLERANCE	DROUGHT TOLERANCE	YIELD POTENTIAL	WINTER HARDINESS	REMARKS
Grasses Basin Wildrye (Magnar)	Bunch	Spring/ Winter	Good	Fair/poor	Long	Slow	Good	Excellent	High	Excellent	
Grasses Creeping Meadow Foxtail (Garrison)	Sod	Spring	Good	Good	Long	Rapid	Excellent	Poor	Medium	Excellent	Excellent Early Palatability May Become Weedy
Indian Ricegrass (Nezpar)	Bunch	Spring Thru Fall	Fair	Fair	Long	Moderate	Poor	Excellent	High	Excellent	
Meadow Brome (Regar)	Sod	Spring Thru Fall	Fair	Good	Long	Rapid	Good	Fair	High	Excellent	
Orchard-Grass (Latar) (Paiute) (Potomac)	Bunch	Spring Thru Fall	Poor	Good	Medium	Rapid	Poor	Fair	Medium	Fair	May Winter-kill above 7500 Ft., Excellent Palatability Paiute-very Drought Tolerant.
Reed Canary	Sod	Spring Summer/ Winter	Moderate	Poor	Long	Rapid	Excellent	Good	Medium	Excellent	Low Alkaloid Varieties Only.

ATTACHMENT II (CONTINUED)

Species	Growth Habit	Season of Use	Salt Tolerance	Seedling Vigor	Longevity	Recovery Rate	Flood or Wetness Tolerance	Drought Tolerance	Yield Potential	Winter Hardiness	Remarks
Red Top	Sod	Spring Summer	Fair	Excellent	Moderate	Moderate	Excellent	Poor	High	Excellent	
Russian Wildrye (Vinall) (Swift) (Bozoisky)	Bunch	Spring Thru Fall	Good	Good	Long	Slow	Poor	Excellent	Medium	Excellent	Plants Will Space Themselves
Smooth Brome (Manchar) (Lincoln)	Sod	Spring Thru Fall	Fair	Good	Long	Medium	Fair	Good	High	Excellent	Excellent Palatability
Tall Fescue (Fawn)	Bunch	Spring Thru Fall	Excellent	Good	Long	Rapid	Good	Fair	High	Good	Fair Palatability Endophyte-free Varieties Only.
Timothy (Climax, Itasca)	Bunch	Spring Thru Fall	Poor	Good	Short	Slow	Good	Poor	Medium	Excellent	
Scotch Timothy (Common Meadow Foxtail)	Bunch	Spring Thru Fall	Good	Fair	Long	Rapid	Excellent	Poor	Medium	Good	

ATTACHMENT II (CONTINUED)

Species	Growth Habit	Season Of Use	Salt Tolerance	Seedling Vigor	Longevity	Recovery Rate	Flood or Wetness Tolerance	Drought Tolerance	Yield Potential	Winter Hardiness	Remarks
Wheat Grasses Crested (Nordan, Fairway, Hycrest)	Bunch/sod	Spring Spring Spring/ Fall	Good	Good	Long	Slow	Poor	Excellent	Medium	Excellent	Fairway-sod former, palatability fair. Hycrest-excellent seedling vigor, strong competitor, high yielder.
Intermediate (Oahe, Amur)	Sod	Spring/ Fall	Fair	Excellent	Medium	Slow	Poor	Excellent	High	Excellent	
Pubescent (Luna)	Sod	Spring/ Fall	Good	Excellent	Long	Slow	Poor	Excellent	Medium	Excellent	
Siberian (P-27)	Bunch	Spring/ Fall	Good	Excellent	Long	Slow	Poor	Excellent	Medium	Excellent	
Slender (Primar)	Bunch	Spring Thru Fall	Fair	Good	Short	Slow	Good	Good	Medium	Excellent	
Tall (Jose')	Bunch	Spring/ Fall/ Winter	Excellent	Excellent	Medium	Slow	Good	Excellent	High	Excellent	Fair palatability
Thickspike (Critana)	Bunch	Summer	Good	Good	Long	Fair	Fair	Excellent	Good	Good	
Western (Barton, Arriba, Rosanna)	Sod	Spring Thru Fall	Good	Good	Long	Fair	Fair	Good	Good	Good	

ATTACHMENT II (CONTINUED)

Species	Growth Habit	Season of Use	Salt Tolerance	Seedling Vigor	Longevity	Recovery Rate	Flood or Wetness Tolerance	Drought Tolerance	Yield Potential	Winter Hardiness	Remarks
Legumes Alfalfa	Tap Root	All Seasons	Fair	Excellent	Long	Rapid	Poor	Good	High	Excellent	Bloat danger. Character-istics will vary with variety
Clovers Alsike	Fibrous Root	All Seasons	Poor	Excellent	Medium	Medium	Good	Poor	Medium	Excellent	Bloat danger.
Red (Kenland) (Redland)	Fibrous Root	All Seasons	Poor	Good	Short	Slow	Poor	Poor	Medium	Excellent	Bloat danger.
Strawberry	Stolons	All Seasons	Good	Good	Medium	Medium	Excellent	Poor	Low	Poor	Bloat danger.
Sweet (white or yellow)	Tap root	All Seasons	Good	Excellent	Biennial	Medium	Fair	Good	High	Excellent	Poor palatability. Bloat and coumar dangers. Good soil improver
White (Ladino)	Stolons	All Seasons	Poor	Good	Medium	Rapid	Fair	Poor	Medium	Poor	Bloat danger. Excellent palatability.
Cicer Milkvetch (Monarch) (Lutana)	Rhizomes	Summer/ Fall	Good	Poor	Long	Rapid	Good	Fair	Medium	Excellent	Seed should be scarified & innoculated Non-bloating.
Birdsfoot Trefoil (Viking)	Fibrous Root	Summer/ Fall	Good	Fair	Medium	Medium	Good	Fair	Medium	Good	Excellent palatability. Non-bloating. Primary grazing use.
Sainfoin (Eski)	Fibrous Root	Spring Thru Fall	Good	Excellent	Medium	Slow	Poor	Good	Medium	Excellent	Non-bloating.

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